 Eskom	NEC3 <i>Engineering</i> and Construction Detailed Specifications	Distribution
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Title: **Rouxville Substation
66/22kV New Transformer
Bay**

Unique Identifier: **NW-STM-1606-2731**

Alternative Reference
Number: **N/A**

Area of Applicability: ***Engineering***

Documentation Type: **Detailed
Specifications**

Revision: **0**

Total Pages: **122**

Disclosure Classification: **CONTROLLED
DISCLOSURE**


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Date: 30 June 2023

Date: 30 June 2023

Date: 30 June 2023

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C3 SCOPE OF WORK

C3.1 Works Information - Civil Works

C3.1.1 Description of the Works

The works shall include the complete construction of the following items:

Access Roads:

Access Road1 will start at the edge of the existing proclaimed gravel road and continue to the south western boundary substation access gate. Access Road 2 will start at Chainage 0+192.830 of Access Road 1 and will continue around the substation to the existing substation access gate and control room on the south eastern side of the substation.

The roads shall be 4.0m wide with a 3.0% crossfall to one side of the road. The direction of fall shall be towards the side with the high natural ground level (NGL).

The road layer works shall include insitu road bed preparation after the stripping of topsoil and “clear and grub” activities along the plan road routes. The road layer works shall be constructed, a G5 selected subgrade layer and a G5 gravel wearing course. G7 Fill layers shall also be required in areas in fill to below the selected subgrade and wearing course layers.

Stormwater Drainage and Management:

The road cross section shall include a trapezoidal shaped side drain for areas in cut to ensure that the road layer works remain dry and free draining. The side drain shall be a earth lined drain. These side drains shall be graded to ensure that water will be directed towards the culvert inlets.

Two pipe culverts shall be constructed along the Access road 1 route. Refer to the layout and long section drawings for a reference chainage at which the culverts shall be constructed. The pipe culverts shall be constructed using 225 mm diameter (nominal diameter) 100D pre-cast concrete pipes. To take note is that the final culvert location and orientation can be changed to suite the final conditions onsite. This shall be done in consultation with the Project Engineer. The new culverts shall be constructed complete with concrete inlet and outlet structures as per the detailed drawings. The inlet and outlets of each culvert shall be stone pitched with Type 1 Stone Pitching (Plain Pitching) to ensure effective erosion protection at the culvert outlets. Some “day-lighting” at the culvert outlets may be required to ensure that the culverts drain storm water runoff freely.

An earth berm shall be constructed of G7 material covered with topsoil and established vegetation. This berm shall be constructed “upstream” of the substation to intercept storm water runoff and direct water around the substation.

“Mitre banks” shall also be constructed along the left-hand bottom of fill of Access Road 1 to direct water away from the fill “toeline”. The positions of the “Mitre banks” shall be placed at positions finalized on site in consultation with the Project Engineer.

Substation and Fencing Works:

A new boundary fence gate shall be installed at the start of the gravel Access Road no 1 Refer to the Project drawings for an exact position. This position may, however be changed after consultations with the property owner. This gate shall be installed complete with a concrete gate ramp. Refer to the detailed drawings for more information. The existing substation security fence diamond mesh shall be completely removed and replaced with a new diamond mesh fence as per the detailed drawings and specifications. All the existing gates shall be replaced as scheduled and a new 5.0m double leaf gate shall be installed on the south western fence to allow access to the substation stone transformer runway.

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The existing internal substation fence shall be completely replaced with the new diamond mesh fence as per the detailed drawings.

All the substation yard stone shall be replaced with new yard stone to the required depth as detailed. Herbicide shall be applied to the substation terrace prior to the placement of the imported yard stone.

The existing substation cable trench covers are asbestos type covers. These shall be removed in accordance with the relevant OHS required standard for working with existing asbestos containing materials and disposed of accordingly. New concrete type trench covers shall be installed on the existing cable trenches.

The existing stone verge kerbing shall be completely removed and disposed of. The kerb line shall be relocated to the require 1.2m from the fence line. Minor earthworks shall be required to fill and the adjacent natural ground to the same level as the substation terrace using G5 material. New pre-cast concrete kerbs shall be installed in the correct position, prior to the spreading and levelling of new yard stone.

New cable trenches shall be constructed on the MV side of the substation, as per the detailed drawings. Refer to the substation General Arrangement drawings for detailed positions of the new cable trenches.

A new concrete plinth and bunded area shall be constructed for the new HV feeder bay. This shall be done as per the project and detailed drawings.

Control Room Extension:

The existing control room shall need to be extended to accommodate the new control plant panels to be installed inside the building. The building extensions shall be 4.747m long x 5.191m wide in a southern direction. The new building façade is to match that of the existing building. The exiting foundation shall be extended, utilizing the same dimensions, for the extent of the building extension.

Brick walls shall be of the same design and type as that of the existing building. No extensions shall be made to the existing cable trenches in the building and new cable ladders shall be installed in the extension and continue vertically into the existing cable trenches to facilitate cable installation in the building extension. The new control plant panels to be installed shall be top entry panels. The existing windows and ventilation ducts shall be built-up and shut using the same brick wall construction as that of the existing building to prevent unauthorised access and lessen dust contamination in the building. The power and lighting installation shall be extended to include the new building extension. Sufficient lights shall be installed to ensure ample task lighting is provided in the building extension, as pre the requirements of the detailed drawings.

The walls shall be plastered inside and outside and then primed and painted with a durable paint finish. The roof shall be extended using the same roof structure design. The roof structure design shall be provided to a reputable roofing designer or supplier which shall confirm the design as suitable for the new extension prior to the construction of the roof. The roof sheeting shall match that of the existing building. A new roof gutters shall be installed on the lower side of the roof slope to drain run-off from the roof. The existing ceiling shall be completely removed and a new ceiling shall be installed to cover the entire building. The ceiling shall be insulated as detailed.

To note is that an existing column foundation will need to be demolished and disposed of and earthworks reinstated prior to the construction of the building extension. This foundation shall obstruct the building extension and thus the demolition of the concrete.

Pest Removal:

The existing building has a serious bee infestation which shall need to be removed from the existing walls and the ceiling cavity prior to any construction activities taking place. Once the infestation has been

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removed, repairs to the walls and roof will be done in order to prevent such a future infestation to the building.

C3.1.2 Work to be performed by the *Contractor* of the Works

a) Scope of Works

The Contractor shall completely construct the following works at Rouxville substation:

- i) Upgrading of Access Roads.
- ii) Construction of Storm water culverts, earth drains, berms and mitre banks.
- iii) Complete replacement of the existing fences and gates with all signs, notices and labels.
- iv) Replacement of existing property boundary gate.
- v) Complete removal of existing stone verge kerbing and replacement with new stone verge kerbing at the correct offset.
- vi) Construction of new cable trenches.
- vii) Construction of new transformer plinth and bund wall.
- viii) Complete extension of the existing Substation Control / Relay Room and the demolition of an existing foundation adjacent to the existing building.
- ix) Closing of existing windows and ventilation openings in the existing building.
- x) Construction of a new cable trench road crossing
- xi) Replacement of Asbestos cable trench covers with new pre-cast concrete type covers
- xii) Removal of yardstone, herbicide treatment and placing of new imported yardstone.

The Works shall be executed in total, to Employer's requirements, as per designs and in accordance with the relevant specifications and Employer standards

C3.1.3 Preliminary, General Costs and Site Establishment

a) Fixed Charge Items for Site Establishment

i) Site Camp

The Contractor will be responsible to locate a suitable site to establish a construction camp, site office and stores.

ii) Contractor's Yard Fencing

The cost to the *Contractor* to make provision for and to erect, alter as necessary, maintain, remove and make good on completion of the works suitable fencing with access gates, etc. As necessary for the

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enclosure of the *Contractor's* yard, all to the satisfaction of the *Employer's* appointed *Supervisor / Representative*. If other suitable and safe storage facilities have already been provided, this item need not be priced.

iii) Contractor's insurance (insurance payments, provide certificates)

The cost to the *Contractor* to make provision to pay all deductibles (excesses) for the risks that he may encounter during the execution of the Works, further explained in the Contract document.

iv) Site Offices (establish & maintain)

The *Contractor* provides a secure and accessible area for the Site Camp, which includes secure storage facilities and areas, etc. The location of the site camp shall be determined on site in consultation with the Project Manager, local communities, and the relevant authorities.

On completion of the contract, the *Contractor* removes the site camp and offices, and the area will be left in its original state to the satisfaction of the *Employer's Representative*.

v) Site Office

- The Contractor shall provide on Site a minimum of one well illuminated, insulated furnished and ventilated site office for utilisation by the Employer / Project Manager or their Representatives. This site office shall have min. the following:
- A Suitable water supply and sanitary facilities (chemical toilet).
- First aid facilities
- Telecommunication facilities (down loading of electronic communications and printing of it)
- Access to Employers website to download latest information.
- 1 x Table, 6 x chairs and drawing/filing cabinet.
- Site dairy

vi) Site Stores (establish & maintain for safe keeping of the materials) - Material Storage Area and Store

- The *Contractor* shall provide a secure fenced-in yard for the whole of the contract period. Storage facilities must be of such a nature that all the *Contractors* materials, including Materials supplied by the Employer, are safe from theft, fire hazards and vandalism and against damage due to wind, weather. Fire breaks around the storage area, and fire-fighting equipment must be in accordance with the OHS Act, and of sufficient capacity to ensure the security of stored materials as per specifications specified elsewhere above.
- The *Contractor* shall provide a qualified store-man to receive and issue materials. This store-man shall maintain a proper administrative record reflecting all materials received and issued as described elsewhere in this document.
- The *Contractor* shall implement a materials management system on the "Kardex Method". The method can be implemented using any equivalent materials management system available. The system shall be such that it utilises best practice principles and methods. This system will be

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updated continuously for monthly inspections by the *Employer* or his *Representatives*. At any time, it must be possible for the *Employer* to establish from these records exactly what material and/or plant is kept in store or has been erected. These figures will regularly be compared to the actual quantities measured on site and the formal *Employer's* issuing invoices.

vii) Accommodation of Employees

The cost to the *Contractor* to make provision for accommodation for his employees that are working on a site which is not close to their home base for an extended period.

viii) Contractor's Plant, Equipment & Tools (establish, maintain and remove)

The cost to the *Contractor* to make provision for the necessary Plant, Equipment and Tools for the execution of the Works, maintain it in a proper and safe working condition and remove on Completion.

ix) Sanitary Facilities

The cost to the Contractor to make provision for and maintain in a thoroughly clean and tidy condition and remove on completion of the Works, proper toilets for the use of the workmen

x) Water Supplies

The cost to the Contractor to make provision for all water necessary for the execution of the Works, including all temporary plumbing, removing same and making good on completion of the Works. Potable drinking water should also be made available for the workmen.

xi) Electricity Supplies

The cost to the Contractor to make provision for all electricity and artificial lighting necessary for the execution of the Works, including all temporary installation work, removing same and making good on completion of the Works.

xii) Communications (telephones, e-mail, faxes)

The cost to the Contractor to make provision and to maintain a proper telephone or cell phone communication system as well as an e-mail and or a fax facility until completion of the Works.

xiii) Security (24 hours)

The cost to the Contractor to make provision for all appropriate measures for the general security of the Works.

xiv) Setting out the Works.

Cost to the Contractor to provide templates, jigs, instruments (dumpy levels) etc. and to set out lines and levels for excavations, concrete plinths, buildings, structures, fencing, drainage, etc.

xv) Management & Programme for the works (appointment of a Supervisor)

The cost to the Contractor to make provision for the employment of a competent supervisor to supervise and manage the execution of the Works as well as to prepare a detailed programme and supporting documentation for the execution of the contract including the work of all approved Sub-Contractors engaged by Employer, representing the information that is required by the Works Information in sufficient detail to enable the Employer's Representative to assess the progress of the works at all times in comparison with the programme.

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C3.2 Health & Safety (OHS Act, Construction Regulations and Eskom Safety Specifications)

C3.2.1 General

a) **Personal protective equipment:**

The cost to the Contractor to make provision to replace PPE. Only when required and not to purchase new PPE for each project. Only the PPE required for the risks exposed to during the Contract period should be priced. Typical PPE (Hard hats, Safety goggles or shields, Respirators, Gloves, Safety shoes, Overalls, Fall Arrest Systems, Testing of equipment.

b) **Compliance with safety plan & safety file**

The cost to the Contractor to make provision to comply with the list of requirements to draw up a H & S plan for the project and compile and maintain a H & S File.

c) **Health & Safety Training**

The cost to the *Contractor* to make provision for H&S training as well as the cost of the idle (unproductive) time of his employees whilst undergoing H & S training.

d) **Legal appointments in terms of the OHS Act and Regulations**

The cost to the Contractor to make provision for the appointees in terms of the OHS Act and Regulations i. e., qualified first aider, construction site Health and safety officer, incident / Accident investigator, if not part of the construction teams of the Contractor, and appointed full time for this purpose. The additional cost of their employment which cannot be recovered through contract rates should be allowed here.

e) **Other Health and Safety items deemed necessary to comply to OHS Act, Regulations and Eskom Safety specifications.**

The cost to the Contractor to make provision for the cost to comply to any other requirement of the OHS Act, i.e., to notify the Department of Labour of the Construction project, time and cost to do and record daily Risk assessments, taking responsibility of Sub-Contractors' compliance in terms of the OHS Act (Safety Plan and File), constant updating of the Health and Safety File, etc.

f) **Provision of Standards and Specifications**

The cost to the Contractor to obtain Standards and Specifications that are referred to in this Contract document but are not supplied in hard copy format by Eskom.

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g) **Special transport of workers to, at and from site i. t. o. OHS Act.**

The cost to the Contractor to provide safe transport to his employees at, to and from the construction site in terms of the Construction Regulations Clause 23 (2).

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C3.3 Environmental Management

C3.3.1 Compliance with environmental legislation as well as environmental specifications included in or referred to in this document.

The cost to the Contractor to all the required obtain permits should it become necessary to cut a protected tree, ensure that waste is disposed of on a permitted, legal waste site and all relevant costs payable to dumping site.

C3.3.2 General

a) Completion and submission of the expanded public works programme report

The cost to the Contractor to complete the report (one page) attached to this Contract document and submitted to the Project Manager upon completion of Electrification, Sub-transmission and Refurbishment projects and with each invoice for Minor Reticulation projects.

b) Provide for the repair to damaged water reticulation pipes

The projected cost to the Contractor of repairing damaged water reticulation and/or other underground services that were not indicated on drawings or which a superficial search by the Contractor, did not reveal.

c) Items deemed necessary for the completion of this Assessment Stage

Any other cost or contingency identified by the Contractor which is not covered in the Site Establishment and could have a cost implication to the Contractor. Must be specified to warrant inclusion in the Price Schedule.

d) Notes:

- i) The Contractor is referred to the contract documents for the full intent and meaning of each clause or item. He shall allow opposite each clause or item herein contained whatever payments he may consider necessary for the carrying out and observance of such item.
- ii) The Contractor shall price the Preliminaries and General Activities, in respect of all payments required for any item of work, risk, contingency or obligation, whatsoever that is not described in the Activity Schedule and which is the responsibility of the Contractor under the contract.
- iii) The Contractor shall, when requested by Employer, make available to Employer the detailed breakdown of each priced item in Preliminaries and General.
- iv) In the event of the Contractor not pricing the items of the Preliminaries and General Activities in sufficient detail, the Employer reserves the right to exercise its own discretion in the apportionment to individual items of the total Preliminary and General prices within the contract documents

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C3.4 Work and things to be supplied by the by the *Contractor* of the Works

C3.4.1 Material

- a) The Contractor will supply, handle and install all material required for this project.
- b) Any material shortages regarding Materials supplied by the Employer must be identified by the Contractor upon delivery. The Contractor will notify the Project Manager of such shortages within 24 hours of the identification of a shortage.
- c) The responsibility for the insurance excess due to any form of damage or theft of materials rests with the Contractor.

C3.4.2 Equipment

The *Contractor* shall supply all the plant required to complete the works.

C3.4.3 Holding Points of the works

- a) No construction activities will commence until the site is officially handed over by the Project Manager or his Representative to the Contractor.
- b) No construction activities will commence prior to the submission of a detailed construction program and special tool calibration certificates, etc. by the Contractor.
- c) The Employer's Supervisor or Clerk of Works will have the prerogative to execute a proper inspection on the condition of all construction tools, equipment and vehicles prior to the commencement of any construction activities.
- d) No granular material obtained from commercial sources shall be used prior to the Contractor submitting the required test results of the following test criteria to the Project Engineer for approval:
 - i) Sieve Analysis
 - ii) Mod. AASTO Maximum Dry Densities
 - iii) Atterberg Limits
 - iv) CBR
 - v) UCS (if applicable)
- e) No results shall be considered valid if they are 3 months and older.
- f) The Contractor shall test/check the compaction of every completed 150mm thick layer of the platform before the construction of the successive layer. The cost of the testing shall be included in the construction rates for the specific payment items. No additional costs for testing of constructed earthworks layers will be paid by the Employer. The Contractor shall ensure that testing is performed and completed prior to commencing Works on the following or subsequent layers. The Contractor shall include the required time to perform tests in their construction programme.
- g) Strength concrete mix designs and test cube results for these mix designs, shall be the responsibility of the Contractor. The Contractor shall provide the proposed strength concrete mix designs and test results, which comply with the specified concrete strengths required, to the Project Engineer for acceptance prior to any concrete casting taking place on site. The Project Engineer's acceptance shall not absolve the Contractor of any responsibility or accountability should the supplied data or concrete not meet the quality and performance criteria specified. No results shall be considered valid if they are 3 months and older.

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- h) All excavations, concrete shutters and steel reinforcement is to be inspected and approved by the Employers' Supervisor /Clerk of Works prior to casting. Timeous requests for inspection shall be submitted to the Employers' Supervisor / Clerk of Works at least five "5" days in advance of the concrete casting. This will allow ample time for rectifying any Works not in compliance with the requirements. The Contractor shall include the required time to perform tests in their construction programme.
- i) The Contractor shall provide levels and cross sections for the calculation of earthworks quantities and agreement reached with the Employers' Supervisor / Clerk of Works concerning the accuracy and adequacy of these before earthworks are started. Only these agreed cross sections shall be used for measurement. Unless otherwise specified all quantities for measurement and payment shall be determined from the authorized dimensions indicated on the drawings.
- j) If the work is constructed in accordance with the authorized dimensions and within the allowable tolerances, the calculation of quantities for measurement and payment will be based on the authorized dimensions and not the actual dimensions to which the work has been constructed. Volumes are measured on the final compacted volumes only and not "loose" volumes in vehicles.
- k) The Contractor shall levels of all interim and final terrace or platform layers constructed. These levels shall be submitted to the Project Engineer for review and acceptance before any structure, foundation, cable trench or road can be erected or constructed on the platform or any work can commence on the final completed layer of the platform. The data for the points must be provided in the following format e.g.:

Y co-ordinate	X co-ordinate	Height	Description / Code
XX XXX.XX	X XXX XXX.XX	XXXX.XX	SS

- l) A detailed contour map is to be supplied in Microstation (DGN) format with a separate XYZ-format ASCII file.
- m) Additional holding points shall be agreed between the Contractor and the Employer's Representative and shall be enforced as per the requirements of this documents and shall not nullify any of the above holding points.
- n) The Contractor will be held accountable for any construction errors, defects, claims, etc. for continuing with the construction activities at the "hold point" stages without the written instructions from the Employers' Supervisor or Clerk of Works after consultations with the Project Engineer.

C3.4.4 Other limitations:

- a) The Contractor shall use the private roads with the necessary respect and maintain them throughout the construction period. The costs for such maintenance shall be for the Contractor's account.
- b) The Contractor shall control his activities and processes in such a way as to ensure compliance with the specifications. He shall carry out as a minimum requirement all the tests laid down in the specifications and shall submit all the test results, timeously, to the Employer.
- c) The Employer Standards, as indicated in Specifications of this document, are requirements of the Contract.

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C3.1 STANDARD SPECIFICATIONS

C3.5.1	LIST OF SANS 1200 SERIES STANDARDISED SPECIFICATIONS.....	14
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C3.1.1 List of SANS 1200 Series Standardised Specifications

The following SANS 1200 Standardized Specification are applicable to this contract.

(Note: These are not issued with the enquiry document copies and may be obtained from SABS, Private Bag X191, Pretoria, 001, Republic of South Africa)

Document	Rev./issue	Title and Publisher
CIVIL ENGINEERING CONSTRUCTION		
SANS 1200 A	1986 3	Standardized specification for civil <i>Engineering</i> construction Section A: General
SANS 1200 AA	1986 3	Standardized specification for civil <i>Engineering</i> construction Section AA: General (small works)
SANS 1200 AB	1986 3	Standardized specification for civil <i>Engineering</i> construction Section AB: <i>Engineer's</i> office
SANS 1200 C	1980 1	Standardized specification for civil <i>Engineering</i> construction Section C: Site clearance
SANS 1200 D	1988 3	Standardized specification for civil <i>Engineering</i> construction Section D: Earthworks
SANS 1200 DA	1988 3	Standardized specification for civil <i>Engineering</i> construction Section DA: Earthworks (small works)
SANS 1200 DB	1989 3	Standardized specification for civil <i>Engineering</i> construction Section DB: Earthworks (pipe trenches)
SANS 1200 DM	1981 1	Standardized specification for civil <i>Engineering</i> construction Section DM: Earthworks (roads, sub grade)
SANS 1200 DK	1996 1	Standardized specification for civil <i>Engineering</i> construction Section DK: Gabions and pitching
SANS 1200 G	1982 2	Standardized specification for civil <i>Engineering</i> construction Section G: Concrete (Structural)
SANS 1200 GB	1984 1	Standardized specification for civil <i>Engineering</i> construction Section GB: Concrete (ordinary buildings)
SANS 1200 GE	1984 1	Standardized specification for civil <i>Engineering</i> construction Section GE: Precast concrete (structural)
SANS 1200 LB	1983 2	Standardized specification for civil <i>Engineering</i> construction Section LB: Bedding (pipes)
SANS 1200 LC	1981 1	Standardized specification for civil <i>Engineering</i> construction Section LC: Cable ducts
SANS 1200 LE	1982 2	Standardized specification for civil <i>Engineering</i> construction Section LE: Stormwater drainage
SANS 1200M	1996 2	Standardized specifications for civil <i>Engineering</i> construction Section M: Roads (general)
SANS 1200 ME	1981 1	Standardized specification for civil <i>Engineering</i> construction Section ME: Subbase
SANS 1200 MF	1981 1	Standardized specification for civil <i>Engineering</i> construction Section MF: Base
SANS 1200 MJ	1984 1	Standardized specification for civil <i>Engineering</i> construction Section MJ: Segmented paving
SANS 1200 MK	1983 1	Standardized specification for civil <i>Engineering</i> construction Section MK: Kerbing and channelling
GENERAL NATIONAL STANDARDS AND ACTS		
Act no. 43	1983	Conservation of Agricultural Resources Act.
Act no. 73	1989	Environmental Conservation act.
Act no. 31	1963	Fencing Act.
Act no. 122	1984	Forest Act.
TRH14	1985	Guidelines for road construction materials
Act no. 63	1970	Mountain Catchment areas act.

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Document	Rev./issue	Title and Publisher
Act no. 85	1993	Occupational health and safety act.
SAISC	1990	South African Steel Construction Handbook
NWP 3109		Standard drawing practice
TMH1	1986	Standard Methods of Testing Road Construction Materials
ESKOM NEW WORKS STANDARDS		
NWS 1017		Accident Prevention
NWS 1494	3	Fire prevention and protection of <i>Contractors</i> and Eskom premises on <i>Engineering</i> sites
NWS 1060		Injury prevention and protection
NWS 1814/C1		Quality assurance requirements for civil and building contracts
NWS 1058	4	Safety at construction sites: Requirements to be met by <i>Contractors</i>
ESKPVAAL7	2	Environmental impact assessment procedure for Eskom
34-479	0	Specification for Battery rooms
ESKPBAAD6		Environmental management policy
OPR 6204		Eskom Operating Regulations
DTOS 0071	0	Eskom Standard for Barricading
DTMG 0112		Guideline for the application of herbicides for weed eradication in substations
DTNG 0012		Guideline for the application of Herbicides for weed eradication in substations
ETP 023		Herbicide management policy
EVS 005	1	Quality requirements for quality related items and equipment
EVS 010		Quality requirements for quality related services
D-FS-887	7	Substation Civil work details
SCSASAAQ1	2	Quality Control Process for the Checking of Distribution Substation Construction Before Handing Over for Commercial Operation.
SCSPVABM9	0	Co-ordination of Safety on Capital Projects
34-333	1	Occupational Health and Safety Requirements to be met by <i>Contractors</i> and <i>Sub-Contractors</i> Employed by Eskom.
34-1544	0	Management of Asbestos
ESKPVAAG5	1	Requirements for the safe processing, storing, removing and handling of asbestos containing material, equipment and articles.
32-136	0	Construction Safety. Health, and Environmental Management
34-145	0	Assessment Procedure for Authorisation
34-146	0	Authorisation Standard for operating on HV Systems
		OCCUPATIONAL HEALTH AND SAFETY ACT, 1993 (ACT NO. 85 OF 1993)
240-113163905	Draft 2.1	LED Floodlights for Distribution Substation Applications
32-245	4	Eskom Waste Management Standard, Appendix F
D-DT-5240		Earthing Standard
		EMP for this project

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C3.1.2 Variation and Additions to Standardized Specifications

Variations and additions to these are given in the following sections and the clauses are numbered to correspond with the standardized specifications clause number to which each variation or additional applies.

1.	SANS 1200A : PRELIMINARY AND GENERAL.....	17
2.	SANS 1200C : SITE CLEARANCE.....	22
3.	SANS 1200D : EARTHWORKS	27
4.	SANS 1200DB : EARTHWORKS (PIPE TRENCHES)	36
5.	SANS 1200DM : EARTHWORKS (ROADS, SUBGRADE)	38
6.	SANS 1200G: CONCRETE STRUCTURAL	42
7.	SANS 1200LB : BEDDING (PIPES).....	53
8.	SANS 1200LE : STORMWATER DRAINAGE	54
9.	SANS 1200ME : SUBBASE	56
10.	SANS 1200MK : KERBING & CHANNELLING.....	57

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1. SANS 1200A: PRELIMINARY AND GENERAL

VA-A 2 **INTERPRETATIONS**

VA-A 2.8 **ITEMS IN SCHEDULE OF QUANTITIES**

VA-A 2.8.1 **Principle**

Add “plus overheads” after “*Contractor’s* profit” in the second line.

VA-A 2.8.2 **Preliminary and General Section**

Delete “general” between “all” and “risks” in the fourth line. Delete “on which the tender is based” in the fifth line and replace with “which form the contract.”

Add a new clause:

VA-A 3 **MATERIALS**

VA-A 3.1 **QUALITY**

Add:

The *Contractor* shall at his own expense provide everything required for the construction, completion and maintenance of the *Works*. The *Contractor* shall ensure that all the constituent parts of the *Works* are to the standard and quality elsewhere specified in these documents and shall ensure that they are suitable for the purpose intended by the *Employer*.

The *Contractor* shall be responsible for the strength and quality of all materials used, workmanship employed and for the stability of both temporary and permanent *Works* during construction.

Add a new clause:

VA-A 3.3 **TRADE NAMES**

All materials, fittings, finishes, etc. specified under a trade name, catalogue number or reference number are to be specified. The Project Manager’s approval shall be obtained for any departure from this specification.

VA-A 5 **CONSTRUCTION**

VA-A 5.1 **SURVEY**

The *Contractor* shall set out the works in accordance with the drawings provided. From the information provided on the drawings, the *Contractor* shall calculate the position or level, or both, of all intermediate points required for by him for the proper control of the *works*.

Any existing benchmarks must be carefully opened in order not to disturb them. All dirt and rust must be properly removed from the pegs and at least 2 coats of bitumen corrosion protective coating must be applied.

A 500mm x 500mm x 500mm 10MPa concrete collar must be cast around each peg to secure the benchmarks. Benchmark descriptions must be legible, engraved on a soft aluminium plate inserted on top of the concrete collar while the concrete is still fresh.

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Any disturbance to existing benchmarks must be reported to Eskom's Land development department.

Add a new clause

VA-A 5.1.3 ***Provision of Survey Instruments (Electronic Total Station)***

The *Contractor* shall supply and keep continuously on Site, a staff, steel tapes, ranging rods and in good working order, maintained in proper adjustment. These shall be made available to the *Supervisor's* use at all reasonable times, together with two survey assistants.

VA-A 5.2 ***WATCHING, BARRICADING, LIGHTING AND TRAFFIC CROSSINGS***

Add:

Every excavation which is accessible to the public, including other *Contractor's* or the *Employer's* personnel, or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered shall be:

- a) protected by a barrier or fence consisting of not less than two ropes or wires stretched **at** heights of 600 mm and 1 200 mm between poles or standards, of strength adequate to safely contain pedestrians and as close to the excavation as practicable; and
- b) provided with red warning lights or other boundary indicators which are clearly visible at night or when visibility is poor.

VA-A 5.4 ***PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES***

Add:

Adequate prior notice by *Eskom* of the existence of any services shall be deemed sufficient to make such services "known" to the *Contractor*.

VA-A 5.6 ***POLLUTION***

Add:

A refuse control system shall be implemented by the *Contractor*. All construction waste shall be collected and disposed of in designated dumps and covered with spoil, or as otherwise instructed by the *Supervisor*.

VA-A 5.7 ***SAFETY***

Add:

Where equipment using high energy gamma radiation is operated on Site, such as soil density meters, the *Contractor* shall conform to the regulations prescribed by the Project Manager and the Department of Health. This shall apply to the transportation, storage and operation of the equipment including the use of personal dosimeters.

VA-A 5.8 ***ACCESS TO WORKS***

Delete this clause.

Add new clause:

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VA-A 5.9 *SITE LEFT CLEAR*

The *Contractor* shall be responsible for the clearing away of excess materials, debris and rubbish, arising from the construction of the *Works*, during the construction and maintenance periods.

On completion of the Permanent *Works* the *Contractor* shall, at his expense, remove all surplus material and equipment save that required for maintenance work, which shall be removed on completion of the whole of the *Works*. However, no guards or safety of persons may be removed, if such removal constitutes a reduction to the safety of persons.

VA-A 5.10 *DIMENSIONS*

Dimensions on the drawings are to be considered correct even if not drawn to scale. No dimensions shall be obtained by scaling.

VA-A 5.11 *REFERENCE STANDARDS*

The *Contractor* shall keep on the Site for reference purposes a master file containing copies of all the standards listed in the specifications.

VA-A 6 *TOLERANCES*

Add new clause:

VA-A 6.4 *TOLERANCES NOT CUMULATIVE*

Tolerances may vary only within the permissible deviation specified in each standard specification. Tolerances shall not be cumulative.

VA-A 6.5 *MEASUREMENT OF WORK*

Unless otherwise specified all quantities for measurement and payment shall be determined from the authorized dimensions indicated on the drawings.

If the work is constructed in accordance with the authorized dimensions and within the allowable tolerances, the calculation of quantities for measurement and payment will be based on the authorized dimensions and not the actual dimensions to which the work has been constructed.

VA-A 7 *TESTING*

VA-A 7.2 *APPROVED LABORATORIES*

Replace the contents of this clause with the following:

Unless otherwise specified in the relevant specification or in the project specification, the testing laboratories certified by the South African National Accreditation Systems (SANAS) or any other laboratory which the *Project Engineer* approves in his absolute discretion, will be deemed to be approved laboratories in which tests or design work required in terms of a specification may be carried out.

Add new clause:

VA-A 7.5 *CONTROL TESTS*

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The *Contractor* shall carry out, at his cost, such tests as he considers necessary to satisfy himself that his work is sound. He shall also carry out such tests as have been specified and the costs therefore are deemed to be included in the rates unless specifically and separately itemized in the relevant Schedules of Quantities.

The *Contractor* shall submit the test results to the *Supervisor* without delay.

The Project Manager may order such additional tests, as he considers necessary to prove the compliance with the specification. The costs of these additional tests shall be borne:

- a) by the *Employer* if the results of the additional tests indicate that the *Works* or the part of it that was subjected to the tests comply with the applicable requirements, and
- b) by the *Contractor* if the results indicate that the *Works* or the said part of it do not so comply.

VA-A 8 *MEASUREMENT AND PAYMENT*

VA-A 8.2 *PAYMENT*

VA-A 8.2.1 *Fixed and Value Related Items*

Delete "in a single payment in terms of the first" and replace with "pro-rata payment in terms of each progress certificate"

VA-A 8.2.2 *Time Related Items*

Delete and replace with:

Payment for time-related items will be effected as follows only after payment for the relevant fixed charge item if any has been made.

Subject to the provisions of the SANS 1200A Clauses 8.2.3 and 8.2.4, payment of incremental amounts (calculated by the division of the remainder of the tendered sum by the number of months required to complete the site activities for which the relevant sum was tendered) will be authorized in each of the subsequent progress certificates until the sum tendered has been paid, provided that the *Employer* shall be entitled to amend the amount to be paid in respect of time-related items in the event of:

- a) Extension of time being granted in accordance with the contract.
- b) Adjustment to the time-related items in accordance with the terms of contract.
- c) Delays caused by the *Contractor* which no extension of time will be granted under the contract.

VA-A 8.3.3 *Other Fixed-charge Obligations*

Add:

The *Contractor* is to take cognizance of the Environmental Management Programme Act, a copy of which is attached hereto and forms part of the contract documents. The *Contractor* is to allow a lump sum price which he deems sufficient to enable him to meet any costs he will encounter in the application of the various clauses of in the Environmental Management Programme, for the entire duration of the contract.

The *Contractor* is to also allow for compliance with **all current** Eskom Health and Safety requirements, procedures and legislation (Occupational Health and Safety Act.), which includes

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the employment of registered safety officer/s, as well as the procurement and use on site, of all necessary Personal Protective Equipment (PPE).

VA-A 8.4.5 *Other Time-related Obligations*

Add:

The *Contractor* is to take cognizance of the Environmental Management Programme Act, a copy of which is attached hereto and forms part of the contract documents. The *Contractor* is to allow a lump sum price which he deems sufficient to enable him to meet any costs he will encounter in the application of the various clauses of in the Environmental Management Programme, for the entire duration of the contract.

The *Contractor* is to also allow for compliance with **all current** Eskom Health and Safety requirements, procedures and legislation (Occupational Health and Safety Act.), which includes the employment of registered safety officer/s, as well as the procurement and use on site, of all necessary Personal Protective Equipment (PPE).

Add new clauses:

VA-A 8.9 *RATES INCLUSIVE OF THE CONTRACTOR'S OBLIGATIONS, LIABILITIES AND RESPONSIBILITIES*

The rates and prices contained in the Preliminary and General Section of the Schedules of Quantities shall, together with the remainder of the obligations, liabilities and responsibilities whether or not they are expressly described therein.

VA-A 8.10 *ADJUSTMENT TO PRELIMINARY AND GENERAL ITEMS*

Adjustment to fixed and value related amounts will be made on the following basis only:

- a) The first 15% variance to the contract value will not be subject to P&G adjustment.
- b) If the final contract value varies by more than 15% in relation to the original contract value, the preliminaries shall be adjusted in proportion to the amount by which the difference exceeds 15% of the original contract value.
- c) No other adjustments shall be made.

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2. SANS 1200C: SITE CLEARANCE

VA-C 3 MATERIALS

VA-C 3.1 DISPOSAL OF MATERIAL

Add:

The spoiling of materials unsuitable for construction will be strictly controlled by the *Supervisor* and indiscriminate dumping of waste of any description will not be permitted. The *Contractor* shall provide the Eskom *Clerk of Works* with the required dumping certificates.

All existing fences, fence posts and gates shall be removed and sold as scrap. The *Project Coordinator* shall be responsible for the scrapping of the fence materials.

All materials are to be disposed of within a distance of 50 km from the site unless otherwise ordered.

Add the following sub-clause:

VA-C 3.2 MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

The management, handling and disposal of asbestos and ACM's shall be performed in accordance with the Eskom Waste Management Standard 32-245, Appendix F.

The following is an extract from the Eskom Waste Management Standard 32-245, Appendix F. Should there be any discrepancy between this document and the latest revision of the Eskom Waste Management Standard, the Eskom standard shall supersede the data contained in this clause:

"F.3.2 Requirements for the handling and disposal of asbestos

- The management, handling and disposal of asbestos and ACM will be done in accordance with Section 20 of the Environment Conservation Act 73 of 1989 ("ECA"), Regulation 20 of the Asbestos Regulations 2001, and Eskom Standard for Requirements for Safe Processing, Handling, Storing, Disposal and Phase-out of Asbestos and Asbestos-containing Material, Equipment and Articles, 32-303.
- All used air filters from vacuum cleaners, air conditioners and ventilation equipment shall be placed in impermeable bags, or similarly effective containers. These containers shall be sealable for disposal (the outside of all containers shall be cleaned before leaving the workplace).
- Asbestos and ACM must be transported in accordance with the minimum requirements of Eskom Standard for Requirements for Safe Processing, Handling, Storing, Disposal and Phase-out of Asbestos and Asbestos-containing Material, Equipment and Articles Standard 32- 303 as well as in accordance with SANS 10228 and SANS 10229.
- All owners of asbestos and ACM will develop and maintain an asbestos inventory and phaseout plan in order to meet the Eskom phase-out date of 2033.
- Waste shall be disposed of only on waste disposal sites specifically designated for this purpose in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), ECA, 1989, or the National Environmental Management Waste Act, 2008 (Act 59 of 2008), NEMWA 2008.

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- Asbestos that has been disposed of will be reported on a six-monthly basis as required by this procedure using the Waste Reporting Template (240-47176064).
- In order to avoid the spread of asbestos dust, employers and self-employed persons must ensure that asbestos and asbestos-containing articles or substances are identified, classified, packed, labelled and handled in accordance with SANS 10228 and 10229."

VA-C 5 CONSTRUCTION

VA-C 5.6 CONSERVATION OF TOPSOIL

Delete this clause and replace with:

VA-C 5.6.1 Before excavations begin, all trees shall be felled, cleared and grubbed.

VA-C 5.6.2 The remaining vegetation consisting of grasses and shrubs shall be mowed with a brush cutter so that the chopped vegetation can be included in the layer of topsoil to be removed.

VA-C 5.6.3 The topsoil and chopped vegetation shall be removed to a depth of at least 150 mm from the areas to be excavated and stockpiled in windrows or heaps. The stockpiles shall be stabilized by watering or other approved means. Stockpiles shall not exceed **1 000mm** in height.

VA-C 5.6.4 After completion of the construction, the topsoil and chopped vegetation shall be spread over the areas required, trimmed, rolled, watered and maintained. Maintenance shall include the repair or erosion damage to the top soiled areas.

MEASUREMENT AND PAYMENT

VA-C 8.2 SCHEDULED ITEMS

Add:

VA-C 8.2.11 Demolish the following:

- a) Existing foundation structures..... Unit: no
- b) Existing cable trenches Unit: m
- c) Existing kerbing..... Unit: m
- d) Existing substation drainage systemUnit: sum
- e) Existing fence post foundationsUnit: sum
- f) Existing gates, all sizes Unit: no
- g) Existing box and pipe culverts Unit: m

The rate shall include full compensation for all equipment, labour, transport, and materials required to demolish, remove and dump at a register dump site within a 50km radius of the site. The relevant dumping certificates are to be provided as proof. All fence materials are to be sold off as scrap.

Add:

VA-C 8.2.12 Clearing of existing drainage systems:

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- a) Manholes and inlet and outlet structures Unit: m³
- b) Concrete lined drains Unit: m³
- c) Substation oil holding dam Unit: m³

The unit of measurement shall be the cubic meter of material excavated and removed, measured in place before excavation.

The rate shall include full compensation of excavating the material, protecting the existing drainage structures, repairing of any damage to existing drainage items, dealing with any surface or subsurface water, disposing of the excavated material, including shaping and levelling-off piles of spoil material. The rates shall also include full compensation for all labour, equipment, transport and the dumping of spoil material at a registered dump site should dumping be required.

Add:

VA-C 8.2.13

Removal of existing fence wires/mesh/palisades:

- a) Existing boundary fencing - fencing wire only Unit: m
- b) Existing diamond mesh fencing - mesh only Unit: m
- c) Existing weld mesh fencing - weld mesh only Unit: m
- d) Existing palisade fencing - palisade panels only Unit: no

The unit of measure shall be the meter length of removed fence mesh or the number of palisade fence panels. The rate shall include full compensation for all equipment, labour, transport, and materials required to remove existing fence mesh, remove and dump at a register dump site within a 50km radius of the site or alternatively transport material to the CNC in order to be sold off as scrap. The relevant dumping certificates are to be provided as proof.

VA-C 8.2.14

Asbestos Management and Disposal in accordance with the Eskom Waste Management Standard 32-245

- a) General Requirements

- 1) Appointment of an Approved Asbestos Contractor Unit: Sum

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, materials, all equipment, transport, accommodation, handling fees for managing the Appointed Contractor in accordance with *VA-C 3.2 MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

- 2) Plan of Work for Asbestos Related Work

- i) Preparation and Submission for Acceptance Unit: Sum

The unit of measure shall be the sum cost.

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The tendered rate shall provide full compensation for all labour, materials, all equipment, transport, accommodation to prepare, submit, revise, as is applicable, a plan of work in accordance with *VA-C 3.2 MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

3) Emergency Response Plan

i) Preparation and Submission for Acceptance Unit: Sum

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, materials, all equipment, transport, accommodation to prepare, submit, revise, as is applicable, a emergency response plan in accordance with *VA-C 3.2 MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

4) Risk Assessments and Monitoring

i) Performing Risk Assessments and Monitoring Unit: Sum
for Asbestos Related Work

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, materials, all equipment, transport, storing of records while performing daily risk assessments.

The tendered rate shall also provide full compensation for monitoring of compliance with the requirements, for airborne Asbestos dust or particles and air quality. All the work shall be performed in accordance with *VA-C 3.2 MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

b) Handling, Transportation and Disposal of ACM's in accordance
with Eskom Waste Management Standard 32-245 General Requirements

1) Site Preparation of Facilities for Asbestos Related Work Unit: Sum

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, materials, all equipment, transport, accommodation to supply, install or prepare facilities for labour performing Asbestos Related work in accordance with *VA-C 3.2 MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

2) Provision of Personal Protective Equipment for Asbestos Unit: Sum
Related Work

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, materials, transport to supply, the required Personal Protective Equipment for labour performing Asbestos Related Work in accordance with *VA-C 3.2 MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

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- 3) Handling of ACM's..... Unit: no

Separate sub-items shall be scheduled for the handling of ACM's

The unit of measure shall be the number (no) of handled items.

The tendered rate shall provide full compensation for all equipment, labour, plant, transport and storage facilities for the handling of ACM's in accordance with VA-C 3.2 *MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

- 4) Transport to and disposal at waste disposal sites.....Unit: no
designated for this purpose in accordance with the
National Environmental Management Waste Act, 2008,
(Act 59 of 2008) NEWMA 2008

Separate sub-items shall be scheduled for the handling of ACM's

The unit of measure shall be the number (no) of transported and disposed items.

The tendered rate shall provide full compensation for all equipment, labour, plant, all loading and off-loading, all transport and accommodation to transport and dispose of the ACM's in accordance with the NEWMA 2008 in accordance with VA-C 3.2 *MANAGEMENT AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS*.

The tendered rates shall also provide full compensation for obtaining and supplying the necessary disposal certificates to the Employer.

c) Auditing and Verification

- 1) Perform Audit to Confirm Complete Removal of ACM's Unit: Sum

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, equipment, materials, transport and accommodation to perform an audit to conform complete removal of all ACM's from the facility.

- 2) Prepare and Submit Final Audit to the Employer Unit: Sum

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, equipment, materials, transport and accommodation to prepare and submit the final audit to the Employer.

VA-C 8.2.15 Removal and Relocation of Bee Infestation at Substation..... Unit: Sum

The unit of measure shall be the sum cost.

The tendered rate shall provide full compensation for all labour, equipment, materials, accommodation and transport to completely remove and relocate the Bee nests to another suitable location.

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3. SANS 1200D : EARTHWORKS

VA-D 2.3 DEFINITIONS

Restricted excavation

Add:

Bulk excavations of width less than five metres shall also be classified as "restricted excavation".

Add:

Commercial source: A source of material provided by the *Contractor*.

Yard Stone: Insulation medium to be applied to substation yards.

VA-D 3 MATERIALS

VA-D 3.2 CLASSIFICATION FOR PLACING PURPOSES

VA-D 3.2.1 Material Suitable For Embankments or Terraces

Replace the contents of the sub-clause with the following:

VA-D 3.2.1.1 Specified Properties

a) Soft fill

The material shall have a CBR of not less than 3% at the relative density specified for compaction. It shall not contain stones or rock fragments in excess of 150mm maximum dimension or 2/3 of the layer thickness, whichever is the least. The PI shall not exceed 18 unless otherwise authorized by the *Project Engineer*.

b) Coarse fill

The fraction of the material smaller than 50mm shall conform to the requirements for soft fill. The material shall not contain stones or rock particles in 2/3 of the layer thickness.

Add:

VA-D 3.2.1 Material Suitable Yard Stone

Material to be used for yard stone shall be clean, hard and durable and of sizes varying between 19 mm to 32mm (maximum dimension)

VA-D 4 PLANT

VA-D 4.4 DETECTORS

The *Contractor* shall allow for the provision and use of suitable specialist equipment for the detection of underground pipes and cables –payment clauses 8.3.8.1 (a) and (b).

VA-D 5 CONSTRUCTION

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VA-D 5.1 *PRECAUTIONS*

Throughout this clause the term "public" shall be deemed to include any other *Contractors* on Site.

VA-D 5.1.1 *Safety*

VA-D 5.1.1.1 *Barricading and lighting*

Delete a) and b) and substitute the following:

- a) adequately protected by a barrier comprising two ropes or wires of adequate strength to safely contain pedestrians, stretched at heights of 600 mm and 1 200 mm above ground between poles or standards of adequate strength.
- b) provided with red warning lights or any other boundary indicators clearly visible at night or when visibility is poor.

VA-D 5.1.1.2 *Safeguarding of excavations*

Add:

- g) All work undertaken by the *Contractor* to ensure the safety of excavations or adjacent structures shall be deemed to be included in his rates and no separate payment will be made, unless scheduled.

VA-D 5.1.2 *Existing Services*

VA-D 5.1.2.3 *Protection of cables*

Add:

The provisions of this clause will also be applicable to pipes

The cost of all work, delays and disruption caused by protection measures required to the services shall be deemed to be included in the tendered rates and no additional payment or claim shall be considered.

VA-D 5.1.6 *Road Traffic Control*

Add:

The cost of any work undertaken by the *Contractor* in compliance with the requirements of this clause shall be deemed to have been included in the tender rates.

VA-D 5.2 *METHODS AND PROCEDURES*

VA-D 5.2.2 *Excavation*

VA-D 5.2.2.1 *Excavations for general earthworks and for structures*

Add:

No projection of earth or rock faces into the net concrete dimensions of any structure will be allowed.

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VA-D 5.2.2.2 *Borrow pits*

Add:

The *Contractor* will be required to open a borrow pit to obtain the selected material required for the roadworks. He shall perform sufficient tests to prove the suitability of these materials at his own expense.

Reinstatement of the borrow pit at the completion of the contract will be required, hence the return and spreading of overburden and topsoil has been separately billed.

The cost of selective excavation and management of the borrow pit is to be included in the various rates.

Haul and overhaul will not be paid.

A commercial source shall be a source of material provided by the *Contractor*. Where it is specified that the *Contractor* shall obtain material from a commercial source, the *Contractor* shall include in his prices for borrow to fill from commercial sources, for finding a commercial source of suitable material, for making all arrangements for procuring the material with the owner of the source, for the payment of royalties, charges and damages and, for transporting the material to site regardless of the distance involved. No payment shall be made for the removal of overburden or stockpiling at the commercial source and no extra payment for excavating in intermediate, hard or boulder material shall apply.

VA-D 5.2.2.3 *Disposal*

Add:

Surplus or unsuitable material will also be disposed of in the designated borrow pit area. On completion the surface shall be levelled to provide a smooth, free draining surface to the satisfaction of the *Engineer*.

VA-D 5.2.4.2 *Topsoiling*

Replace the last sentence of the paragraph with the following:

“The final thickness of topsoil after compaction shall be at least 100mm”

VA-D 5.2.4.3 *Grass and other Vegetation*

Add:

The *Contractor* shall consult with the Appointed Environmental Officer for a suitable mix of grass seeds to be prepared for the areas to be grassed. No grass or vegetation shall be planted until approval of the proposed seed mixture is received from the Eskom Environmental Officer.

Only fresh, certified seed shall be used and mixed in the presence of the Appointed Environmental officer following prescribed methods. Should a premixed batch of seed be supplied the exact composition of the seed shall be confirmed with the supplier prior to any grass or vegetation planting activities commence.

In addition to the seed mixture, the *Contractor* shall include the required fertilizers or other recognised soil improvement measures such as commercial compost. Should commercial compost be utilised, the *Contractor* shall ensure that the compost shall be well decayed, friable and free from any weed seeds or other undesirable materials or particles.

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Where the risk of erosion is high the *Contractor* shall include the necessary anti-erosion compounds to bind the soil particles and prevent erosion until such time as the grass seed has germinated and has established.

a) Hydroseeding

Should grassing be done by hydroseeding, the *Contractor* shall ensure that the planned seed mixture is suitable for use in hydroseeding grassing methods.

The *Contractor* shall be solely responsible for establishing an acceptable grass cover and any approval of seed or seed mixtures intended for use by the *Contractor* shall not relieve the *Contractor* of this responsibility.

A suitable mulch shall be added to the hydroseeding mixture at an approved rate, determined by the appointed Environmental Officer.

Hydro seeding shall be carried out using an approved hydroseeding machine at an application rate prescribed by the approved Environmental Officer.

When an anti-erosion compound be required the compound shall be applied simultaneously with the hydroseeding mixture.

b) Hand Sowing of Approved Grass Seed Mixture

If approved by the appointed Environmental Officer, sowing of grass seed done by hand shall be done ensuring that the seed shall be spread uniformly over the entire surface and then lightly raked into the topsoiled areas.

VA-D 5.2.3.2 *Embankments*

Add:

At every stage in the forming of the terrace the general surface of the fill shall be maintained to the required grades and wherever possible the whole extend of the terrace in fill shall be constructed at the same time.

The *Contractor* will not be permitted to extend the terrace by successive end or side dumping.

The top of the terrace shall be finished to the required grades to a tolerance of $\pm 25\text{mm}$ and suitable boning rods and sight rails must be erected and used over the whole area of the cut and fill to arrive at this tolerance. Motor graders shall do this final trimming.

Before commencing any construction work on the prepared terrace, the *Contractor* must satisfy himself that this terrace is correct to the tolerance of $\pm 25\text{mm}$.

The sides of the embankments and cuttings, which are to be true to line and grade, area to be trimmed to form slopes not steeper than one vertical to two horizontals, unless stated differently on the drawings. The rate of cut and fill to form terrace shall include trimming of embankments.

VA-D 5.2.3.2 *Backfilling of trenches and backfilling or filling against structures*

Throughout this clause delete "250 mm" and replace with "150 mm".

Add:

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Backfilling shall be compacted to 93% Mod. AASHTO dry density unless otherwise indicated on the drawings. Backfilling shall not commence until three days after the concrete has been cast.

VA-D 5.2.4 *Finishing*

VA-D 5.2.4.1 *Top Soiling*

Add:

Topsoil brought back to form a slightly compacted layer of at least 150mm thick on terraces and slopes must be trimmed to exact line and levels indicated on drawings. This trimming should be done mechanically.

The rate for topping certain areas with soil shall include all operations: Loading, bringing back of temporary stockpile topsoil, dumping, trimming and compaction.

VA-D 5.2.5 *Transport for Earthworks*

VA-D 5.2.5.1 *Freehaul*

Delete and replace with:

No overhaul will be paid. All haul will be freehaul.

VA-D 5.2.5.2 *Overhaul*

Omit this clause.

VA-D 7 *TESTING*

VA-D 7.2 *TAKING AND TESTING OF SAMPLES*

Add:

a) Field Density Control

Density control shall be either by sand replacement or by a nuclear density meter. The use of the nuclear density meter will be subject to the following provisions:

The tests will not be valid unless the instrument is properly calibrated at the depth of test and the test performed not within 1 meter of any concrete structure or face of an excavation in a confined space of width less than 2m.

For every 10 nuclear density meter tests a minimum of 3 corresponding sand replacement tests shall be performed.

The accuracy of any nuclear density meter shall be proved to the *Supervisor* by performing at least twenty comparative nuclear density and sand replacement tests before the results of the nuclear density meter will be accepted as valid. Thereafter the correlation between the nuclear density meter and sand replacement tests shall be reviewed on a fortnightly basis and presented to the *Supervisor*.

Each nuclear density meter shall have a certificate stating that the machine is in good working

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order. Each density meter shall be re- calibrated at least once a year. Certificates of proof of re-calibration will be required.

The minimum number of density control tests shall be 4 sand replacement tests or 12 nuclear density meter tests per production lot or 500 m3, whichever is less.

A production lot shall mean a portion of fill placed and compacted in one process, using material from a single zone in a borrow area. If production continues uninterrupted, a production lot will usually be taken as one day's work and shall not exceed two days production.

The *Supervisor* may order a production lot of reduced quantity, if:

- the fill material being used shows variation in quality
- a low production rate is maintained.

The acceptance criteria for density test results shall be as follows:

SPECIFIED DENSITY% MOD AASHTO	MINIMUM AVE. DENSITY (FOR NUMBER OF TESTS GIVEN BELOW)			MINIMUM VALUE OF ANY SINGLE TEST (FOR NUMBER OF TESTS GIVEN BELOW)		
	3&4	5	6	3&4	5	6
90	90.7	90.9	91.1	89.3	89.1	88.9
93	93.7	93.9	94.0	92.3	92.1	92.0
95	95.6	95.8	95.9	94.4	94.2	94.0

b) Maximum Dry Density (Mod AASHTO)

A minimum of one Maximum Dry Density test per production lot or per 500 m3 whichever is the minimum, shall be carried out provided that the material is obtained from one source. The production lot shall be as defined above. The *Supervisor* may require more tests if the material varies in quality.

c) TMH 1: Standard methods of testing road construction materials.

VA-D 8 MEASUREMENT AND PAYMENT

VA-D 8.1 BASIC PRINCIPLES

Add new clauses:

VA-D 8.1.4 No separate payment will be made for the selection of excavated material in excavations or in borrow areas.

VA-D 8.1.5 The rates tendered for excavation shall cover the cost of providing adequate safeguarding. No separate payment will be made for safeguarding in the form of shoring and timbering, or battering back, unless scheduled.

VA-D 8.1.6 The cost of any tests to prove the compliance of material and the placement thereof as specified shall be included in the rates unless scheduled.

VA-D 8.1.7 The excavation rates shall include for all the *Contractor's* obligations and responsibilities in respect of dealing with water on the Works.

VA-D 8.2 COMPUTATION OF QUANTITIES

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VA-D 8.2.3 Delete and replace with:

Levels and cross sections for the calculation of earthworks quantities shall be taken by the *Contractor* and agreement reached with the *Supervisor* concerning the accuracy and adequacy of these before earthworks are started. Only these agreed cross sections shall be used for measurement.

VA-D 8.3 **SCHEDULED ITEMS**

VA-D 8.3.2 **BULK EXCAVATION**

a) Excavate in all materials and use for embankment or backfill or dispose as ordered.

To this clause add:

Compaction of material:

(1) To 95% of modified AASHTO maximum
dry density at $\pm 2\%$ OMC..... Unit: m³

The rate shall also cover the cost of selection to remove residual roots and organic material and spoiling of these, and of compaction of the material.

c) Excavate in all materials and place on stockpile Unit: m³

The rate shall cover the cost of complying with all precautions required in terms of 5.1 in addition to the cost of excavation in all materials, selection to remove residual roots and other organic material and spoiling of these, loading, all haul, offloading, spreading and the maintaining the stockpile.

d) Excavate in all materials and spoil Unit: m³

The rate shall cover the cost of complying with all precautions required in terms of 5.1 in addition to the cost of excavation in all materials, basic selection, loading, all haul, offloading and spreading.

VA-D 8.3.3 **RESTRICTED EXCAVATION**

a) Excavate for restricted foundations, footings and pipe trenches in all materials and use for embankment or backfill or dispose.

Add:

c) Excavate in all materials and place on stockpile Unit: m³

The rate shall cover the cost of complying with all precautions required in terms of 5.1 in addition to the cost of excavation in all materials, selection to remove residual roots and other organic material and spoiling of these, loading, all haul, offloading, spreading and the maintaining the stockpile.

d) Excavate in all materials and spoil Unit : m³

The rate shall cover the cost of complying with all precautions required in terms of 5.1 in addition to the cost of excavation in all materials, basic selection, loading, all haul, offloading and spreading.

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VA-D 8.3.14 Application of herbicide to substation yard prior to placing yard stone Unit: m²

The unit of measure shall be the square meter area of yard stone to be applied with an approved herbicide.

The rate shall include full compensation for all transport, procurement of the material, labour, and equipment to mix and apply the herbicide to the substation yard stone in accordance with 240-125477962 - Herbicide Usage in Eskom Prohibited and Restricted Areas, Live Chambers, Telecommunication Infrastructure Yards and Security Fences.

VA-D 8.3.15 Substation Yard stone:

a) Removal of existing yard stone to required depth:

1) Remove and Place in Stockpile..... Unit: m³

2) Remove and Spoil Unit: m³

The unit of measure shall be the cubic meter volume (m³) of existing yard stone which is removed and stockpiled or removed and spoiled at a designated site.

The rate shall include full compensation for all equipment, labour, transport, and materials required to remove existing yard stone to stockpile for sub-item 1), or to a designated spoil area/site for sub-item 2).

b) Cleaning and Re-Utilizing Existing Yard Stone Placed in Stockpile

1) Clean, Wash and Process Existing Fouled Yard Stone..... Unit: m³

2) Extra-over item VA-1200D - 8.2.15 b) 1) for Unit: m³
Stockpiling of Cleaned Yard Stone

The unit of measure shall be the cubic meter volume (m³) of existing yard stone which is cleaned / washed / processed and stockpiled separately from fouled yard stone.

The rate shall include full compensation for all equipment, labour, transport, and materials required to clean / wash / process existing fouled yard stone from existing stock piles for sub-item 1) and stockpiling cleaned yard stone in separate stockpile areas for sub-item 2).

c) Place, spread, level to nominal depth of 100mm, Unit: m³
and lightly roll Yard Stone

The unit of measure shall be the cubic meter volume (m³) of yard stone which to be placed to a nominal depth of 100mm, levelled and lightly rolled.

The rate shall include full compensation for all equipment, labour, transport, and materials required to load from existing stockpiles, offload on site, place, spread, level to a nominal depth of 100mm and lightly roll placed yard stone.

d) Testing and Importing of Yard Stone

1) Testing of material to determine suitability for Unit: no
use as substation Yard Stone in accordance with
CIGRE SA 2015 Paper 46

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The unit of measure shall be the number of tests performed in accordance with CIGRE SA 2015 Paper 46.

The rate shall include full compensation for all equipment, labour, transport, and materials required to performs tests on proposed yard stone materials in accordance with CIGRE SA 2015 Paper 46. The rate shall also in include full compensation for preparing and submitting a detailed report of the test results to the Primary Plant *Engineer*.

- 2) Extra-over item VA1200 – D - 8.3.15 c) for the Importation Unit: m³
of Yard Stone From Commercial Sources

The rate shall cover the additional cost of supplying yard stone materials from commercial sources. The rate shall include all additional costs of finding a suitable source or materials, procuring the material inclusive of all royalties or other charges by the owner of the source, transportation of the material from the source to a designated stockpile on site.

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4. SANS 1200DB : EARTHWORKS (PIPE TRENCHES)

VA-DB 3 MATERIALS

VA DB 3.3 SELECTED GRANULAR MATERIAL

VA DB 3.4 SELECTED FILL MATERIAL

For both these clauses the requirements given in SANS 1200 LB clause 3 shall apply.

VA-DB 3.5 BACKFILL MATERIAL

i) Delete and replace with:

Except as provided for in sub-clause b) below, only sandy material excavated from trenches may be used as main fill. Any shortfall shall be made up from stockpiled sandy material or from borrow pits.

VA DB 3.6 MATERIALS FOR REINSTATEMENT OF ROADS AND PAVED AREAS

VA DB 3.6.1 Sub-base and Base

Add:

Whenever the pipeline excavation necessitates damaging the existing road surface, the *Contractor* shall set aside and stockpile separately material excavated from the upper 200 mm of the road for re-use as sub base during reinstatement of each road crossing.

VA-DB 5 CONSTRUCTION

VA-DB 5.5 TRENCH BOTTOM

Add:

The bottom of the trench in soil shall be compacted to ensure that the density of the upper 100 mm layer is 90 % of Mod. AASHTO maximum density. This to be done prior to trimming and bedding.

VA-DB 5.6 BACKFILLING

VA-DB 5.6.2 Material for Backfilling

Delete the last paragraph and replace with:

Under roadways and paved areas and for a distance of at least 2 m on either side, material for backfilling trenches and around structures such as manholes, catchpits and the like, shall comprise selected gravel with a PI not exceeding 15 and a CBR at 93% Mod. AASHTO density of at least 15.

Add the following:

All excavations in excess of the specified depth and width shall be backfilled with approved backfill material. No additional payment for the backfilling will be made.

VA-DB 5.6.3 Disposal of Soft Excavation Material

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VA-DB 5.6.4 *Disposal of Intermediate and Hard Rock Material*

Delete both clauses and replace with:

Excavation material from the trench which has become surplus because of bulking, displacement by the pipe, importation and where the quantity of rock or hard material exceeds that which the *Supervisor* allows to be incorporated in the backfilling, shall be carted to an approved spoil dump.

VA-DB 5.7 *COMPACTION*

VA-DB 5.7.2 *Areas Subject to Traffic Loads*

Add:

All pipe trenches shall be treated as subject to traffic loads.

VA-DB 7 *TESTING*

VA-DB 7.1 *Delete this clause and replace with:*

The testing of backfill and bedding shall be done as specified in SANS 1200 D clause 7. Compaction is to be tested at the rate of at least one sand replacement field density or two nuclear density tests for every 20 m³ of compacted backfill and bedding material. The provisions of SANS VA-D 7.2 shall apply to the use of a nuclear density meter.

VA-DB 8 *MEASUREMENT AND PAYMENT*

VA-DB 8 *BASIC PRINCIPLES*

VA-DB 8.1.2 Add:

The principle governing payment for excavation of trenches of various depths shall be as follows:

- i) For a trench of depth up to 1 m, all material from the ground surface to the bottom of the trench shall be paid for at the scheduled rate for a trench of depth up to 1 m.
- ii) For a trench of depth over 1 m and up to 2 m, all material from the ground surface to the bottom of the trench shall be paid for at the scheduled rate for a trench of depth over 1 m and up to 2 m, and so on for each successive metre of additional depth.

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5. SANS 1200DM : EARTHWORKS (ROADS, SUBGRADE)

VA-DM 3 MATERIALS

VA-DM 3.2 CLASSIFICATION FOR PLACING PURPOSES.

VA-DM 3.2.2 Fill

b) Delete and replace with:

Maximum particle size shall not exceed two thirds of the layer thickness.

VA-DM 3.2.3 Selected layer

d) Delete and replace with:

A maximum plasticity index for natural material of $10 + 3 \times \text{grading modulus}$ and for stabilised material of slightly plastic.

VA-DM 5 CONSTRUCTION

VA-DM 5.2 METHODS AND PROCEDURES

VA-DM 5.2.3 Treatment of Roadbed

VA-DM 5.2.3.1 Natural draining of road-bed

Add:

Before roadbed preparation is started, permanent side drains and whatever temporary drainage is necessary, shall be constructed to ensure that the roadbed is not inundated and drains freely.

VA-DM 5.2.3.3 Treatment of road-bed

Add new clause:

c) Control of shape of roadbed.

The roadbed shall be bladed to the same shape as layerworks i.e. to the same slope and falls.

The roadbed shall not be allowed to dry out appreciably below OMC, hence excavations shall be covered with borrow material, tipped and spread within 24 hours of the completion of the excavation.

VA-DM 5.2.4 Fill

VA-DM 5.2.4.2 Placing and Compaction

c) Breaking down of Material

Add:

All weathered soils and gravel used in the construction of the road shall be thoroughly broken down by means of a grid roller to ensure reasonable homogeneity of the material in each layer and that all soft or weathered lumps have been crushed.

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Oversize material to the extent of up to 5 % by volume of the material used shall be removed without additional payment.

d) Watering and Mixing

Add:

The field OMC (Mod AASHTO compaction effort) shall be determined in that portion of the *Works* where the particular material is first used. Further field OMC determinations shall be performed whenever the material changes. The field OMC shall be datum upon which moisture content tolerances apply.

VA-DM 5.2.8 *Transport*

Delete and replace with:

No overhaul will be paid. All haul will be freehaul.

VA-DM 5.2.8.2 *Overhaul*

Omit this clause.

VA-DM 7 *TESTING*

VA-DM 7.2 *PROCESS CONTROL*

Delete Table 1 and replace with:

1		2	3	4
			TESTING FREQUENCY	
TEST		LAYER	MAX AREA OR VOLUME PER TEST	MIN NO OF TESTS PER LOT
Field Density	a)	Ordinary fill	500 m ²	4
	b)	Roadbed and top 300 mm of fill	2 000 m ²	4
	c)	Selected layers	1 500 m ²	4
Mod AASHTO		Fill and selected layers	3 000 m ²	1
Indicator	a)	Fill	3 000 m ²	1
	b)	Selected layers	1 000 m ²	2
CBR/UCS	a)	Fill	2 000 m ²	1
	b)	Selected layers	6 000 m ²	1

*The frequencies quoted here shall be correlated with SANS M Clause 6.3 (Frequency of checks)

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VA-DM 7.3 *ROUTINE INSPECTION AND TESTING*

VA-DM 7.3.1 *Add the following:*

a) Field density control

Density control shall be either by the sand replacement method or by an approved nuclear density meter. The use of the nuclear density meter shall be subject to the following provisions:

The tests will not be valid unless the instrument is properly calibrated at the depth of test and the test performed not within 1 meter of any concrete structure or face of an excavation in a confined space of width less than 2 m.

For each 10 nuclear density meter tests a minimum of 3 corresponding sand replacement tests shall be performed.

The accuracy of any nuclear density meter shall be proved to the *Supervisor* by performing at least twenty comparative nuclear density and sand replacement tests before the results of the nuclear density meter will be accepted as valid. Thereafter the correlation between the nuclear density meter and sand replacement tests shall be reviewed on a fortnightly basis and presented to the *Supervisor*.

Each nuclear density meter shall be required to have a certificate provided by the supplier of the machine stating that the machine is in good working order.

The minimum number of density control tests required shall be 4 sand replacement tests or 8 nuclear density meter tests per production lot.

b) Maximum Dry Density (Mod AASHTO)

A minimum of one Maximum Dry Density test (mod. AASHTO compaction effort) shall be carried out per lot from one source. If the material being used varies in quality, the *Supervisor* may instruct more tests to be carried out.

VA-DM 8 *MEASUREMENT AND PAYMENT*

VA-DM 8.2 *COMPUTATION OF QUANTITIES*

VA-DM 8.2.5 *Verifying Quantities*

Delete and replace with:

Levels and cross-sections for the establishment of earthworks quantities shall be taken by the *Contractor* and agreement reached with the *Supervisor* concerning the accuracy and adequacy of these before earthworks are started. Only those agreed cross sections shall be used for measurement purposes.

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VA-DM 8.3 SCHEDULED ITEMS

VA-DM 8.3.5 Selected layer Compacted to 93 % of Mod AASHTO maximum density.

Delete and replace with:

Selected layer

- a) From stockpile compacted to 93% of modified
AASHTO maximum Unit: m³

The rate shall cover the cost of excavation, selection of suitable material, loading, transportation, offloading at point of placing, compaction, and trimming in terms of 5.2.4.3 (d).

- b) From commercial source compacted to 93%
of modified AASHTO maximum density Unit: m³

The rate shall cover the cost of locating the source, complying with all the relevant precautions required in terms of Sub-clause 5.1 of SANS 1200 D, procuring the material, basic selection, transportation from the source to point of deposition, spreading, watering, compacting, final grading, complying with the tolerances, and testing.

All these rates shall include testing and transport within the freehaul distance. All the operations specified in SANS 1200 DM clause 5.2.4 shall be carried out.

VA-DM 8.3.7 Cut to Spoil or Stockpile from

Revise this heading to read:

“Cut to Spoil from”

**VA-DM 8.3.17 Extra-over items 6.03 and 6.04 for obtaining material from
Commercial sources..... Unit: m³**

The rate shall include full compensation for the cost of finding a suitable source of material, for procuring the material, transportation of the material to the construction site regardless of the distance and for excavation in all material classes.

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6. SANS 1200G: CONCRETE STRUCTURAL

VA-G 2 INTERPRETATIONS

VA-G 2.4 EXPLANATION OF TERMS

VA-G 2.4.2 Strength Concrete

Add:

Where the aggregate size is not specified, the *Contractor* shall use a size of coarse aggregate consistent with the requirements of clause VA-G 3.4.1.

VA-G 3 MATERIALS

VA-G 3.1 APPROVAL OF MATERIALS

Delete and replace with:

No later than three weeks prior to the commencement of concreting, the *Contractor* shall supply to the PE for its acceptance, test results of the fine and coarse aggregates that he proposes to use for the concrete and shall demonstrate by means of a report from an approved laboratory that the aggregate comply with the requirements of SANS 1200 clause 3.4.

The *Contractor* shall demonstrate also by means of a report from an approved laboratory

- a) All aggregates used in the concrete mix meet the requirements as per SANS 1083.
- b) That the aggregates do not exhibit excessive shrinking properties, in accordance with clause C.14, Appendix C of SANS 1083.
- c) That the aggregates do not have a potential for Alkali Silica reaction. In this regard a petrological examination of the aggregate and report by a qualified Geologist, shall accompany the laboratory report.
- d) In accordance with the recommendations of the Cement and Concrete Association. Slough, England, Working Party Report – Minimising the Risk of Alkali-Silica Reaction. September 1983.

Or

- e) In accordance with the latest recommendations of the National Building Research Institute.

The *Contractor* shall not commence concreting until the *Eskom Supervisor* has approved in writing the aforesaid materials.

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VA-G 3.2 *CEMENT*

VA-G 3.2.1 *Applicable Specifications*

Delete this clause and replace with:

All cement shall comply with the requirements of SANS 50197-1

VA-G 3.2.2 *Alternative Types of Cement*

Delete this clause and replace with:

Where the aggregates have been shown in terms of clause VA-G 3.1 to have no potential for Alkali Silica Reaction, concrete shall be manufactured using only cements which comply with the requirements of SANS 50197-1 and will minimize the risk of an Alkali-silica reaction.

VA-G 3.2.3 *Storage of Cement*

Add:

Cement and cementitious materials shall not be stored longer than 3 months.

Should storage of cementitious materials be longer than 3 months through reasons beyond the control of the *Contractor* he may have the material tested by an approved laboratory for compliance with the standard and apply to *Eskom* for a concession.

Cement shall also be stored in such a manner that it is handled on a "first in, first out" basis.

VA-G 3.4 *AGGREGATES*

VA-G 3.4.1 *Applicable Specifications*

Add:

The maximum size of coarse aggregate for structural concrete, unless stated on the relevant drawings, shall not exceed:

- a) One fifth of the thickness of the concrete element;
- b) 5mm less than the clear distance between reinforcing bars.
- c) 40mm.

Coarse aggregate for use in mass concrete may be larger than 40mm, if not shown on the drawings or approved by *Eskom*.

VA-G 3.4.2 *Use of Plums*

Delete and replace with:

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Plums shall not be used.

VA-G 3.5 *ADMIXTURES*

Add:

The *Contractor* shall stipulate the technical reasons indicating the use of admixtures in the mix. Adequate test mixes and test samples to the satisfaction of *Eskom* shall be prepared to demonstrate that the presence of the admixture has no detrimental effect on any of the characteristics of the fresh and hardened concrete specified elsewhere herein.

No admixtures containing chlorides shall be used.

VA-G 3.9 *HOLDING DOWN BOLTS*

All holding down bolts shall be galvanised to SANS 763 for a length of 100mm below the bottom of the thread unless otherwise indicated on the drawings.

Nuts and washers used with the HD bolts shall be galvanised to SANS 763.

VA-G 5 *CONSTRUCTION*

VA-G 5.1 *REINFORCEMENT*

VA-G 5.1.1 *Bending*

Add new clause:

VA-G 5.1.1.5 *Reinforcement shall be cut with cropping or shearing equipment*

Cutting torches shall not be used.

VA-G 5.1.2 *Fixing*

Add:

No welding of reinforcement shall be permitted.

VA-G 5.1.4 *Splicing*

Add:

Screw type or Swage type connectors or additional splice lengths from those indicated on the Drawings shall be subject to the approval of *Eskom*.

VA-G 5.2 *FORMWORK*

VA-G 5.2.1 *Classification of Finishes*

a) Smooth

Add:

This finish shall be obtained by the use of steel-faced forms arranged in a regular pattern to fit the appearance of the structure.

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Add new clause:

VA-G 5.2.6 *Chamfers*

Unless otherwise specified all exposed corners and arises shall have a 20x20mm chamfer.

VA-G 5.3 *HOLES, CHASES AND FIXING BLOCKS*

Add:

Holes or chases shall be thoroughly cleaned and prepared prior to the placing of concrete or grout. They shall be subject to approval by *Eskom*.

VA-G 5.5 *CONCRETE*

VA-G 5.5.1 *Quality*

VA-G 5.5.1.1 *General*

Delete the first sentence and replace with:

Only strength concrete shall be used.

VA-G 5.5.1.7 *Strength concrete*

Add:

The *Contractor* shall design trial mixes in accordance with SANS 10100-2, 2014. The target strength of the trial mix shall be determined using K equal to 1,7 and a standard deviation of 5 MPa for a “good” degree of site control.

Target Strength = Specified Strength + (K x standard deviation).

The *Contractor* shall submit the trial mixes together with 7 and 28 day test results to *Eskom* for approval. The average 28 day test result shall equal or exceed the target strength. No concreting shall proceed until the trial mixes have been approved.

Where it has been shown in terms of clause VA-G 3.4.1 that aggregate to be used in the *Works* has a potential for Alkali Silica Reaction, the concrete mixes shall be designed so as to ensure that the alkali content of the concrete calculated in accordance with clause 4.4 of the Cement and Concrete Association Working Party Report – Minimising the Risk of Alkali Silica Reaction, September 1983 – does not exceed 2,1 kg/m³.

VA-G 5.5.2 *Batching*

VA-G 5.5.2.3 *Aggregates*

Add:

Volume batching is permitted for concrete pours of up to 0,5m³. All greater quantities shall be weight batched to an accuracy of 2%.

VA-G 5.5.3 *Mixing*

VA-G 5.5.3.1 *Mixing at construction site*

VA-G 5.5.3.1 b) Add:

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Where the use of cement has been approved by *Eskom*, the OPC shall be batched into the mixer before the addition of the other cementitious constituent.

g) Delete and replace with:

Concrete shall only be retained in the mixer for such additional time such that the concrete is placed within one hour of the start of mixing. In such event the mixer shall not turn continuously but shall run for only 2 minutes every 15 minutes. *Eskom* may order that the period of one hour be reduced if in its opinion the ambient temperature or any other factor will tend to produce early setting.

Concrete thus retained shall ever so comply with all other requirements of the specification, and failure to comply shall result in the rejection of such concrete.

VA-G 5.5.3.2 *Ready-mixed concrete*

Add:

Ready-mixed concrete other than that produced at the *Contractor's* own central mixing plant shall not be used without *Eskom's* written consent.

VA-G 5.5.5 *Placing*

VA-G 5.5.5.1 *Delete and replace with:*

The *Contractor* shall give *Eskom* adequate notice of his intention to place concrete.

Concrete shall be placed within one hour of the start of mixing (and not "within one hour its discharge from the mixer"). Concrete shall not be re-tempered in any way whatsoever. The forms to be filled shall be clean internally. All excavations and other surfaces of an absorbent nature that are to come into contact with the concrete shall be thoroughly dampened with water immediately prior to placing. There shall be no free water standing on the surfaces against which concrete is to be placed.

No "cold joints" resulting from any discontinuity of any pour will be permitted.

VA-G 5.5.6 *Compaction*

VA-G 5.5.6.3 *This clause is amplified as follows:*

Concrete shall not be compacted by spading, rodding or forking.

VA-G 5.5.7 *Construction Joints*

VA-G 5.5.7.1 Add:

The *Contractor* shall continue concreting through meal breaks or after normal working hours in order to complete work up to a construction joint and no extra payment shall be made to the *Contractor* for overtime working.

VA-G 5.5.7.2 Add:

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The *Contractor* shall continue concreting through meal breaks or after normal working hours in order to complete work up to a construction joint and no extra payment shall be made to the *Contractor* for overtime working.

VA-G 5.5.7.3 Add:

The finishing-off of concrete to form unforeseen joints shall be to the approval of *Eskom*. In the event that the position of such unforeseen joints in the opinion of *Eskom* jeopardises the design of the *Works*, *Eskom* shall have the right to instruct the *Contractor* to break down and remove all such concrete to a point to be determined by *Eskom*.

All costs relating to such breaking down and removal of the defective work as well as those related to the reinstatement of the *Works* in accordance with the contract shall be borne by the *Contractor*.

Add new clauses:

VA-G 5.5.7.4 ***Joint former material***

Joints shall be formed using material specified on the drawings.

VA-G 5.5.7.5 ***Joint sealing***

Sealing compounds shall be as indicated on the drawings.

The sealing compounds shall be supplied by a sub-*Contractor* approved by the *Engineer*.

Joints shall be prepared, primed and sealed in strict accordance with the sealant manufacturer's requirements.

The joints to be sealed shall be formed by the *Contractor* to the sizes shown on the drawings.

The restoration of incorrectly constructed and/or damaged joints to the specified sizes shall be carried out using two part epoxy mortar designed for the repair of spalled and damaged concrete which shall be applied in strict accordance with the manufacturer's requirements.

VA-G 5.5.8 ***Curing and Protection***

Add:

Precautions shall be taken to prevent cycles of wetting and drying.

The curing and protection of concrete is vital and the *Contractor* shall comply strictly with these requirements. Blinding layers, of thickness 50mm or less, needs to be cured.

VA-G 5.5.10 ***Concrete Surfaces***

VA-G 5.5.10.2 ***Delete and replace with:***

Concrete surface finishes required will be indicated on the drawings and shall be classified as follows:

- a) Rough: This shall comprise a lightly ridged surface as struck off with a tamping board. Degree of Accuracy III is required. This finish shall provide a good key for subsequent finishing with a screed or bituminous carpet.

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- b) Smooth wood float: The surface shall be wood floated to a uniform surface free of trowel marks and shall be Degree of Accuracy II.
- c) Smooth Steel Float: The surface shall be accurately struck of and floated and finished with a steel float to a smooth and uniform surface, free of trowel marks, to degree of Accuracy I.

Rubbing with a Carborundum stone will be permitted in certain circumstances but no plastering to correct imperfections will be permitted.

VA-G 5.5.13 *Grouting*

Delete and replace with:

The *Contractor* will be required to grout under structural steel base-plates erected by other *Contractors*.

- a) Surface Preparation

The concrete surface shall be scabbled and thoroughly cleaned so that all unsatisfactory material such as dust, oil, grease and laitance is removed.

The surface shall be kept wet for at least 12 hours prior to grouting but no standing water shall remain at commencement of grouting.

- b) Mixing

All grouting shall be done using a non-metallic, non-shrink, and proprietary grout having a minimum compressive strength at 28 days of 35 MPa. The grout shall be mixed at a "plastic" consistency to the grout suppliers specifications. Any mixed grout shall be discarded if not placed within 1 hour of mixing and no partially set grout may be re-tempered.

- c) Placing

Waterproof shutters shall be securely fixed to three sides of the base-plate and the grout forced in and tightly caulked using a wooden tamping tool. The cavity shall be slightly over-filled and a closing shutter introduced.

In the case of obstructive levelling packs, two adjacent sides shall be shuttered and grout placed behind the packs before the third shutter is fixed and the grouting is completed.

- d) Stripping and curing

Once the grout has reached an initial set, the shutters may be stripped and a coating of curing compound be applied to all exposed grout surfaces.

- e) Alternative: Use of Liquid Grout

Should the *Contractor* so choose the grout may be mixed to a free- flowing consistency

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and installed by means of a headbox and tail reservoir shutter system to the grout supplier's specifications.

VA-G 5.5.14 *Defects*

VA-G 5.5.14.2 *Delete and replace with:*

After thorough inspection and investigation of the quality and strength of the work, as a first priority the *Contractor* shall propose the extent and method of repair for *Eskom's* approval. Notwithstanding the foregoing *Eskom* may order alternative or more extensive methods of repair, or order the demolition and reconstruction of the whole of the defective element of work that it considers necessary.

The costs of all such investigation, repair and remedial work and any demolition and reconstruction work shall be borne by the *Contractor* and all repair, remedial and reconstruction work shall be the satisfaction of *Eskom*.

Add new clause:

VA-G 5.5.16 *Holding Down Bolts*

All holding down bolts and anchorages, shall be set absolutely true in accordance with the Drawings by means of accurately constructed templates and securely fixed in position to prevent displacement during concreting.

Exposed threads of holding down bolts shall be adequately protected with grease and sacking and this protection shall be maintained in all portions of the Works until they are taken over.

VA-G 6 *TOLERANCES*

VA-G 6.2 *PERMISSIBLE DEVIATIONS*

VA-G 6.2.3 *Specified Permissible Deviations*

d) *Elements or components above foundations*

- 4) Level (deviation from designated level with reference to the nearest transferred datum (TD) of the upper surface of any slab or other element or component.

DEGREE OF ACCURACY I

Delete -10mm + 0mm

And replace with 4mm

- 7) Exposed Concrete Surface

DEGREE OF ACCURACY I

Flatness of Plane surface 3mm

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Delete and replace with:

- | | | |
|-----|---|-----|
| a) | All elements except Transformer Plinths | 3mm |
| b) | Transformer Plinths | 2mm |
| ii) | Abrupt changes in a continuous surface | |

Add:

Concrete surfaces adjacent to angle iron edgings of cable trenches shall be laid at a level such as to ensure that the surface of the specified floor covering can be laid and finished off flush with the angle irons with no abrupt changes in levels.

Permissible deviations in Degree of Accuracy I for items not specified in SANS 1200 G sub-clause 6.2.3 shall be as follows:

f) Location of holding down bolts

- 1) The centre line of a holding down bolt from its designated location in plan 2mm.
- 2) The top of the bolt from its designated elevation 4mm.

Add new clause:

h) Location of built-in Items

- 1) From the defined positions in plan - $\pm 25\text{mm}$.
- 2) From the defined position in level – in accordance with the tolerances specified for the formwork to which it is related.

VA-G 7 TESTS

VA-G 7.1 FACILITIES AND FREQUENCY OF SAMPLING

VA-G 7.1.1 Facilities

Add:

The *Contractor* shall be fully responsible for sampling and testing the concrete at the frequency laid down.

VA-G 7.1.2 Frequency of Sampling

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Every time a sample is taken, a slump test is to be performed on the same batch of concrete and the result recorded.

From every sample 6 cubes are to be made and 3 cubes tested at 7 days and 3 cubes tested at 28 days.

Sample shall be taken at the point of placing.

VA-G 8 *MEASUREMENT AND PAYMENT*

VA-G 8.1 *MEASUREMENT AND RATES*

VA-G 8.1.3 *CONCRETE*

VA-G 8.1.3.2 *Delete and replace with:*

Separate items will be scheduled, as applicable for each type and each grade of concrete.

Concrete will not be separately scheduled for the exact location in the *Works*, however it shall be separately scheduled for placing in different types of structural elements.

VA-G 8.1.3.3 a) *Delete and replace with:*

The rates shall cover the cost of the design of the mix in the case of strength concrete, the provision of concrete (made with the cement type schedule or, where not scheduled, as listed in clause VA-G 3.2.2), designated joints other than expansion and contraction joints shown on the drawings, mixing, transporting, testing, placing, compacting, the forming of kickers, stop-ends and unforeseen construction joints, striking-off or levelling as applicable, and curing and repairing where necessary.

Any precautions required for mixing and batching, transporting, placing and curing in adverse weather conditions shall be covered in the rate.

Add new clause:

- VA-G 8.1.3.4 a)** Where concrete foundations for steel columns, transformers and equipment, cable trenches and junctions are scheduled in the Bill of Quantities as a Unit, or per metre of length, as applicable, the rate shall cover all the costs associated with the construction of the unit or per metre, within the dimensions of the item, in compliance with the specifications and as shown on the drawings, including excavation in soft material, disposal, blinding, concrete, reinforcement, formwork, backfilling, finishing off, curing, testing and any other items which may be required.

Extra-over payment will be made for Intermediate or Hard Rock material encountered in the excavations.

- b) Where concrete, reinforcement, formwork and associated items are separately scheduled clauses SANS 1200 G, 8.1.1 to 8.8 and the variations and additions to these shall apply.

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VA-G 8.4 SCHEDULED CONCRETE ITEMS

VA-G 8.4.2 Blinding layer in Concrete

Delete and replace with:

Minimum Thickness and Grade

- a) Cast against soft excavationUnit: m²
- b) Cast against intermediate excavationUnit: m²
- c) Cast against hard rock excavationUnit: m²

VA-G 8.7 GROUTING

Amend the unit of measurement to litre (dm³) in sub-clauses (a) and (b).

- a) Under bases (or beds).

Add:

The rates for grouting under bases or beds shall include the cost of any shuttering required.

VA-G 8.9 Construction of cable trench complete indicated:

- (a) Single type A cable trench D-FS-887 sheet 1 Unit: m
- (b) Double type A cable trench D-FS-887 sheet 1 Unit: m
- (c) Precast concrete trench cover with support
steel work D-FS-887 sheet 1 Unit: m
- (d) Single cable trench under road 0.54/390 SHEET 37C..... Unit: m

The unit of measure shall be a linear meter of cable trench constructed with cable trench bends, support steelwork, cable trench covers.

The rate shall include full compensation for all transport, procurement and safe keeping of the all the material required, all excavations required, setting out of trenches, confirming of construction levels, labour, and equipment for complete construction of the cable trench.

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7. SANS 1200LB : BEDDING (PIPES)

VA-LB 3 MATERIALS

VA-LB 3.3 BEDDING

Add:

All bedding for rigid pipes shall be class B. Flexible pipes shall be bedded as shown on drawing LB 2 (a).

VA-LB 7 TESTING

VA-LB 7.1 DENSITY

The testing of backfill and bedding shall be as specified in SANS 1200 D Clause 7. Compaction is to be tested at the rate of at least one sand replacement field density test or two nuclear density tests for every 20 m³ of compacted backfill and bedding material. The provisions of SANS 1200 VA-D 7.2 shall apply to the use of a nuclear density meter.

VA-LB 8 MEASUREMENT AND PAYMENT

VA-LB 8.1 PRINCIPLES

VA-LB 8.1.5 Disposal of Displaced Material

Delete and replace with

Displaced materials shall be carted to an approved spoil dump.

VA-LB 8.1.6 Freehaul

Delete and replace with:

No overhaul will be paid. All haul will be freehaul.

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8. SANS 1200LE : STORMWATER DRAINAGE

VA-LE 3 MATERIALS

VA-LE 3.1 CULVERT UNITS AND PIPES

- a) Precast Concrete Pipes

Add:

Pipes shall be of the types and classes indicated on the drawings and shall have interlocking joints.

- b) Skewed Ends

Whenever pipe culverts are cut on site the ends are to be repaired with a suitable wet to dry epoxy and cement mortar to restore cover to the reinforcing steel.

VA-LE 3.4 MANHOLES, CATCHPITS AND ACCESSORIES

VA-LE 3.4.1 Bricks

Amplify this clause as follows:

Bricks shall be NFX type with a nominal compressive strength of 10,5 MPa and shall comply with SANS 227.

VA-LE 3.5 GEOFABRIC BLANKET

Add new sub-clauses:

VA-LE 3.5.1 Geofabrics and the tests performed on them shall comply with SANS 0221. Tests shall be performed in an approved laboratory on samples of the materials and the following minimum values shall be equalled or exceeded. Test results are to be submitted for every consignment.

VA-LE 3.5.2 Filter grade geofabric shall be a woven, non-woven or combination type of fabric. The permeability (SANS 0221 test method 3.7) shall be not less than 100 l/s per square metre. Penetration load (SANS 0221 test method 3.5) shall be at least 2,0 kN.

VA-LE 3.5.3 Strength grade geofabric shall be a woven type of fabric. The penetration load (SANS 0221 test method 3.5) shall be at least 4,5 kN. The permeability (SANS 0221 test method 3.7) shall be not less than 15 l/s per square metre.

VA-LE 5 CONSTRUCTION

VA-LE 5.1 TRENCH BOTTOM

VA-LE 5.1.2 Portal and rectangular culverts

Delete sub-clauses 5.1.2.1 to 5.1.2.3 and replace with:

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The cast in situ invert slabs shall be constructed on 150 mm thick selected subgrade quality gravel compacted to 93% Mod. AASHTO density. Should the trench bottom be unsuitable for placing and compaction of the selected layer, the *Supervisor* may order the excavation to be taken out to a greater depth or may order the laying of a strength grade geofabric to strengthen the selected layer and separate it from the underlying soil.

VA-LE 5.2 *BEDDING AND LAYING*

VA-LE 5.2.2 *Pipe Culverts*

In sub-clause c) for 16 mm read 1,6 mm.

VA-LE 5.2.3 *Concrete casing of pipelines*

Amend as follows:

Concrete encasement and bedding shall be strength grade 20 MPa concrete.

Add a new clause:

VA-LE 5.8 *CULVERTS TO BE KEPT CLEAR*

The *Contractor* is to regularly clear debris from the culverts during construction to ensure an open waterway. Before the work is handed over on completion, the culverts are to be cleaned and inspected by the *Contractor*.

VA-LE 8 *MEASUREMENT AND PAYMENT*

VA-LE 8.2 *SCHEDULED ITEMS*

Add:

VA-LE 8.2.14 *Supply and install sub-soil drains complete as indicated on drawing*

D-FS-887 Sheet 02 detail 1 Unit: m

The unit of measure is the metre length of installed sub-soil drains as indicated on the drawings. The tendered rate shall include full compensation for all materials, equipment, labour and transport to construct the sub-soil drains as indicated on the drawings.

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9. SANS 1200ME : SUBBASE

VA-ME 5 CONSTRUCTION

VA-ME 5.5.7 Constructions limitations

In Table 1 delete "10 hours for Portland cements, PBFC, Cement/Slag, Cement/Fly ash, Lime/Flag and Lime/Fly ash" and replace with "6 hours"

VA-ME 5.7 Transport

Delete and replace with:

No overhaul will be paid. All haul will be freehaul.

VA-ME 5.7.2 Overhaul

Omit this clause.

VA-ME 8 MEASUREMENT AND PAYMENT

VA-ME 8.1 (c) Omit this subclause

VA-ME 8.3 SCHEDULED ITEMS

VA-ME 8.3.3 Construct the gravel wearing course with material from commercial sources or designated borrow areas

Add new sub-items:

VA-ME 8.3.3 a) Gravel material compacted to:

2) 95% of modified AASHTO density for a compacted layer

thickness of 150 mm, G5..... Unit: m³

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10. SANS 1200MK : KERBING & CHANNELLING

VA-MK 8 MEASUREMENT AND PAYMENT

VA-MK 8.2 SCHEDULED ITEMS

Add a new sub-item

VA-MK 8.2.14 Remove Existing Kerbing

a) Remove and dispose of existing kerbing off Site Unit: m

The tendered rates shall include full compensation for providing all labour and equipment, excavations, lifting of the existing kerbs and, in the case of sub item (a), loading and transporting the kerbs from the Site.

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C3.2 Particular Specifications

Particular specifications are given in the following sections.

1.	PA PARTICULAR SPECIFICATION : FENCING.....	59
2.	PB PARTICULAR SPECIFICATION: BUILDING WORK.....	96
3.	PC PARTICULAR SPECIFICATION : OIL CONTAINMENT AREAS, FIRE TRAPS AND OIL HOLDING DAMS	107
4.	PE PARTICULAR SPECIFICATION : OH&S Specifications and Standards.....	116

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1. PA PARTICULAR SPECIFICATION : FENCING

PA 1 SCOPE

This specification covers the requirements for the construction of security fencing & farm boundary/stock proof fencing.

Also included in the scope of these particular specifications are the requirements for constructing non-lethal electric fencing with integrated alarm systems.

PA 2 INTERPRETATIONS

2.1 Supporting Specifications

The fencing shall be constructed in accordance with:

- a) SANS 10044 Part 1 to 5: Welding.
- b) SANS 121: Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.
- c) SANS 1700: Fasteners.
- d) SANS 927: Precast concrete kerbs, edgings and channels.
- e) SANS 1024: Welded steel fabric for reinforcement of concrete.
- f) SANS 675: Zinc-coated fencing wire.
- g) SANS 10162: The structural use of steel.
- h) SANS 10100: The structural use of concrete.
- i) SANS 1431: Weld able structural steels.
- j) SANS 1200 DA: Earthworks (Small works).
- k) SANS 1200 G: Concrete (Structural) and the relevant variations and additions to these.
- l) SANS 1200 GE: Precast concrete (structural) and the relevant variations and additions to these.
- m) 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS - ANNEX A
- n) This particular specification.

PA 3 MATERIALS

3.1 Concrete:

- a) All concrete to be in accordance to SANS 1200 and any variations and additions made in this document.
- b) Concrete strength at 28 days to be 25MPa.
- c) Concrete strength for blinding layer at 28 days to be 15MPa.
- d) Pre-cast concrete fence panels, fence posts and kerbing may be used where required and should be in accordance to the relevant SANS specifications.
- e) Reinforcing steel to be used is as indicated on the relevant detail drawings.

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3.2 Fence & Gate Posts:

For fences installed with average or mild corrosion conditions, the materials shall be:

a) Boundary Fence (D-DT-5237 Sh1):

Post Type	Material Details
Gate Post	Mild Steel Tubing Ø:65 mm
Intermediate Post	Mild Steel Tubing Ø:65 mm
Stay Post	Mild Steel Tubing Ø:50 mm
Fence Standard	Galvanized Fencing Standard, Y-Section – 2,5kg/m
Dropper	Ridge Back Dropper – 0.56kg/m

b) 1,8m and 2,4m Security Fence – Diamond Mesh (D-DT-5237 Sh 2 – 5):

Post Type	Material Details
Corner / Gate Post	Mild Steel Angle 100 x 100 x 10
Strain Post / T-Off Post	Mild Steel Angle 100 x 100 x 10
Intermediate Post	Mild Steel 60 x 60 x 6 Angle
Strut Post	Mild Steel 60 x 60 x 6 Angle

c) 2,4m Security Fence – Weld Mesh (D-DT-5237 Sh 6):

Post Type	Material Details
Gate Post	Taper Flange Channel 100 x 50 x 10kg/m
Corner Post	Mild Steel Angle 100 x 100 x 10
Strain Post	Mild Steel 80 x 80 x 6 Angle
Intermediate Post	Mild Steel 50 x 50 x 6 Angle
Corner Post Stay	Mild Steel 80 x 80 x 6 Angle
Strain Post Stay	Mild Steel 60 x 60 x 6 Angle
Sliding Gate Support Post	Mild Steel Square Tubing 76 x 76 x 4

d) 2,4m Security Fence – Steel Palisade (D-DT-5237 Sh 7):

Post Type	Material Details
Corner Post	Mild Steel tubing Ø100mm – Medium Class
Inline Tee Post	Mild Steel tubing Ø100mm – Medium Class
Fence Post	IPE 100 x 55 x 6,7kg/m
Sliding Gate Support Post	Mild Steel Square Tubing 76 x 76 x 3

e) 2,4m and 3,0m High Security Fence – Concrete Wall (D-DT-5237 Sh 8 - 9):

Post Type	Material Details
Gate Post	Taper Flange Channel 120 x 55 x 13kg/m
Corner Post	Pilaster pre-cast 390mm x 390mm blocks filled with class 30/20 concrete
Inline Post	Pilaster pre-cast 390mm x 390mm blocks filled with class 30/20 concrete
End / Gate / T-Post	Pilaster pre-cast 390mm x 390mm blocks filled with class 30/20 concrete

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PA 4 Fence Materials:

- a) Wires – Non Electrified:
 - i. All fencing wire to comply with SANS 675.
 - ii. Boundary fence to consist of 6 runs of single H.T. Steel strand Campeon Ø24mm Galvanized Class “A” Barbed wire.
 - iii. Diamond mesh tying wire to be Ø 2,5mm mild steel galvanized wire for tying fencing to standards and droppers.
 - iv. Diamond mesh binding wire - Ø 2mm Class “A” Heavy Galvanized wire or Hogg Rings.
 - v. Diamond mesh strain wire – Ø 4mm Class “A” Heavy Galvanized wire. Binding of Strain wires to have a 5 wrap finish.
 - vi. Diamond mesh razor wire flat wrap – 500mm Class “A” Heavy galvanized flat wrap. Bond to top 3 strain wires with 2mm Class “A” Heavy Galvanized wire with 3 twists each. Circle to be fastened in three places.
- b) Conductors – Electrified – Non-Lethal:
 - i. Refer to item *PAPA 15 Electric Fence Conductors* for requirements relating to electric conductors to be used for non-lethal electrified fencing.
- c) Mesh:
 - i. Diamond mesh Class “A” Heavy Galvanized (1800 x 50 x 3.15mm). Bound to the bottom 4 strain wires with Ø2 mm Class “A” Heavy Galvanized wire ties with 3 twists each at 300mm centres.
 - ii. Weld mesh to Class “A” - SANS 935 Size 50 x 50 x 3.14mm Galvanized Mesh to be 2 700mm high, 300mm into the ground and bitumen coated 400mm from bottom. No bulging to occur.
 - iii. Weld mesh to Class “A” - SANS 935 Size 75 x 12.5 x 4.0mm Galvanized Mesh to be 2 700mm high, 300mm into the ground and bitumen coated 400mm from bottom. No bulging to occur.
- d) Palisade
 - i. Steelwork to conform to SANS 10044 Part 1 to 5.
 - ii. All Structural steel to conform to SANS 10162.
 - iii. Grade of steel to be SANS 1431 Grade 350WA.
 - iv. Steelwork to be hot dipped galvanized to SANS 121. Steelwork to be straightened after galvanizing.
 - v. No steel extensions will be allowed on any steelwork.
 - vi. All palisade panels are to be of Standard Palisade “D” section 65 x 3 x 3m / 2,5m / 2m / 1,5m / 1m / 0,55m.
- e) Concrete Walls
 - i. Pre-stressed hollowcore panels to be in accordance to SANS 10100 and SANS 1200GE.
 - ii. Pre-stressed hollowcore grout filling to be 15MPa.
 - iii. All wall panels are to have a lifting device fixed to the reinforcing steel.
 - iv. All formwork for to be steel.

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PA 5 Gates:

a) Gates

Gate Type	Gate Nominal Size	Gate Frame Details
1.2m Boundary Fence Double Leaf Gate	1.2 (1 x Panel)	Mild Steel Tubing Ø 40mm – Medium Class
1.8m High Diamond Mesh Fence Double Leaf Gate	6.0m (2 x Panels)	Mild Steel Tubing Ø 40mm – Medium Class
1.8m & 2.4m Diamond Mesh Fence Single Leaf Gate	1.5m (1 x Panel)	Mild Steel Tubing Ø 40mm – Medium Class
1.8m & 2.4m Diamond Mesh Fence Single Leaf Gate	1.0m (1 x Panel)	Mild Steel Tubing Ø 40mm – Medium Class
2.4m Diamond Mesh Fence Double Leaf Gate	5.0m (2 x Panels)	Mild Steel Tubing Ø 40mm – Medium Class
2.4m Weld Mesh Fence Double Leaf Gate	6.5m (2 x Panels)	Mild Steel Square Tube 50 x 50 x 5
2.4m Weld Mesh Fence Sliding Gate	6.8m (2 x Panels)	Mild Steel Square Tube 50 x 50 x 5
2.4m Steel Palisade Double Leaf Swing Gate	5.0m (2 x Panels)	Mild Steel Square Tube 50 x 50 x 3
2.4m Steel Palisade Double Leaf Swing Gate	4.0m (2 x Panels)	Mild Steel Square Tube 50 x 50 x 3
2.4m Steel Palisade Single Leaf Swing Gate	1.5m (1 x Panel)	Mild Steel Square Tube 50 x 50 x 3
2.4m Steel Palisade Single Leaf Swing Gate	1.0m (1 x Panel)	Mild Steel Square Tube 50 x 50 x 3
2.4m Steel Palisade Double Leaf Sliding Gate	5.0m (2 x Panels)	Mild Steel Square Tube 50 x 50 x 3
2.4m Steel Palisade Double Leaf Sliding Gate	4.0m (2 x Panels)	Mild Steel Square Tube 50 x 50 x 3
3.0m High Security Swing Gate	6.5m (2 x Panels)	Mild Steel Square Tube 50 x 50 x 3.5
Non-Lethal Electrified Security Fence, 2.475m in height Single Leaf Sliding Gate,	5.0m (1 gate leaf)	Mild Rectangular Tube 76 x 38 x 3.5

b) Gate Manufacturing

- i. Where gates are required to be specially manufactured or modified the *Contractor* shall liaise with the *Engineer* and the Gate Manufacturer to confirm gate opening dimensions. Indicative detailed drawings are provided to indicate the gate construction / fabrication requirements. Dimension will be altered accordingly to fit the gate opening.
- ii. The *Contractor* shall supply the *Engineer* with a complete set of gate and fence manufacturing drawings prior to any manufacturing or fabrication commencing.

c) Gate and Gate Motor Details, :

- iii. Sliding gate / foundations are designed for a Centurion ® D5/D10gate motor capable of operating the gate. The Motor supplier shall be provided with the final gate mass to determine the correct motor and with a steel gate rack.
- iv. The motor is to be installed as per the supplier specifications
- v. Rail wheels to be Ø 100mm x 30 (galvanized) sealed roller bearings.
- vi. Top rollers to be Ø 35mm x 40mm nylon.

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- vii. All gate rails shall be included in the gate ramp construction.
- viii. The installation of the gate motor shall be in accordance e with the SANS 10142-2017: The Wiring of Premises and the installation shall be included in the issued CoC for the substation Building Electrical Installation.
- ix. All motorised gate shall also be supplied and installed with infra-red gate safety beams.

d) **Metal Fittings**

2,50mm, 2,0mm and 1,8mm dia galvanised MS.

Bolts, nuts, washers, turnbuckles, hinges and similar metal fittings shall be of galvanised MS complying where relevant with SANS 135 and 1149.

PA 6 Galvanising

- a) Galvanising of steel members and metal fittings shall comply with SANS 763 for heavy-duty applications.
- b) Galvanising of mild steel and high tensile wire shall comply with SANS 935 Class "A". Galvanising of barbs on barbed tape shall comply with SANS 934 Class Z600.
- c) Bolts, nuts and washers and any other miscellaneous steel items shall be hot dipped galvanised in accordance with SANS 763 for general applications. Threaded items shall be spun in a centrifuge during galvanising.
- d) Ø 6mm breathing holes to be drilled in all posts to be hot dipped galvanized.
- e) All galvanized steel to be straightened after galvanizing.

PA 7 Holes

- a) Holes in the steel members for fences shall not be punched or flame cut but shall be drilled (and burrs removed) before the member is galvanised.
- b) Hole sizes are to be as per detail drawings.

PA 8 Chain & Padlocks

- a) Steel Ø 8mm chain links with Ø 50mm x Ø 8mm rings.
- b) Standard approved Eskom colour coded locks to be installed as per HV regulations.

PA 9 Bolts, nuts and washers

- a) All bolts, nuts, shearnuts, washers to be in accordance to SANS 1700.

PA 10 Welds

- a) All welds to be in accordance with hSANS 10044.
- b) All welds to be sealed welded.
- c) No sections to be butt welded.

PA 11 Substation Signs and Notices

11.1 OHS ACT minimum requirements

1.11.1 The following are the minimum requirements for 'Notices' in terms of the OHS Act, Electrical Machinery Regulation 4 (refer to part 0). The purpose of these notices is to:

- a) prohibit unauthorized persons from entering the premises;
- b) prohibit unauthorized persons from handling or interfering with electrical machinery;
- c) warn of electric shock hazard;
- d) contain procedures in case of fire; and

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- e) contain directions on how to resuscitate persons suffering from the effects of electric shock.

11.2 Signs and notices on substations and mini-substations

2.11.1 Requirements for signs and notices on substations and mini-substations are as follows:

- a) Any building or enclosure housing electrical plant such as generating, transforming, switching or linking apparatus shall have the following notices and signs displayed at each entrance:
 - 1) a notice prohibiting unauthorized persons from entering;
 - 2) a notice prohibiting unauthorized persons from handling or interfering with electrical machinery;
 - 3) a warning of electric shock hazard sign;
 - 4) any other mandatory signs only when they are applicable, e.g.:
 - i) head protection (hard hat),
 - ii) eye protection, and
 - iii) hearing protection.
- b) Mini-substations and distribution boxes do not require any signs or notices. However, it is advisable to display the following combination:
 - 1) a notice prohibiting unauthorized persons from entering;
 - 2) a notice prohibiting unauthorized persons from handling or interfering with electrical machinery; and
 - 3) a warning of electric shock 'Hazard' sign.

11.3 Signs and notices at perimeter fences and entrances to substations

3.11.1 Requirements for signs and notices at perimeter fences and entrances to substations are as follows:

- a) All entrances (locked gates) in perimeter fences shall have the following notices and signs exhibited:
 - 1) a notice prohibiting unauthorized persons from entering;
 - 2) a notice prohibiting unauthorized persons from handling or interfering with electrical machinery; and
 - 3) a warning of electric shock 'Hazard' sign.
- b) On the perimeter fences between the entrances, all that is required is a single combination of the notices described in (1), (2) and (3) in paragraph 3.11.1 a).
- c) Where there is only one entrance to the yard, a single combination sign per side is required.

11.4 Combined emergency notices

4.11.1 At each substation, be it indoor, outdoor or a combination, the following combined notices shall be displayed in a conspicuous position, such as on the wall of the building facing the normal direction of approach, so that they may be referred to when required:

- a) a notice of procedure in case of fire; and
- b) a notice on how to resuscitate persons suffering from the effects of electric shock.

11.5 Quantity of signs, notices and positions to be fitted

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Table 1: Details of Where Which Signs and Notices Should be Fitted at Substations

OHSA requirement	D-DT	Additional D-DT	SAP	SAP description	Where to install
a, b, c	6072	5015	0172497	SIGN, A B C - UNAUTH. ENTRY/INTERF. APP.	<ul style="list-style-type: none"> - Control building entrance - First fence panel next to each gate, - First fence panel at each corner, - Intervals not exceeding 20m along the fence
d, e	6073	5016	0172495	SIGN DE - FIRST AID	Each gate
	6074	5017	0172496	SIGN F - PROHIBITIVE (VARIOUS)	Each gate
	6075	5018	0172498	SIGN G - HARD HAT AREA	Each gate

PA 12 Electric Fence Energizers

- 12.1 Electric fence energizers shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 12.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 12.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.

12.4 Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:

4.12.1 General

- 1.12.4.1 The energizer shall be a Type A energizer as defined in SANS 60335-2-76. This is a battery-operated energizer suitable for connection to the mains consisting of an impulse generating circuit, a battery charging circuit and a battery, the impulse generating circuit being connected to the mains or the battery when the energizer is in operation.
- 1.12.4.2 The energizer shall meet the applicable requirements of a class II appliance as outlined in SANS 60335-1 with respect to protection against electric shock. This is an appliance in which protection against electric shock does not rely on basic insulation only but in which additional safety precautions are provided, such as double insulation or reinforced insulation, there being no provision for protective earthing or reliance upon installation conditions.

4.12.2 Certification requirements

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2.12.4.1 The energizers shall be certified as compliant to SANS 60335-2-76. Certificates stating compliance and type test reports shall be provided with tender documentation.

4.12.3 Electrical requirements

3.12.4.1 Power supply

- .12.4.3.1.1. Unless otherwise specified, ancillary equipment shall be supplied with power through the substation AC and DC supply routed from the AC & DC distribution board.
- .12.4.3.1.2. The power supply to the energizer shall be provided through the site's 220V ($\pm 10\%$), 50Hz ($\pm 2\%$) AC and/or DC. The DC voltage supplies available are 48V, 110V and/or 220V DC depending on the site type.
- .12.4.3.1.3. The AC and DC supply shall be protected by Class 1 and 11 surge protection.
- .12.4.3.1.4. There shall be no system malfunctioning on the failure, restoration, under or over voltage of the power supply to the unit.
- .12.4.3.1.5. The existing standby power systems at site shall be used as the primary standby power source, provided that the standby time (autonomy) requirements of the site are not adversely affected.
- .12.4.3.1.6. In cases where the above is not possible, the standby power systems requirements for security systems at Eskom sites shall comply with the following:
 - i) The system design shall comply with the requirements of 240-91190294, DC & Auxiliary Supplies Philosophy.
 - ii) Security systems are required to ensure that the site is protected at all times, hence the standby time of these systems shall be in line with the overall required standby time for the site. The requirements of 240-118870219, Standby Power Systems Topology and Autonomy for Eskom sites, shall be adhered to.
 - iii) Standard or technically acceptable equipment shall be used. This equipment is available on Eskom National Contracts (ENCs) or recommended technically acceptable equipment lists.
 - iv) In the absence of ENCs for specific equipment or recommended technically acceptable equipment, the offered equipment shall comply with the technical standards as indicated in Table 1 below:

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Table 1: Technical Standards for Standby Power Systems equipment

Equipment	Technical Standard
Nickel Cadmium Batteries	240-56360086, <i>Stationary Vented Nickel Cadmium Batteries Standard</i>
Vented Lead Acid Batteries	240-56360034, <i>Stationary Vented Lead Acid Batteries Standard</i>
Valve Regulated Lead Acid Batteries	240-51999453, <i>Standard Specification for Valve-Regulated Lead Acid Cells</i>
Power Electronics	240-53114248, <i>Thyristor and Switch Mode Chargers, AC/DC to DC/AC Converters and Inverter/Uninterruptible Power Supplies Standard</i>
Low Voltage Protective Devices, Cubicles and wiring	240-64139144, <i>AC Boards and Junction Boxes for Substations</i> 240-76628687, <i>AC/DC Reticulation Equipment for Breaker-and-a-Half Substations</i> 240-75658628, <i>Distribution Group's Specific Requirements for AC/DC Distribution Units</i>

3.12.4.2 Energizer High Voltage Output requirements

The output characteristics of the energizer, when operating at rated voltage with a 500Ω load connected across the fence terminals shall be as follows:

- .12.4.3.2.1. The energy delivered to the 500Ω load shall be above 5J but not exceed 8J.
- .12.4.3.2.2. Maximum voltage delivered to the load shall not exceed 10kV.
- .12.4.3.2.3. The impulse repetition rate shall not exceed 1 Hz.
- .12.4.3.2.4. The impulse duration shall not exceed 10 ms.

3.12.4.3 Alarm / Relay Output requirements

- .12.4.3.3.1. The energizer shall have a minimum of two relay outputs provided by potential free contacts for retransmission of alarms.
- .12.4.3.3.2. The contacts shall be fully configurable in terms of the alarm being indicated.
- .12.4.3.3.3. These output contacts shall comply with the following rating:
 - i) A power rating of at least 50 VA.
 - ii) Switching voltage of at least UDC = 110 V and/or UAC/DC = 230 V.
 - iii) A life expectancy of at least 106 operations.
 - iv) The pulse retransmission contacts shall be change over contacts. It is preferred that these contacts are not commoned with each other.
 - v) All contacts shall be bounce free.

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- vi) All relays shall have a minimum isolation of 2 kV between the relay coil and the contacts.

4.12.4 Mechanical requirements

4.12.4.1 Energizer IP rating

- .12.4.4.1.1. Energizer(s) shall have an IP rating of IP51.

4.12.4.2 Markings used on energizer

- .12.4.4.2.1. The general markings on the energizer shall comply with SANS 60335-1 and at minimum shall include the following markings:

- i) rated voltage or rated voltage range in volts;
- ii) symbol for nature of supply, unless the rated frequency is marked;
- iii) rated power input in watts or rated current in amperes;
- iv) name, trade mark or identification mark of the manufacturer or responsible vendor;
- v) IP number according to degree of protection against ingress of water, other than IPX0;
- vi) The energizer shall be marked with the warning: "***Before obtaining access to terminals, all supply circuits must be disconnected***". This warning shall be placed in the vicinity of the terminal cover.

4.12.5 Functional requirements

5.12.4.1 General

- .12.4.5.1.1. A minimum of two energizers shall be used per installation to improve the reliability and availability of the system.
- .12.4.5.1.2. The minimum expected life of the energizer and associated equipment (PC hardware & software, relay card(s), synchronisation mechanism etc.) shall be 10 years.

5.12.4.2 Synchronising equipment/mechanism

- .12.4.5.2.1. The synchronising mechanism shall be used to synchronize multiple energizers in order to be regarded as one energizer with multiple outputs, all firing at the same time, as one single pulse.

5.12.4.3 Energizer safety

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- .12.4.5.3.1. The Energizer shall be constructed so that in normal use, they function safely so as to cause no danger to persons or surroundings, even in the event of carelessness that may occur in normal use.
- .12.4.5.3.2. There shall be a safety mechanism (such as a watchdog) to ensure that the energizer(s) output voltage and energy levels are within the legal non-lethal levels. When the maximum level is exceeded, then the output shall be shut down and an alarm generated.
- .12.4.5.3.3. The energizers shall shut down if there is a synchronisation failure.

5.12.4.4 Electric fence zones / sectors

- .12.4.5.4.1. The non-lethal energised fence shall comprise of various zones or sectors (depending on the NLEPD system).
- .12.4.5.4.2. The controller shall be used to configure the electric fence into zones or sectors.
- .12.4.5.4.3. It shall be configurable to accommodate at least the number zones or sectors along an electric fence's perimeter specified in the technical schedules.
- .12.4.5.4.4. It shall be possible to allocate and generate alarms for intrusions to each individual zone or sector.
- .12.4.5.4.5. The alarms shall be routed to individual relays for triggering other security measures.

PA 13 Electric Fence Control and Display Units

- 13.1 Electric fence control and display units shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 13.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 13.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.

1.13.4 Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:

1.13.4.1. Control unit

- 1.13.4.1.1 All settings of the system including energizer configurations and alarm settings shall be configurable from the control unit.

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1.13.4.1.2 Alarm conditions shall be resettable and acknowledgeable from the configuration PC and the user interface (locally and remotely).

1.13.4.2. User interface / Display unit

1.13.4.2.1 The display unit shall be able to display the configured zones or sectors of the fence including all fence alarms.

1.13.4.2.2 Alarmed zone(s) or sector(s) of the fence shall be clearly depicted (shape and size) on the display unit.

1.13.4.2.3 The User interface shall be used to view and acknowledge alarms.

1.13.4.2.4 The Control unit and the user interface/display unit can be separate units or configured as a combined system. Strict configuration rights management shall be applied such that only authorised users can make configuration changes to the system.

PA 14 Relays / relay cards

14.1 Electric fence relays / relay cards shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.

14.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.

14.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.

1.14.4 Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:

1.14.4.1. Alarming

1.14.4.1.1 The NLEPDS shall have alarming capability to generate alarms and notifications listed in Table 2 below (but not limited to):

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Table 2: Energizer indications and alarms

Type	Duration	Description	Condition
Status	Continuous	System-on (for each energizer)	System on
Status	Continuous	Energizer armed (for each energizer)	System is armed
Alarm	Continuous	Fence intrusion alarm (for each zone/sector)	Alarm condition detected
Alarm	Continuous	Battery low (for each energizer)	Battery voltage less than minimum operating voltage
Control	Minimum 1s	System reset	System and alarm reset input
Alarm	Continuous	Mains supply fail	AC power fail
Alarm	Continuous	Synchronisation problems	Energizers not pulsing simultaneously
Alarm	Continuous	Equipment failure	Energizer energy lower than 5 Joules
Alarm	Continuous	Watchdog	Energizer Joules and voltage beyond legal requirements i.e. higher than 8 joules and 10kV

1.14.4.1.2 If analogue alarms are used, then all status and alarm indication relays shall use change-over contacts, so that either NO or NC contacts can be wired to the IDF as and when required.

1.14.4.1.3 The alarm output shall be capable of triggering the following security systems at minimum:

- a) Switching on of substation security lighting
- b) Triggering of PA system recorded voice warnings
- c) Sirens
- d) Strobe lights
- e) CCTV cameras

1.14.4.1.4 The indications shall be supplied as potential free change over contacts.

1.14.4.1.5 Remote resetting of alarms shall be possible. Compliance to Eskom's cyber security standard [9] shall be ensured.

1.14.4.1.6 The energizer shall be self-monitoring and alarm any out-of-bounds condition or system failure.

1.14.4.1.7 The NLEPDS shall be triggered by either of the following which could indicate an intrusion:

- a) Electric fence conductors been short circuited
- b) Electric fence conductors been cut (open circuit)

1.14.4.1.8 When a NLEPDS is triggered/alarmed the following sequence of events and interoperation of different security technologies deployed at site shall be possible:

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- a) Each violation shall be reported to the security control centre (remotely) and/or locally.
- b) The security perimeter lights shall be illuminated at the affected fence zone(s).
- c) The security controller shall be able to confirm the arrival of the responders on site following an alarm/intrusion event.

1.14.4.1.9 The system shall have an option of sending security alerts and confirmations through email and SMS.

1.14.4.1.10 If analogue alarming is used, then an IDF frame shall be provided which will accommodate minimum of 10 alarm input / outputs.

1.14.4.2. Monitoring

1.14.4.2.1 The system shall allow both local and remote monitoring of intrusion alarms.

1.14.4.2.2 The client stations/display units shall show site configuration and configured fence zones/sectors.

1.14.4.2.3 The intrusion alarms generated shall contain details regarding triggered fence zones/sectors for timeous reaction.

1.14.4.2.4 All security alarms and events shall be date-and-time stamped accurately for traceability and investigation purposes.

1.14.4.3. Communication infrastructure

1.14.4.3.1 All cables including power and communication cables shall ensure that there are no data losses/disruptions due to harsh operating conditions and voltage/current surges, as such cabling shall not be limited to copper cable only.

1.14.4.3.2 Communication between all components of the NLEPDS shall be through a communication medium (e.g. fibre optic cables) that will be immune to interruptions due to other devices in the equipment room as well as immune to EMI.

1.14.4.3.3 Communication protocols supported shall be made available to Eskom upon request to ensure integration of equipment from different suppliers. The NLEPDS system shall be required to interface to a security integration system.

1.14.4.3.4 Communication to remote security monitoring centres shall be via Eskom Telecom's infrastructure. Where no Eskom Telecom's infrastructure is installed, a third party communication infrastructure may be used while ensuring compliance to Cyber security standard for operational technology standard [9].

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PA 15 Electric Fence Conductors

- 15.1 Electric fence conductors shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 15.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 15.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.
- 15.4 **Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**

1.15.4.1 Electric fence conductors

- .15.4.1.1.1. Conductors shall comply with requirements of SANS 10222-3 Electrical Security installations – Part 3: Electric fences (non-lethal).
- .15.4.1.1.2. Conductors shall be manufactured from 2.24mm diameter solid fully galvanised steel wire for inland installations. For coastal regions Eskom may opt to use a 1.6mm aluminium conductor, there shall be provision made for both these requirements. Eskom's approval shall be requested before using a multi-strand wire.
- .15.4.1.1.3. Ferrules used for crimping conductors and tensioners shall be of similar material as conductor (e.g. steel on steel).

1.15.4.2 HT cables

- .15.4.1.2.1. High Tension (HT) armoured cable shall be used to connect the energizer electrical output connectors to the conductor / trace wires of the NLEPDS structure.
- .15.4.1.2.2. The HT cables shall be UV stabilised and double insulated.

PA 16 Electric Fence Insulators

- 16.1 Electric fence insulators shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 16.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 16.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.

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**16.4 Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER
DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**

4.16.1 Insulators

1.16.4.1 All insulators shall conform to the following requirements:

- .16.4.1.1.1. They shall comply with requirements of Annex A of SANS 10222-3 standard.
- .16.4.1.1.2. They shall be designed in such a way that under no condition can/shall arcing occur including during high moisture or wet conditions.
- .16.4.1.1.3. They shall have a guaranteed UV protection for a minimum period of 10 years.
- .16.4.1.1.4. Requirements for Lightning Protection and over current on the HV circuits

4.16.2 General lightning and over current requirements

- .16.4.2.1.1. The system will be installed where it will be subject to voltage surges due to lightning, a variety of line faults, power interruptions and high voltage switching conditions. The system shall be able to operate without failure under all of the above mentioned conditions. Therefore, it is imperative that the system be adequately earthed.
- .16.4.2.1.2. Protection against high voltage transients shall be provided on both the signal and power circuitry, without impairing the system's electrical parameters, sensitivity, or performance.
- .16.4.2.1.3. Lightning arrestors shall comply with the requirements in Annex B of SANS 10222-3.

4.16.3 Earthing requirements

- .16.4.3.1.1. Three (3) earth pegs, 1,8 m apart in a triangular layout, shall be installed at both sides of the security equipment room. The pegs shall be connected to the main earth mat (where installed) and the first post on each side of the NLEPDS structure. The earth pegs shall be 1,5 m in length and be copper coated.
- .16.4.3.1.2. On both sides of the security equipment building, connect all earth pegs, lightning diverter and energizer ground connections together with 16 mm² copper earthing cables.
- .16.4.3.1.3. 16 mm² copper earth cables from the energizer to the earth pegs shall be laid on both sides of the security equipment building.

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PA 17 Electric Fence Equipment Housing (Kiosk)

17.1 Electric fence equipment housing's (kiosk's) shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.

17.2 Kiosk Construction

2.17.1 The kiosk shall be manufactured from 2mm 3CR12 steel. The complete kiosk shall have an IP rating of 3 for protection against touching live parts and it shall have an IP rating of 3 for protection against ingress of liquids. (IP33)

2.17.2 The kiosk shall be ground mounted.

2.17.3 Refer to drawing D-DT-1000 SH 01-05 for further details.

2.17.4 Box

4.17.2.1 The door surround shall incorporate a splash proof channel around its perimeter.

4.17.2.2 Inspection covers (cover plates) shall be fitted on both sides of the kiosk to allow access to the back of the kiosk. These cover plates shall be secured to the kiosk by eight stainless steel set screws, nuts and washers.

4.17.2.3 The design of the cover plates shall be such that the IP rating will be IP33. Vermin proof louvers with an effective width of 150mm and effective height of 100mm shall be punched into the cover plates as shown in the drawings. The width of the opening in the louvers shall be between 2mm and 5mm. A stainless steel mesh with openings of not more than 2mm shall be spot welded onto the back of the louvers.

4.17.2.4 The roof shall form part of the box and shall not be a separate item. Lifting lugs shall be fitted onto the top of the kiosk as indicated in the drawings. Lifting lugs shall be designed such that they can handle the gross weight of the complete unit.

2.17.5 Bottom of kiosk

5.17.2.1 The bottom shall have eight slotted holes as indicated in the drawings for the fitment of the kiosk to the ground.

2.17.6 Earthing

6.17.2.1 All metal components of the kiosk, inner plates and devices shall be effectively connected to the earth bar by green 4mm² PVC insulated earthing conductors.

6.17.2.2 All earth connections shall be as short as possible and shall not be coiled.

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2.17.7 Inner plate

7.17.2.1 The plate shall be manufactured from 2mm 3CR12 steel.

7.17.2.2 A cut-out (rectangular hole) shall be provided through which the current and voltage secondary wiring can be routed from front to back and from where access to the CT secondary terminals and nameplate data can be gained.

2.17.8 Back plate

8.17.2.1 The back plate shall be hinged on the left side to allow for a swing frame action for work to be carried out on the back. The plate shall be manufactured from 1.5mm 3CR12 steel and shall be powder coated white.

8.17.2.2 The back plate shall be supplied with two non-ferrous hinges (stainless steel preferred) to fit onto the inner plate and a lock lip whereby the back plate can be locked onto the inner plate.

8.17.2.3 All the holes and cut-outs shall be done to suite the equipment to be installed. The *Contractor* shall discuss with the Manufacturer prior to any fabrication taking place.

8.17.2.4 The holes shall be fitted with stainless steel or brass self-clinching nuts or rivet nuts with a M4 or M5 thread size. 20mm M4 or M5 stainless steel set screws shall be fitted into three of these nuts.

8.17.2.5 Should they be required, DIN-rails shall be fitted onto the inner plate using stainless steel set screws, nuts and spring washers or screws and spring washers or rivets. The DIN-rail may also be spot welded onto the back plate.

8.17.2.6 All holes through which wiring must pass shall be fitted with rubber grommets.

2.17.9 Door

9.17.2.1 The door shall have vermin proof louvers at the top and bottom as shown in the drawings. The width of the opening in the louvers shall be between 2mm and 5mm. A stainless steel mesh with openings not more than 2mm shall be spot welded onto the back of the louver.

9.17.2.2 The door shall be fitted with two hinges of non-ferrous metal (stainless steel preferred).

9.17.2.3 A sturdy door stay shall be provided on the doors to ensure that the door can be kept in a 90° open position. The door stays shall be manufactured from a non-ferrous metal.

9.17.2.4 Stainless steel three-way lever locks suitable for a padlock with an 8mm diameter shackle shall be fitted horizontally on the right. The holes in the lever lock shall have a minimum diameter of 12mm. A protective box which is open on the bottom shall be fitted over the lever lock.

9.17.2.5 A document box shall be fitted onto the door as indicated in the drawings.

2.17.10 Set screws, nuts and spring washers

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10.17.2.1 All set screws, nuts and spring washers used for the fitment of different parts or equipment in the kiosk shall be of stainless steel. All set screws and nuts shall be fitted with spring washers.

17.3 Fabrication of 3CR12 steel kiosks

3.17.1 All cutting, forming, forging, machining, welding, fastening, annealing, stress relieving, post weld cleaning and coating shall comply with the internal standards of the manufacturer of 3CR12 steel.

3.17.2 Cutting

2.17.3.1 In all cutting operations, whether thermal or mechanical, carried out on 3CR12 steel, no contamination by ferrous (iron or steel) material or particles shall take place. Sharp or rough edges shall be removed by manual grinding or filing.

3.17.3 Bending

3.17.3.1 It is important to ensure that there is no contamination of the 3CR12 steel from mild steel particles adhering to the tooling. It is recommended that the tooling be thoroughly cleaned before running 3CR12 steel.

3.17.4 Welding

4.17.3.1 For Manual Metal Arc (MMA) welding type 309L electrodes are recommended for welding 3CR12 steel, although E308L and E316L may also be used.

4.17.3.2 For Tungsten Inert Gas (TIG), Metal Inert Gas (MIG) and Plasma arc welding (PAW) the recommended welding consumables are AWS A5.9 ER309L, ER308L or ER316L.

4.17.3.3 When welding stainless steel studs, set screws or nuts onto 3CR12 steel it is recommended that the weld consumable shall be the AWS class 309L to avoid excessive weld metal dilution.

4.17.3.4 Where the manufacturer is using stud welding onto 3CR12 steel then 304L stainless steel studs shall be used.

4.17.3.5 Spot welding (resistance welding) shall only be used on parts of the kiosk that are not directly in contact with the outside atmosphere.

3.17.5 Post weld cleaning (pickling and passivation)

5.17.3.1 Post weld cleaning, pickling and passivation shall be done according to Technical bulletin 240-98195962 - chemical treatment of 3CR12 kiosks.

3.17.6 Powder coating

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6.17.3.1 Before powder coating can take place it is very important to ensure that there is no oil present on the kiosk.

6.17.3.2 The kiosk shall be degreased before powder coating.

6.17.3.3 The inner plate shall be powder coated with white epoxy-polyester powder (SANS colour code 69-0135) to ensure a coating thickness of between 60µm and 80µm.

6.17.3.4 The kiosk (box, roof and/or base) shall be powder coated with light navy grey polyester powder (SABS colour code G35) and the thickness shall be between 60µm and 80µm.

3.17.7 Concrete Plinth

3.17.8 The concrete plinth shall be constructed in accordance with D-DT-1010

8.17.3.1 The concrete plinth shall be cast using 25MPa concrete, cast in-situ.

8.17.3.2 The in-situ soil shall be compacted to 95% of Modified AASHTO density.

8.17.3.3 The concrete slab shall be reinforced using REF 617 high tensile steel mesh placed 50mm from the bottom.

8.17.3.4 The formwork shall be steel with a smooth finish.

8.17.3.5 The plinth shall have a 30mm chamfer all around.

17.4 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.

17.5 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.

17.6 **Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**

6.17.1 General

1.17.6.1 Unless otherwise specified, electrical equipment including the energizers, power supply circuitry, isolation switches, relays and relay cards (where required), surge protectors and lighting switches shall be housed in Eskom approved kiosk.

6.17.2 Equipment power supply

2.17.6.1 Unless otherwise specified, ancillary equipment shall be supplied with power through the substation AC and DC supply routed from the AC & DC distribution board.

6.17.3 Kiosk earthing requirements

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3.17.6.1 The earthing of the equipment in the kiosk shall comply with requirements of Eskom standard for earthing of secondary plant equipment in substations [12].

6.17.4 Miniature circuit breaker (MCB) specification

4.17.6.1 The rating of the MCBs shall be adequate for the protection of installed equipment. The *Contractor* shall be responsible for selection and installation of the appropriately sized MCB.

6.17.5 Surge arrester specification

5.17.6.1 Surge arrestors shall be installed to protect the kiosks electrical equipment from lightning. The surge arrester shall be the metal oxide, DIN rail mount type with indication suitable for Zone 1 protection. The arrester shall comply with SANS 61643-1 and bear the SANS mark.

5.17.6.2 The technical specification for the surge arresters shall be as listed in Table 3 below:

Table 3: Surge arrester specification

Surge arrester parameter	Specification	
	110 V	400V
I_{\max} (8/20 μ s)	6.5kA	40kA or 65kA (4/20 μ s)
Response time	< 25ns	< 25ns
Max. Operating voltage	130V AC 175V DC	280V AC (phase to neutral) 360V DC
Frequency	50Hz	50Hz
Internal fuse	Yes	Yes
Open circuit	Open circuit on expiration of the device	Open circuit on expiration of the device
Indication	Clear change-of-state (functional or non-functional) e.g. LED on/off	Clear change-of-state (functional or non-functional) e.g. LED on/off

6.17.6 Isolation switches

6.17.6.1 The energizer unit shall have a visible isolating switch for switching off the HV of the electrified fence. In the off state, the isolating switch shall be connected to earth.

6.17.6.2 The energizer isolation switch shall have visible ON/OFF positions and the contacts designed to handle high voltages.

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6.17.7 Wiring

7.17.6.1 The kiosk shall be wired in accordance with 240-64636794.

7.17.6.2 All wiring shall be done in stranded copper PVC insulated conductor, which shall comply with SANS 1507.

7.17.6.3 There shall be no joints or splices in the wiring.

7.17.6.4 Not more than two conductors shall be connected to a terminal.

7.17.6.5 All conductors shall be terminated with crimped connectors using a tool recommended by the manufacturer of the lugs.

NB: Only JST type YNT or Cembre type HP4 crimping tools shall be used for the crimping of lugs.

Note: No bare wiring or bare part of lugs shall be exposed at termination points on the energizers, the miniature circuit-breakers, the relays and the terminals.

6.17.8 Trunking

8.17.6.1 Cable trunking, location and sizing, shall be provided in accordance with the respective drawings to accommodate the necessary cables. The trunking shall be fastened to the kiosk using rivets or screws. Rivets and/or screws shall not protrude through to the front of the plate.

8.17.6.2 The HV cabling shall be situated in dedicated trunking.

6.17.9 Notices, labeling and packaging

9.17.6.1 Notices

.17.6.9.1.1. Notices shall be provided as required by the Occupational Health and Safety Act. All notices shall be fastened to the kiosks by self-tapping stainless steel screws or by rivets.

.17.6.9.1.2. b) A standard "Danger" notice in accordance with SANS 1186 shall be provided and placed on the front of the kiosk.

9.17.6.2 Labels

.17.6.9.2.1. A label showing the name of the manufacturer, the date of manufacture and the various quality checks shall be placed on the inside of the kiosk door. The label shall be durable preferably of metal.

.17.6.9.2.2. The following additional labels shall be placed in the kiosk to indicate the following:

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.17.6.9.2.2.1.....	Energizer identification including associated sectors/zones energized by each energizer
.17.6.9.2.2.2.....	Cables identification though out the system cable routes
.17.6.9.2.2.3.....	Isolation switches and their ON and OFF positions
.17.6.9.2.2.4.....	Relay identification
.17.6.9.2.2.5.....	Lighting identification
.17.6.9.2.2.6.....	IDF identification

PA 18 Electric Fence Warning Signs

- 18.1 Electric fence warning signs shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 18.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 18.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.
- 18.4 **Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**

1.18.4.1 Warning Signs

- .18.4.1.1.1. Materials used for the manufacture of warning signs shall be of such a composition as to withstand anticipated weather conditions and the effects of ultra-violet radiation throughout their design life.
- .18.4.1.1.2. All electric fences shall be identified by prominently displaying warning signs.
- .18.4.1.1.3. The minimum warning sign dimensions shall be 200×100 mm.
- .18.4.1.1.4. The background colour of both sides of the warning sign shall be yellow (refer to Annex A). The inscription on the sign shall be black with the words “CAUTION: Electric fence”.

PA 19 Electric Fence Documentation

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- 19.1 Electric fence insulators shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 19.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 19.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.
- 19.4 **Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**

4.19.1 Documentation

1.19.4.1 Energizers shall be supplied with instructions that contain information regarding:

- .19.4.1.1.1. The installation of electric fences;
- .19.4.1.1.2. The means of connecting the energizer to the electric fence.

1.19.4.2 If the manner of installing components is not obvious, each component of NLEPDS shall be supplied together with instructions for the installation of the component. Any component that may be damaged by the reversal of the input polarity shall have this fact clearly stated in the instructions.

1.19.4.3 Advice on the application of the barrier, to avoid inappropriate use and potential false operation

1.19.4.4 List of all field replaceable spare parts

1.19.4.5 Electrical and mechanical specifications and parameters for the equipment

1.19.4.6 Wiring diagrams of the equipment

1.19.4.7 Installation, commissioning and maintenance procedures

1.19.4.8 All modules and circuit diagrams

1.19.4.9 Schematic diagrams

1.19.4.10 Installation drawings

1.19.4.11 The following additional information shall be provided:

- .19.4.1.11.1. Power supply requirements
- .19.4.1.11.2. Performance characteristics, including the MTBF
- .19.4.1.11.3. Wiring and mounting instructions
- .19.4.1.11.4. Output ratings
- .19.4.1.11.5. Instructions for adjustment, including specification of any special tools required
- .19.4.1.11.6. Programme for maintenance, testing and servicing

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PA 20 Electric Fence System Life Cycle

- 20.1 Electric fence system life-cycle shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 20.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 20.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.
- 20.4 **Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**

4.20.1 System life-cycle

- 1.20.4.1 The minimum system life-cycle of the proposed product must be ten (10) years.
- 1.20.4.2 The life-cycle of the product must be further supported in terms of spares availability for a minimum period of seven (7) years after discontinuation of the product.

PA 21 Electric Fence Warranty and Support

- 21.1 Electric fence warranty and support shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 21.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 21.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.
- 21.4 **Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**

4.21.1 Warranty and support

- 1.21.4.1 The system shall carry a minimum local (South African) warranty of 36 months with on-site as well as telephonic support from date of the system being commissioned. Eskom shall thereafter have the option to access on-going support in terms of a subsequent agreement.
- 1.21.4.2 The supplier must have a technician on call on a 24-hour basis for purposes of telephonic support.
- 1.21.4.3 Supplier spares holding should include minimum replacement spares to restore service of the system in its entirety.

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- 1.21.4.4 All support shall also include all firmware upgrades of the initial system version installed over the operational life of the system.
- 1.21.4.5 The support shall include first line level maintenance training.
- 1.21.4.6 The supplier shall also provide operator training on site to the end-user.
- 1.21.4.7 Product support must include national as well as international support through the local branch.
- 1.21.4.8 The supplier shall be willing to enter into an SLA with Eskom
- 1.21.4.9 The supplier should have a history of supplying products of this nature in South Africa for at least a minimum period of five (5) years.
- 1.21.4.10 The supplier to provide a list of reference sites where the product on offer has been installed and the year of implementation.

PA CONTRACTOR'S EQUIPMENT

The *Contractor* shall ensure the provision of suitable construction equipment for the erection of the fencing, gates and concrete kerb in compliance with the requirements of this specification.

PA CONSTRUCTION

PA 1 General

- 1.1 Construction of the fence, gates and concrete kerb shall comply with the requirements given on the drawings and with the requirements of this specification.

PA 2 Clearing Fence Line

- 2.1 Where the fence line has not already been cleared, it shall be cleared over a width of at least 1m on each side of the centre line of the fence and surfacing irregularities shall be graded so that the fence will follow the general contour of the ground. The bottom of the fence shall be located a uniform distance above the ground line in accordance with the requirements shown on the drawings.

PA 3 Installing Posts and Standards

- 3.1 The lengths of all post above ground shall be such that the correct clearance between the lowest wire and the ground can be maintained.
- 3.2 Straining posts shall be entered at all ends and corners or bends in the line of the fence and at all junctions with other fences, provided that straining posts shall not be spaced further apart than the minimum distances shown on the drawings.
- 3.3 Spacing of intermediate posts, standards and droppers shall not be more than is indicated on the drawings, provided that the spacing of standards and intermediate posts between any two straining posts shall be uniform.
- 3.4 All posts and stays shall be set in dug holes of the dimensions shown on the drawings and provided with concrete bases. Holes shall be dug to the full specified depth, even in rock where blasting may be necessary to obtain the required depth.
- 3.5 Corner, tee-off, gate and straining posts shall be braced by stays bolted to the posts.

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- 3.6 All posts shall be accurately aligned and set plumb. After posts have been set in concrete the concrete shall be cured for at least 7 days before the fence wire is attached to the posts at the spacing shown on the drawings.

PA 4 Installing Fencing and Straining Wire

- 4.1 All fencing wire shall be attached to the posts as detailed on the drawings. The wire shall be carefully stretched and hung without sag, and with true alignment, care being exercised not to stretch the wire so tightly that it will break or that posts will be pulled up or destroyed.
- 4.2 The maximum force in fencing wire after it has been stretched between straining posts shall be 0,9 KN.
- 4.3 Splices in the straining wire will be permitted if made using a splice tool. The wire ends shall be carried past the splicing tool for at least 75mm and wrapped snugly around the other wire for at least 6 complete turns, the two separate wire ends being turned in opposite directions. The unused wire ends shall be cut close to leave a neat splice.

PA 5 Installing Welded Mesh Sheets

- 5.1 Welded mesh sheets shall be stretched against the fence posts and properly tied to the straining wire by means of 2,5mm nominal diameter binding wire or stainless steel clips at 250mm centres, or closer to remove excessive bulges in the mesh.
- 5.2 The mesh shall be taken continuously past the face of all immediate posts, intermediate straining posts and corner posts. At the straining posts and corner posts the mesh is to be clamped on either side of the post using 20mm wide galvanised flat bars, bolted together with galvanised bolts and nuts and fastened to the post by means of a hook bolt, as detailed on the drawing. Small bulges formed in the mesh between these clamps are acceptable. Mesh that has been distorted prior to erection e.g. egg shaped instead of circular coils will not be accepted.
- 5.3 The bottom 400mm of the welded mesh shall be dipped in a bitumen solution, and when erected the bottom 300mm (min 250mm) shall be buried in an excavated trench. The screw threads on the standouts of all bolts, hook bolts and eye bolts to be turned over after erection to prevent the possible removal of the nuts.

PA 6 Installing Diamond Mesh or Wire Netting

- 6.1 Diamond mesh shall be stretched against the fence and properly tied to the fencing wire as detailed on the drawings. The diamond mesh shall be secured by tying wire at every third aperture along the straining wires and at every aperture at end and gate posts.

PA 7 Installing Barbed Wire (only if specified)

- 7.1 Single strand barbed wire to be fitted to the top of posts shall be installed along the upper face of the single overhang of fence. The barbed wire shall be stretched and fixed to the immediate posts using 2.5mm diameter binding wire.

PA 8 Scope of Work for Non-Lethal Energized Perimeter Detection System (NLEPDS)

- 8.1 All works shall be prepared, submitted and constructed in accordance with 240-170000192 - Scope of Work for Non-Lethal Energized Perimeter Detection System (NLEPDS).

NOTE: The terms Non-lethal Electrified Fence and Non-Lethal Energized Perimeter Detection System (NLEPDS) are used interchangeably in this document and shall refer to the same system.

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8.2 Reference Drawings shall be as follows:

- 2.8.1 0.54/8282 Non-lethal fence plan, sections and details
- 2.8.2 0.54/7470 Access Area Gates layout
- 2.8.3 0.52/30115 Standard template for NLEPDS

8.3 Technical returnable schedules:

3.8.1 The tenderer shall submit the following deliverables for technical evaluation:

- 1.8.3.1 PSIRA registration certificate (mandatory).
- 1.8.3.2 A completed technical Schedule A/B indicating compliance to NLEPDS requirements (mandatory) from Eskom standard (240-78980848).
- 1.8.3.3 Supporting information including deviation schedules in response to AB Schedule for NLEPDS from Eskom standard (240-78980848) to be evaluated on technical basis.
- 1.8.3.4 The tenderer's past experience in delivering projects of a similar nature and scale (provide references).
- 1.8.3.5 A company overview detailing the company background, available local expertise and international technical support capabilities.
- 1.8.3.6 CVs of company personnel
- 1.8.3.7 OEM signed confirmation letter/s confirming that warranties to the end user shall be honoured by the OEM.
- 1.8.3.8 Functional design specification and system design report (refer to Annex A).
- 1.8.3.9 Detailed design specification (refer to Annex A).

8.4 General scope

- 4.8.1 The *Contractor* shall design, manufacture, supply, develop user documentation, perform testing at works, deliver, install, and commission the Non-Lethal Energized Perimeter Detection System (NLEPDS) according to the associated technical specifications. The proposed design and costing shall be based on the associated site as outlined in sections below.

8.5 Pre-installation development scope

- 5.8.1 The appointed *Contractor(s)* shall be responsible for the following pre-installation development scope of work:
 - 1.8.5.1 System development including manufacturing of conductors. This includes any additional development work required to fully comply with the technical requirements.
 - 1.8.5.2 Compiling site specific detailed designs including the following:
 - .8.5.1.2.1. All equipment required to comply with the specification and its configuration;
 - .8.5.1.2.2. Cable layout and routing drawings;
 - .8.5.1.2.3. Interfacing to the SCADA system for security alarms to the security monitoring centre.
 - .8.5.1.2.4. Interface drawings to the site security lighting.
 - 1.8.5.3 Ensure that the design complies with all relevant standards in order for a Certification of Compliance (COC) to be issued.
 - 1.8.5.4 Model system testing scheme for required functionality including energy, voltage tests and energizers synchronisation tests at the tenderer's workshop/premises.

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- 1.8.5.5 Factory testing of the complete system (FAT).
- 1.8.5.6 Development of product training material and delivery of system related courses.
- 1.8.5.7 Produce site acceptance testing procedure for Eskom's acceptance.
- 1.8.5.8 Produce a functional design specification (refer 240-83684419 and Appendix A of this document).
- 1.8.5.9 Produce a detailed design specification (refer to 240-83684419 and Appendix A of this document).

8.6 Equipment for decommissioning and disposal

- 6.8.1 The existing non-lethal electrified fence and associated equipment shall be completely decommissioned, removed and stored to a designated scrap area on site.
- 6.8.2 Decommissioning shall be done in close consultation with the responsible Eskom *Representative* for guidance on decommissioned equipment that will be reserved for spares.

8.7 Equipment for manufacturing, supplying, installing and commissioning

- 7.8.1 The appointed *Contractor* shall manufacture, supply, install and commission all the equipment in the following sections:

1.8.7.1 Site Perimeter

- .8.7.1.1.1. Install HT cables, fence conductors (2.24 mm galvanised steel) and associated insulators.
- .8.7.1.1.2. Install warning and zoning signs around the site perimeter.
- .8.7.1.1.3. Install a 25 Pair communication cable from the guard house to the control room to interface the fence alarms to the SCADA system for routing of alarms to the remote monitoring centre. A trench has to be dug from the guard house to the closest trench in the HV yard.
- .8.7.1.1.4. For coastal sites Eskom might decide to install aluminium fence conductors, clarity should be obtained from Eskom *Representative* for the site for preferred fence conductor.

8.8 Testing and commissioning

- 8.8.1 Site Acceptance testing shall be performed to ensure that the entire Non-Lethal Fence is fully functional and all alarms are commissioned to the monitoring centre.
- 8.8.2 Issue the Certificate of Compliance (CoC) for the site.
- 2.8.8.1 Every user or lessor of an electric fence, as the case may be, shall have an original valid electric fence system certificate of compliance. Meaning that the original CoC shall be handed over to Eskom.
- 2.8.8.2 The electric fence system certificate of compliance shall be accompanied by a test report.
- 2.8.8.3 An electric fence certificate of compliance shall be in accordance with the Electrical Machinery Regulations, 2011 as contained in the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).
- 2.8.8.4 A map of the electric fence installation, clearly showing various aspects of the installation shall be attached to the test report.
- 2.8.8.5 The customer shall receive training in the operation of the Non-Lethal Fence.
- 2.8.8.6 Official hand-over to the customer shall take place. The hand-over documentation shall consist of all marked-up drawings, test certificates / documents and the Certificate of Compliance.

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PA 9 Installation of Electrified Fencing and Site Acceptance Testing

- 9.1 Electric fence installation and site acceptance testing shall comply with the requirements of 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS, the latest revision.
- 9.2 The data that follows has been extracted below follows an extract from the standard mentioned in item for reference purposes.
- 9.3 Should a discrepancy arise between the data in the extract and the actual latest published revision of the standard, the published standard shall take precedence.
- 9.4 Extract from 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS:**
- 4.9.1 Installation and Site Acceptance Testing (SAT)
- 1.9.4.1 The supplier shall install the system on site (energizers, relays, control unit, synchronisation equipment, fence conductors & communication infrastructure) inclusive of all interconnections between the system modules.
- 1.9.4.2 The supplier shall avail themselves for Site Acceptance Testing at site after installation.
- 1.9.4.3 All test procedures required to ensure the correct functioning shall be specified with a list of required test equipment and tools.

PA 10 Concrete Kerb and In-situ Cast Concrete

- 10.1 Where scheduled a concrete kerb of nominal dimensions 100mm wide x 380mm deep of Grade 30 MPa concrete shall be constructed along the security fence line, as detailed on the drawings.
- 10.2 Where scheduled cast insitu 25MPa concrete shall be cast beneath the fence line to discourage tunnelling beneath the fence. The dimensions are as per the detailed drawings.

PA 11 Installing Gates

Gates shall be installed at the places indicated on the drawings or as instructed by Eskom. The gates shall be hung on gate fittings in accordance with the details shown on the drawings. Gates shall be so erected as to swing in a horizontal plane at right angles to the gate posts, clear of the ground in all positions. Gates shall not be further than 40mm from the gate post when closed, or as otherwise shown on the drawings.

PA 12 Transport and Storage

The transporting, offloading and storage on site of all materials shall be carried out with care so that no damage to steel, mesh, paint or galvanising will occur. Any damage shall be made good in a manner approved by the Supervisor.

PA 13 Earthing

The fence and gates shall be earthed as detailed on the earthmat layout drawing and the Eskom Earthing standard D-DT-5240.

PA 14 Corrosion treatment and re-painting

All corrosion protection and treatment is to be done in accordance to the following standards:

- Standard ST_240-75655504 Rev 1/ **DSP 34-1658** : Corrosion Protection Standard For New Indoor and Outdoor Eskom Equipment, Components, Materials And Structures Manufactured From Steel Standard.

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- Technical Bulletin 240-100394368 / **10TB-011**: Approved Coating Suppliers and Products For DSP 34-1658.

PA TOLERANCES

PA 1 General

The completed fence shall be plumb, taut, true to line and ground contours, with all posts, standards and stays firmly set.

Permissible Deviations shall be as follows:

- a) The height of the lower fencing wire above the ground at posts and standards shall not vary from that shown on the drawings by more than 25mm. Other fencing wires shall not vary by more than 10mm from their prescribed relative vertical positions.
- b) The maximum acceptable out of alignment of fence posts in any direction shall be 25mm. The maximum acceptable out of plumb of fence posts in any direction shall be 20mm.
- c) The maximum acceptable distortion of mesh already erected shall not exceed \pm 25mm on each 4m length.
- d) Gates shall swing in a horizontal plane at right angles to the gate posts clear of the ground in all positions with a maximum ground clearance of 80mm. Double leaf gates shall not have a gap of more than 40mm between the two leaves when closed and all gates shall be not further from the gate posts when closed than the dimensions shown of the drawings.

PA TESTING

Testing shall be specified in SANS 1200 G clause 7 and variations and additions or as called for by the Supervisor:

PA MEASUREMENT AND PAYMENT

PA 1 General

Fences will be measured by length over the lengths laid, excluding gates, which are scheduled separately.

Corner and strain posts (including stays) and intermediate posts will be measured separately by number including excavation in earth.

Soft or hard rock encountered in the excavations will be separately measured and paid for.

Payment will be made in accordance with clause 8.2

PA 2 Scheduled Items

2.1 Fencing complete with posts and foundations, Unit: m as indicated on drawing D-DT-5237:

Fences will be classified by type or detailed description. The unit of measure is the meter length of installed fences installed complete as indicated on the detailed drawings.

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The rate shall cover all the costs associated with the erection of the fence in compliance with the specification, including supply, transport and erection of the fencing complete as described, provision of the mesh footing trench and filling, and complying with precautions and tolerances.

**2.2 Gates, complete with posts and foundations, Unit: no
as indicated on drawing D-DT-5237:**

Gates will be classified by type and size or detailed description.

The unit of measure is the number of gates installed complete as indicated on the detailed drawings.

The rate shall cover all costs associated with the supply and erection of the gate in compliance with the specification including posts, excavation of post holes in earth, disposal, and filling with concrete, excavation in earth for the earth, backfilling and provision and installation of the earth strap, complying with precautions and tolerances. For motorised gates items shall be scheduled for the complete supply and installation of a manufacturer specified gate motor, infra-red gate safety beams, a complete gate motor foundation.

**2.3 Non-Lethal Electric Fencing complete with posts and
foundations, as indicated on drawing
0.54/8282:**

**a) Compliance with the requirements 240-170000192 Scope of Work for Non-Lethal Energized
Perimeter Detection System (NLEPDS)**

- 1) Preparation and submission of returnable schedules Unit: Sum
- 2) Preparation and submission of Pre-installation Unit: Sum
Development Scope
- 3) Site Acceptance Testing and Issuing of CoC Unit: Sum

The unit of measure shall be sum cost for scheduled items to comply with the requirements of 240-170000192 Scope of Work for Non-Lethal Energized Perimeter Detection System (NLEPDS).

The rate shall include full compensation for all labour, materials, equipment, plant and transport to consult, prepare and submit the scheduled data as per the requirements of 240-170000192 Scope of Work for Non-Lethal Energized Perimeter Detection System (NLEPDS)

**b) Non-Lethal Electrified Security Fence, 2.475m in height with Unit: m
single overhang and "flat wrap", complete with insulators,
tensioners, crimping ferrules, Ø: 2.24mm galvanized steel
electric fence conductors, HT Cables as per
drawing: 0.54/8282 REV 04**

The unit of measure is the meter length of installed fences installed complete as indicated on the detailed drawings.

The rate shall cover all the costs associated with the erection of the fence in compliance with the specification, including supply, transport and erection of the fencing complete as described, provision of the mesh footing trench and filling, and complying with precautions and tolerances.

c) Electric Fence Energizers

- 4) Type A Energizer Unit: no

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5) Submission of Certification in terms of SANS 60335-2..... Unit: Sum

6) Electric Power Supply to Energizers in accordance with Unit: no
240-78980848 – STANDARD FOR NON-LETHAL
ENERGIZED PERIMETER DETECTION SYSTEM
(NLEPDS) ELECTRICAL COMPONENTS

Separate items shall be scheduled for the type of energizer type, the certification documents and the electric power supply.

The unit of measure is the number (no) for sub-items 1) and 3) and the sum cost for sub-item 2) to supply and install energizers in accordance with 240-78980848 – STANDARD FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM (NLEPDS) ELECTRICAL COMPONENTS.

The rate shall include full compensation for all labour, materials, equipment, plant and transport to supply and install the scheduled items or components.

d) Electric Fence Control and Display Units Unit: no

Separate items shall be scheduled.

The unit of measure is the number (no) control or display units to be supplied and installed.

The rate shall include full compensation for all labour, materials, equipment, plant and transport to supply and install the scheduled items or components.

e) Electric Fence Relays / Relay Cards Unit: no

Separate items shall be scheduled.

The unit of measure is the number (no) control or display units to be supplied and installed.

The rate shall include full compensation for all labour, materials, equipment, plant and transport to supply and install the scheduled items or components.

f) Electric Fence Equipment Housing (Kiosk) Unit: no
in accordance with 240-78980848 – STANDARD
FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM
(NLEPDS) ELECTRICAL COMPONENTS

Separate items shall be scheduled.

The unit of measure is the number (no) kiosks to be supplied and installed.

The rate shall include full compensation for all labour, materials, equipment, plant and transport to supply and install the scheduled items or components. The rate shall include the construction of the plinth as indicated item **PAPA 17 Electric Fence Equipment Housing (Kiosk)**. The rate shall also include full compensation for consulting with manufacturers to ensure compliance with the requirements.

g) Electric Fence - Electric Equipment and Installation Unit: no
in accordance with 240-78980848 – STANDARD
FOR NON-LETHAL ENERGIZED PERIMETER DETECTION SYSTEM
(NLEPDS) ELECTRICAL COMPONENTS

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Separate items shall be scheduled.

The unit of measure is the number (no) electric equipment items to be installed.

The rate shall include full compensation for all labour, materials, equipment, plant and transport to supply and install the scheduled items or components. The rate shall also include full compensation for the consultation with a supplier or manufacturer to determine the equipment current ratings to ensure compliance with the SANS 10142-2017: The Wiring of Premises and the manufacturer's requirements.

h) Electric Fence Notices and Labelling Unit: no

Fence notices and labelling to be installed will be as scheduled

The unit of measure is the number of notices and labels installed complete, as required.

The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to install the various notices and labels.

i) Electric Fence Warning Signs Unit: no

The unit of measure is the number of signs installed complete, as required.

The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to install the warning signs.

j) Electric Fence Regulatory Documentation in accordance with Unit: sum
240-78980848 – STANDARD FOR NON-LETHAL
ENERGIZED PERIMETER DETECTION SYSTEM
(NLEPDS) ELECTRICAL COMPONENTS - ANNEX A

The unit of measure shall be the sum cost to prepare and supply the regulatory documentation.

The rate shall cover all costs associated with the supply of materials, transport and labour to prepare the documentation as required and to submit the documentation in accordance with 240-78980848

k) Anti-Tunnelling Slab, cast in-situ 25/19 concrete, complete Unit: m
with Ref 245 welded mesh reinforcement as per
drawings 0.54/8282 SH0 REV04

The unit of measure shall be the meter (m) length of anti-tunnelling slabs cast in-situ.

The rate shall include full compensation for all materials, formwork, equipment and plant to cast the anti-tunnelling slabs as detailed on the drawings.

l) Vegetation slab, cast in-situ 25/19 concrete, complete Unit: m
with Ref 245 welded mesh reinforcement as per
drawings 0.54/8282 SH0 REV04

The unit of measure shall be the meter (m) length of vegetation slabs cast in-situ.

The rate shall include full compensation for all materials, formwork, equipment and plant to cast the vegetation slabs as detailed on the drawings.

2.4 Extra-Over items 13.1 and 13.2 for

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- a) Hard Rock excavation Unit: m³

The unit of measure is the cubic meter volume of rock excavated to the authorised dimensions as indicated on the detailed drawings. The rate shall cover all the costs additional to the cost of excavating in earth disposing of surplus material and backfilling, where required.

- 2.5 Construction of gate ramp, complete as indicated on drawings Unit: no**

Construction of ramps will be classified by type and size or detailed description.

The unit of measure is the number of gate ramps installed complete as indicated on the detailed drawings. The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to construct the gate ramps as indicated on the drawings complying with precautions and tolerances.

- 2.6 Construction of cast insitu concrete below fence line, Unit: m³
complete as indicated on drawings**

Construction of cast insitu concrete will be classified by type and size or detailed description.

The unit of measure is the cubic meter volume of cast insitu concrete complete as indicated on the detailed drawings. The rate shall cover all costs associated with the supply of all materials, concrete shuttering, transport, labour and equipment to construct the cast insitu concrete below the fence line as indicated on the drawings complying with precautions and tolerances.

- 2.7 Construction of pre-cast kerbing below fence line, Unit: m
complete as indicated on drawings**

Construction of pre-cast kerbing below fence line will be classified by type and size or detailed description.

The unit of measure is the meter length of constructed pre-cast kerbing complete as indicated on the detailed drawings. The rate shall cover all costs associated with the supply of all materials, transport, labour, equipment to construct the pre-cast kerbing below the fence line as indicated on the drawings complying with precautions and tolerances.

- 2.8 Installation of signs as indicated Unit: no**

Signs to be installed will be classified by type and size or detailed description.

The unit of measure is the number of signs installed complete as indicated on the detailed drawings. The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to install the various signs as indicated on the drawings complying with precautions and tolerances.

- 2.9 Earthing of fence and gates as indicated on drawing D-DT-5240 sheet 9:**

- a) Installation of main earth mat to fence tails Unit: no
b) Installation of earth tails to fence post Unit: no
c) Installation of earth tails to gate posts Unit: no

The unit of measure is the number of installed earth connections complete as indicated on the detailed drawings.

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The rate shall cover all costs associated with the supply of materials, transport, labour and equipment required to install the various earthing equipment and installations as indicated on the drawings in order to comply with precautions and tolerances.

2.10 Testing Concrete Unit: no

The unit of measure is the number of accepted tests order by the *Project Engineer*. Received test results are to meet the minimum criteria specified before any payment may be claimed.

The cost of failed tests will be paid for by the *Contractor* and with no claimed tests measured under this measurement and payment item. The rate shall cover the cost of making and testing groups of three test cubes in accordance with SANS Test Methods 5861 and 5862.

2.11 Replacement of existing fence posts Unit: no

The replacement of fence posts will be classified by type and size or detailed description.

The unit of measure is the number of replaced fence posts installed complete as indicated on the detailed drawings.

The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to remove and replace with a specified post type and reinstating the fence to its original state as indicated on the drawings complying with precautions and tolerances.

2.12 Replacement of existing fencing mesh and palisades Unit: m & no

The replacement of fencing mesh or palisade panels will be classified by type and size or detailed description.

The unit of measure is the meter length for mesh type fences and/ or the number of installed palisade fence panels installed complete as indicated on the detailed drawings.

The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to remove and replace with a specified fence type and reinstating the fence to its original state as indicated on the drawings complying with precautions and tolerances.

2.13 Replacement of existing gates Unit: no

The replacement of existing gates will be classified by type and size or detailed description.

The unit of measure is the number of installed gates complete as indicated on the detailed drawings.

The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to remove and replace with a specified gate type and reinstating the fence to its original state as indicated on the drawings complying with precautions and tolerances.

**2.14 Cleaning corrosion treatment and painting of existing gates Unit: no
and fence posts**

The specified corrosion treatment and re-painting of existing gates and fence posts will be classified by type and size or detailed description.

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The unit of measure is the number of treated and re-painted gates and fence posts complete as specified. The rate shall cover all costs associated with the supply of materials, transport, labour, equipment to treat and repaint with specified materials as indicated on the refurbishment specifications, complying with precautions and tolerances.

APPENDIX A: APPLICABLE STANDARDS

Reference is made to applicable issues of the following standards:

Standards:

280	:	Hole Location in Fencing Posts and Droppers
317	:	Industrial Bitumens
657	:	Steel Tubes for Non-pressure Purposes
675	:	Zinc-coated fencing wire
14713	:	Protection against corrosion of iron and steel n structures – Zinc and aluminium coatings
50025	:	Hot rolled products of structural steels

Eskom Standards:

NWS 1058	:	Safety at Construction Sites – Requirements to be met by <i>Contractors</i>
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2. PB PARTICULAR SPECIFICATION: BUILDING WORK

PB 1. SCOPE

- 1.1. The specification covers the construction of buildings for control rooms, switchgear buildings, relay houses, transformer oil containment areas, "fire traps" and oil holding dams.

PB 2. GENERAL

- 2.1. This specification to be read in conjunction with Eskom's Standard Specification and General Conditions of Contract.
- 2.2. The *Contractor* is to pay all fees with regard to services supplied by and for the Local Authority.
- 2.3. Portable latrines are to be provided and serviced by the *Contractor*
- 2.4. The *Contractor* is to include in his pricing for the temporary supply of water and power for construction purposes.
- 2.5. Reference specifications:
- 2.5.1. SANS 10400 – The Application of the National Building Regulations
- 2.5.2. National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977)
- 2.5.3. Standard Drawing D-DT-5238 sheet 1 – 16 – NATIONAL STANDARD CONTROL BUILDING DETAIL PLAN, SECTIONS AND ELEVATIONS
- 2.5.4. Standard Drawing D-DT-5239 sheet 1 – 4 – NATIONAL STANDARD RELAY HOUSE PLAN, SECTIONS AND ELEVATIONS

PB 3. FOUNDATIONS

3.1. Foundations General:

3.1.1. Standard soil classifications:

- a) "Type 1" soils: Competent soil with equal or better consistency (strength or toughness) than one would encounter in stiff cohesive soils or dense cohesionless soils above the water table. This soil must have a broad balanced texture (constituent particle sizes) with high average combinations of un-drained shear strength and internal angle of friction, with minimum values of 80kN/m² and 30° respectively. The minimum natural specific weight shall not be less than 18kN/m³. Maximum soil bearing pressure 300kPa.
- b) "Type 2" soils: A less competent soil than "Type 1", with equal or weaker consistency than one would encounter in firm to stiff swelling cohesive soils, or dry poorly graded loose to medium dense cohesionless soils above the water table. The minimum un-drained shear strength shall be 40kN/m², and the minimum natural specific weight shall not be less than 16kN/m³. Maximum soil bearing pressure 150kPa.
- c) "Type 3" soils: Dry loose cohesionless soil or very soft to soft cohesive soil. Maximum soil bearing pressure 100kPa.
- d) "Type 4" soils: Submerged cohesionless and cohesive soils. This includes all soils below the permanent water table, including soils below a re-occurring perched water table, or permeable soil in low-lying areas subjected to confirmed seasonal flooding. Maximum soil bearing pressure 50kPa.

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e) Summarised Geotechnical design parameters for various soil types:

Design Parameter Unit	Soil Type			
	Type 1	Type 2	Type 3	Type 4
Maximum Soil Bearing Pressure (kPa)	300	150	100	50
Maximum Toe Bearing Pressure (kPa)	375	200	125	65
Internal Angle Of Friction / Frustum Angle (degrees)	30°	20°	0°	0°

3.1.2. For maximum soil bearing pressure and maximum toe bearing pressure, use the tabled pressure or 80% of the ultimate tested bearing pressure determined from appropriate tests.

3.2. Building foundations:

3.2.1. The depths and sizes of the foundations are to be as shown on the standard drawings D-DT-5238 and D-DT-5239.

Soil Type	Dimensions (W x D)	Special Measures
Type 1	700 x 250*	For compact non-cohesive soils consisting of gravels and sands located above the water table No reinforcing is required.
Type 2	700 x 250*	For stiffer or firm cohesive soils consisting of clays and silts,, the foundation to have a single layer of Ref. 617 mesh reinforcing placed in the centre of the foundation, i.e. 125mm from the bottom of foundation bottom.
Type 3	To Be Designed	For soils consisting of soft clays and silts or submerged soils, the foundation is to be designed by a registered Professional <i>Civil Engineer</i> .

** Walls of 220 mm and 280 mm without adjacent trenches are to have a 700 mm x 250 mm concrete foundation.*

3.2.2. The concrete is to be class 15MPa concrete at 28days.

3.2.3. Reinforcing shall be as indicated on the detail drawings for each foundation type. For Type 3 foundations in soils containing soft clays, silts or submerged soils (Type 4) the foundation and reinforcement shall be design and by a registered Professional *Civil Engineer* Technologist.

PB 4. WALLS

4.1. Building Walls:

4.1.1. For sections of the wall below ground, well burnt red hard clay R.O.K Bricks.

4.1.2. For internal walls: Red Clay R.O.K. Bricks are to be used (min. compressive strength: 7MPa)

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- 4.1.3. For facebricks: Clay facebricks. Smooth or Rustic Ironspots, min. 35MPa) or as approved by Eskom. The use of facebricks is to start 1 course below the final ground line.
- 4.1.4. Cavity walls to be 110 – 60 110 skins with 60mm cavity.
- 4.1.5. Brickforce: 75mm wide or 150mm wide galvanized brickforce to be applied to the first four courses above the foundation and on the top 4 courses below the wall plate.
- 4.1.6. Gables are to be applied at every 4th course to the ridge.
- 4.1.7. Wallties: Galvanized Butterfly type, 5/m² in the wall at 300 mm c/c at jambs.
- 4.1.8. Damp Proof Course: Gunplas Brikgrip 375 microns, stepped at floor level in cavity walls and around openings.
- 4.1.9. Joints: Facebrick, 10 mm raked, all other joints to be keyed for plastering. Every 4th joint to be perpendicularly above stepped damp proof course to be raked clear to drain the cavity.
- 4.1.10. Mortar is to be mixed at a ratio of 1:4 (cement:sand).
- 4.1.11. Top 3 courses of cavity below truss to be filled with concrete.
- 4.1.12. For “Combo” Control Room 340mm x 340mm fAcebrick piers to be reinforced with 2 x Y12 bars. Cavity to be filled with concrete. Piers required to buttress external walls at 5000mm centres.

PB 5. PLASTERWORK

- 5.1. Internal plasterwork is to be 15 mm thick and smooth steel float finished. The plaster is to be mixed to a ratio of 1:1:6 (cement:lime:sand).
- 5.2. External plasterwork to be 20mm thick, wood floated. The plaster is to be mixed to a ratio of 1:4 (cement:sand).

PB 6. FLOORS & FLOOR FINISHES

- 6.1. Abe.® cron cementitious floor hardener to be applied to the manufacturer's specification on 100 mm thick, 30MPa strength concrete. The service bed is to be constructed on the compacted sand fill, constructed in 150mm thick backfill layers.
- 6.2. The floor to be steel power floated to a hard level surface.
- 6.3. All floors are to be reinforced with BRC 395 or 617 weldmesh. Minimum cover of 50mm from the bottom of slab. Refer to specified detailed drawing. Reinforcing to be carried though into the platforms.
- 6.4. Floor level to be laid to a tolerance of 0.5 m per metre with a maximum of 2.5mm difference over the entire length.
- 6.5. Steps and loading bay to have a 150m brush finish, 30MPa concrete cast to a slope as shown on the drawings. Reinforcing to be the same as for the Switch room floor.
- 6.6. Relay and Switch Room to have 2 coats of Sika® Purigo® transparent sealer or equal approved equivalent. Product to be applied after the commissioning of electrical equipment.
- 6.7. For the Relay room and W/C: a natural grey finish is to be applied.
- 6.8. The Battery room is to have a sloping floor of 25mm to a glazed floor channel. Alternatively the Battery room floor would be ceramic non slip acid resisting tiles fixed with acid resistant tile adhesive and grouting.

PB 7. ROOF & CEILING

- 7.1. For Relay House:
 - 7.1.1. Big Six or Profile B 6mm fibre cement or 0.6 mm galvanized IBR sheeting on 76 mm x 50 mm purlins at maximum 1400 mm c/c or 1050 mm c/c on gangnail type trusses.
 - 7.1.2. Where gangnail trusses are not available the Contractor shall use 150 mm x 38 mm rafters and tiebeams and 114 mm x 38 mm struts. All joints to be galvanized and bolted with M12 bolts.

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- 7.1.3. 114 mm x 38 mm wallplates to be tied 600 mm into the brick wall. With galvanized hoop iron straps.
- 7.1.4. *Contractor* to obtain a certificate of compliance from the Roof Truss manufacturer.
- 7.1.5. 4mm Nutec fibre/cement ceiling on 50 mm x 38 mm branderling at 400 mm c/c. Joints are to be taped for painting.
- 7.1.6. 75mm thick Aerolite or approved equivalent roof insulation to be applied over the ceiling.
- 7.2. For "Combo" Control Building:
 - 7.2.1. "Megaspan" or approved equivalent 0.6mm galvanized IBR Sheeting in 4200mm lengths bonded to 4mm Sagex core with either 0.4mm Chromadek ceiling or 4mm Nutec fibre/cement ceiling.
 - 7.2.2. Supports to be 220mm x 69mm PAR SA Pine beams as shown. Beams to be spaced at , maximum, 1735mm c/cs.
 - 7.2.3. Truss construction for Relay/Switch room more than 6000m in length supporting truss to be constructed at mid span or every 5000mm. refer to drawing: D-DT-5238 Sheet 15 Rev 01 for more details.
 - 7.2.4. Truss to be tied to the brickwork with galvanized hoop iron straps (wallplates) embedded 600mm deep into the brickwork.
 - 7.2.5. *Contractor* to obtain a certificate of compliance from the Roof Truss manufacturer.

PB 8. ROOF DRAINAGE & WATERPROOFING

- 8.1. Roof Drainage shall be done by 140mm high x 130mm wide standard galvanized steel gutters. The gutters shall be fixed to roof sheeting at 515mm centres with standard galvanized steel or standard equivalent aluminium brackets.
- 8.2. All bends and downspout fittings of standard galvanized steel shall also be supplied and installed.
- 8.3. The *Contractor* shall install standard galvanized steel down pipes and gutter outlets over 1000mm x 150mm precast concrete rainwater channel outlets. The down pipes shall be supported by standard galvanized steel brackets at the supplier specified bracket spacing, capable of supporting the down pipes.

PB 9. DOORS

- 9.1. Doors are to be of the type specified and installed according to the details on drawing D-DT-5239 sheet 04, latest revision for the Relay house. Drawing D-DT-5238 sheet 16, latest revision for the "Combo" Control building.

PB 10. WINDOWS

- 10.1. Windows are to be Wespeco® type NCF5 galvanized steel or approved equivalent. The glazing is to be 6mm Georgian wired cast.

PB 11. AIR FILTERS & FRAMES

- 11.1. The number of air filters is to be determined by the length of the building.
- 11.2. WinBlok® WB66, 600mm x 600mm x 300mm deep. Rebate to Winblok® to be on external skin of wall, facing outwards.
- 11.3. Winlouvre® WL (A)66 fitted with nat anodized aluminium louvers externally.
- 11.4. Burglar bars to be 20mm x 6mm galvanized steel with Ø:8mm galvanized twist off nut expansion bolts. Burglar bars to be supplied by WinBlok® and to be installed/fixed on site by the *Contractor*.

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- 11.5. Air filter frames to be 55mm x 40mm x 1.6mm formed galvanized mild steel channels. Outer holes to flange to be Ø: 20mm, with Ø:7mm holes to the inner flange (against wall) for 30mm long x Ø:6mm CSK fixing screws.
- 11.6. Air filter frame to fit "Fibratron" WP77 594mm x 594mm x 48mm washable filters or equivalent approved products.

PB 12. SERVICE TRENCHES

- 12.1. Service trench walls to be bagged brick, all trench covers and channels to be constructed by the *Contractor*. Refer to drawing D-DT-5238 sheet 13, latest revision for details.
- 12.2. Service trench covers to be 4.5mm steel "vastrap" chequer plate with Ø: 25mm lifting holes.

PB 13. SWITCHGEAR RACK OUT STEEL PLATES:

- 13.1. *Contractor* to fix in position (after installation of switchgear by specialist *Contractor*) 3mm thick x 1225mm galvanized steel plates with CSK stainless steel screws at 2500mm centres. The *Contractor* is to refer to the design document as to the extent (lengths) of the plates required.

PB 14. SANITARY WARE

- 14.1. The battery room sink is to be in accordance with drawing D-DT-5238 sheet 14.
- 14.2. The W/C is to be Vaal Klip suite white vitreous china with seat and lid.
- 14.3. Cobra Star stop valve and toilet roll holder.
- 14.4. The basin is to be Vaal Bantam 455 mm x 290 mm white vitreous china complete with wall brackets, plug & chain and cobra star cold water tap only.
- 14.5. Hose tap is to be Cobra N108LK.

PB 15. PAINT

- 15.1. Galvanized steel is to have galvkleen applied followed by 1 coat calcium universal undercoat, 1 coat of gloss enamel, colour brilliant white.
- 15.2. Internal walls & ceilings are to have 1 filler coat and 2 coats Dulux Wash & Wear PVA or Eskom approved equivalent. The colour is to be white. The final coat of paint will only be applied after the final commissioning of all electrical equipment by Eskom.
- 15.3. Battery room walls and ceiling will have 3 coats super silk acrylic acid resisting paint. The Battery room floor will have 2 coats of Epoxy acid resisting floor paint. The colour of the floor paint is to be grey. Sikaguard 62 with Sika 73 primer shall be applied to the manufacturer's specification or Eskom approved equivalent.
- 15.4. Trusses, purlins, wall plates and rafter ends, backing piece and exposed trusses are to have one coat pink primer and 2 coats of flat enamel applied.
- 15.5. Steel work: Galvanized steel is to have galvkleen applied followed by 1 coat calcium universal undercoat, 1 coat of gloss enamel, colour brilliant white.
- 15.6. Trench covers : 1 coat red lead primer, 1 coat undercoat, 2 coats eggshell enamel. Colour: light grey to Eskom approval.

PB 16. WATER SUPPLY

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- 16.1.** Water supply is to be supplied by 15mm or 20mm copper pipes from the water supply tank to the W/C, external tap, basin and battery sink. Refer to the detailed drawings for the correct water supply pipe diameter.

PB 17. AIR BRICKS

- 17.1.** External air bricks are to be 220 mm x 150 mm cement face and internal air bricks are to be 220 mm x 150 mm plastic face with vermin proofing. Both are to be set flush into the wall. Two will be required in accordance with drawing **D-DT-5239**. They are to be mounted 150 mm above the final floor level in the positions shown.

PB 18. CONVECTIONAL AIR VENT

- 18.1.** "Whirlybird" air ventilation system, or approved equivalent, to be installed in accordance with the manufacturers' specifications. Ø 300mm. The number of vents to be specified.

PB 19. HANDRAILS

- 19.1.** Inter-link handrail system to be supplied and installed as indicated on the detail drawings.
19.2. All "Wecrolok ®, or approved equivalent, handrail systems are to be installed as per the manufacturer's specifications. handrail

PB 20. CABLE RACKS

- 20.1.** Cable racks shall be supplied and installed by the *Contractor*.
20.2. Cable racks shall be 600mm wide wire mesh type trays, 2800mm above the final floor level, robustly supported and fixed to the walls in order with stand the loads of the cables which shall be installed in the building.

PB 21. POWER & LIGHTING

- 21.1.** All Electrical work shall be carried out in strict accordance with the latest revision and requirement of the SANS 10142-2017: The Wiring of Premises.
21.2. AC/DC Board supplied and installed by Eskom. The Electrical *Contractor* to supply and hang all light fittings. All wiring to these fittings shall run surface and terminate in a Sub Board as shown on the plan. If no position is indicated on the plan, the *Clerk of Works* and *Engineer* will provide a position on site.
21.3. The *Contractor* shall wire conduit and terminate wiring at the Sub Board supply cable above the AC/DC Board. Top of the Eskom AC/DC Board is as shown on the AC/DC board drawings.
21.4. Wiring shall be P.V.C sheathed in white plastic conduit (with SANS mark). All conduit to be run surface in straight lines.
21.5. Switches shall be SANS approved surface mounted toggle type mounted in the Sub Board. For relay rooms they shall be surface mounted toggle type, mounted 1200mm above the final floor level. External sockets shall be weatherproof cam type to Eskom approval.

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- 21.6. All lighting fittings are to have SANS mark. Fittings shall be fixed to the flat ceiling and 3400mm above final floor level. Light fittings for the Battery Room shall be mounted against the wall at 2800mm above the final floor level.
- 21.7. Battery Room extractor to be LUFT or approved equivalent, 12 BWX/4D/EXE 3 phase flameproof motor with standard PVC coated heavy gauge wire guards fitted to inside and standard glass fibre wall cowl fitted to outside. The unit shall be switched from the AC/DC board. The fan shall have a 3 pole isolator mounted at high level externally next to Battery room door.
- 21.8. Ceiling Fans, where required, shall be 1400mm dia aluminium blade single phase with 5 speed wall mounted choke type regulator. The fans shall have 315mm anti-vibration mounting and ceiling hook as Donkin Summering "Coolflo" or approved equivalent. The maximum distance between fans shall be 500mm. For mounting below sloping ceilings the mounting point shall be suspended from the 144mm x 69mm timber beam, fixed to the roof beams/purlins.
- 21.9. Time switch for AC Light switches shall be Coupaton C53-T125, 240V / 16A, 60 minute or approved equivalent.
- 21.10. Contactor for AC Lights shall be Lovato BF12 with 220V coil or approved equivalent.
- 21.11. Timer Box shall be surface mounted Gewiss GW 44207 or approved equivalent.
- 21.12. Emergency Lighting shall be provided in the buildings. For emergency lighting one tube in the fitting shall have an additional conduit run from the DC side of the distribution board which will include 1 x positive, 1 x switched positive and 1 x negative wire.
- 21.13. The *Contractor* to supply and install a 110V DC to 220V AC inverter in the fitting and a contactor rated at 10A in the Sub Board for the emergency lighting fitting. Affected fittings and end caps to be painted red in order to differentiate between fittings. The *Contractor* shall supply and fit the required switch and timer on wall as indicated on the drawings. The Wiring shall be connected by authorised Eskom personnel to the AC/DC Board.
- 21.14. Inverters to affected emergency lighting to be fixed into the fittings and replace the normal ballast. The inverter to be 110V, DC input and 1 x 60W output. The inverter shall be as supplied by Smith Walker inverters or approved equivalent.
- 21.15. Luminance levels for Switch/Relay and Battery Room is 300 Lux, Store Room and WC is 160 Lux.
- 21.16. Emergency lighting shall require 1 tube for every 60 m² of room area.
- 21.17. Main circuit breakers are to be rated at 5kA.
- 21.18. Earth Leakage unit shall be HY-MAG or approved equivalent.
- 21.19. Socket Outlets shall be 15A 3 pin round, surface mounted. 3 socket outlets are required.
- 21.20. The Sub Board/ Distribution board shall be supplied and installed and wired by the *Contractor*. The Sub Board shall be clearly labelled and marked in strict accordance with the requirements of SANS 10142. The Sub Board shall be surface mounted and shall be large enough to accommodate the following:
- 21.20.1. 1 x 3 Pole Isolator,
- 21.20.2. 1 x Earth Leakage Unit,
- 21.20.3. 1 x MCB for the Lights circuit,

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- 21.20.4. 2 x MCB's for Socket Outlet circuits,
- 21.20.5. 1 x Day/Night Switch for the yard lights,
- 21.20.6. 1 x Contactor rated for the yard lights,
- 21.20.7. 1 x MCB for the "Day/Night Switch Bypass circuit,
- 21.20.8. 1 x MCB for the Ceiling and Ventilation Fan circuit.

- 21.21.** All details regarding type and rating of all fittings are indicated on the detail drawings.
- 21.22.** The *Contractor* shall submit a Certificate of Compliance for all Electrical installations performed by themselves or their delegated sub-*Contractors*. This Certificate of Compliance is to be prepared and submitted in strict accordance with the SANS 10142: Wiring of Premises. The Certificate of Compliance is also to be issued by Organisations of Persons which have been registered in good standing with the Electrical *Contractors* Association.

PB 22. MEASUREMENT AND PAYMENT

22.1. Scheduled items:

22.1.1. Control / Relay Room Cable Racks – Ladder Type

- a) Mounting Plates / Brackets Unit: no

Separate items shall be scheduled for the various mounting plates as per the detailed drawings.

- b) Cable Racks Unit: no

Separate items shall be scheduled for the various lengths of cable racks as per the detailed drawings.

- c) Erection Bolts Unit: no

Separate items shall be scheduled for the various bolts types, sizes and lengths as per the detailed drawings.

- d) Earthing of Cable Rack Unit: no

Separate items shall be scheduled for the earthing of the cable racks as per the detailed drawings.

The unit of measurement shall be the number (no) of items to be supplied and installed as per the detailed drawings.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to supply and install the scheduled items.

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22.1.2. Repair of existing Control Room and Relay Room:

- a) Crack repair on existing walls and plaster Unit m²

The unit of measurement shall be the square meter area (m²) of treated and repaired cracks to plaster and walls.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to complete the scheduled work as scheduled.

22.1.3. Control / Relay Room Building Extension:

- a) Masonry Unit: m³

Separate items as scheduled

- b) Paint Application to walls and ceilings Unit: m³

Separate items as scheduled

- c) Floor Coatings Unit: m²

Separate items as scheduled

The unit of measurement will be as scheduled above. Reference is to be made to the standard substation Control Room / Relay Room drawings and the project specific control room drawings applicable to this project.

The rate shall include all costs for the procurement of all materials, all transport, labour and equipment to complete each scheduled item.

- d) Roof

- 1) Roof Trusses and Battens Unit: Sum

The unit of measure shall be the sum cost to design, supply and erect the roof trusses and battens as per the manufacturer/supplier's requirements and in accordance with SANS 10400: Building Regulations.

The tendered rate shall include full compensation for all consultations and site visits by the professional design team, all labour, all materials, all transport and all plant and equipment required to erect and install the roof structure in accordance with the Manufacturers' requirements and the SANS 10400.

- 2) Roof Sheeting Unit: m²

The unit of measure shall be the square meter area (m²) of roof sheeting to be supplied and installed in accordance with SANS 10400: Building Regulations.

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The tendered rate shall include full compensation, all labour, all materials, all transport and all plant and equipment required to supply and install the roof sheeting in accordance with the Manufacturers' requirements and the SANS 10400.

- 3) Brandering, Ceiling and Roof Insulation Unit: m²

The unit of measure shall be the square meter area (m²) for the scheduled items.

The tendered rate shall include full compensation, all labour, all materials, all transport and all plant and equipment required to supply and install the scheduled items in accordance with the Manufacturers' requirements and the SANS 10400.

- 4) Roof Gutters

- i) Remove and replacement of existing Control / Relay Room roof gutters and down pipes..... Unit: m

The unit of measure shall be the meter (m) length of gutters to be removed and replaced as per the detailed drawings.

- ii) Supply and install Ø:precast concrete rainwater channel -1.0m long Unit: no

The unit of measure shall be the number (no) precast concrete rain water channels supplied and installed as per the detailed drawings.

The tendered rate shall include full compensation, all labour, all materials, all transport and all plant and equipment required to supply and install the scheduled items in accordance with the detailed drawings and the SANS 10400.

22.1.4. Power and Lighting:

- a) Light fittings and Switches Unit: no

Separate items as scheduled

The unit of measurement shall be the number of scheduled light fittings and switches as indicated in the detailed drawings and detailed specifications.

The rate is to include the cost of procurement of the materials, transport, labour, equipment , wiring, blanking plates, wall boxes, covers, conduit, saddles, inspections boxes, joints and any other item deemed necessary to complete the installation in accordance with SANS 10142-1 complete as indicated on the standard drawings.

- b) Socket Outlets..... Unit: no

Separate items as scheduled

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The unit of measurement shall be the number of scheduled socketed outlets as indicated in the detailed drawings and detailed specifications.

The rate is to include the cost of procurement of the materials, transport, labour, equipment , wiring, blanking plates, wall boxes, covers, conduit, saddles, inspections boxes, joints and any other item deemed necessary to complete the installation in accordance with SANS 10142-1 complete as indicated on the standard drawings.

c) Surface-mounted timer box Unit: no

The unit of measurement shall be the number of surface-mounted timer boxes as indicated in the detailed drawings and detailed specifications.

The rate is to include the cost of procurement of the materials, transport, labour, equipment , wiring, blanking plates, wall boxes, covers, conduit, saddles, inspections boxes, joints and any other item deemed necessary to complete the installation in accordance with SANS 10142-1 complete as indicated on the standard drawings.

d) Surface-mount Sub Board / Distribution Board Unit: no

Separate items as scheduled

The unit of measurement shall be the number of scheduled items required for the complete installation of a surface-mount sub board / distribution board and all the related circuit breakers, isolators, etc. as indicated in the detailed drawings and detailed specifications.

The rate is to include the cost of procurement of the materials, transport, labour, equipment , wiring, blanking plates, wall boxes, covers, conduit, saddles, inspections boxes, joints and any other item deemed necessary to complete the installation in accordance with SANS 10142-1 complete as indicated on the standard drawings.

e) Issuing of an Electrical Certificate of Compliance.....Unit: sum

The unit of measurement will be the sum for the issuing of an electrical certificate of compliance of the electrical installation in accordance with the SANS 10142-1 by an Authorised Person.

The rate is to include the cost of transport, labour, equipment and any materials required to issue the certificate and completion of any work not deemed to be in compliance with the SANS 10142-1.

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3. PC PARTICULAR SPECIFICATION : OIL CONTAINMENT AREAS, FIRE TRAPS AND OIL HOLDING DAMS

PC 1 SCOPE

The specification covers the construction of brick built transformer oil containment areas, "fire traps" and oil holding dams. Concrete Oil holding dams shall be constructed using the 1200 G: Concrete (Structural) Specifications, as amended.

PC 2 GENERAL

- 2.1 This specification to be read in conjunction with Eskom's Standard Specification and General Conditions of Contract.
- 2.2 Reference specifications:
 - 2.2.1 Standard Drawing D-DT-5231 sheet 1A – 1C – TRFR PLINTH, SLIPWAY, DRAINAGE AND CONTAINMENT AREA DETAILS
 - 2.2.2 Standard Drawing D-DT-5232 sheet 1A – 6D – TRFR PLINTH, SLIPWAY, DRAINAGE AND CONTAINMENT AREA DETAILS
 - 2.2.3 Standard Drawing D-DT-5233 sheet 1A – 1F – OIL SUMP PUMP DETAIL DRAWINGS
 - 2.2.4 Standard Drawing D-DT-5234 sheet 1A – 9C – OIL HOLDING DAM DETAIL DRAWINGS

PC 3 FOUNDATIONS

- 3.1 Foundations General:
 - 3.1.1 Standard soil classifications:
 - 3.1.2 "Type 1" soils: Competent soil with equal or better consistency (strength or toughness) than one would encounter in stiff cohesive soils or dense cohesionless soils above the water table. This soil must have a broad balanced texture (constituent particle sizes) with high average combinations of un-drained shear strength and internal angle of friction, with minimum values of 80kN/m² and 30° respectively. The minimum natural specific weight shall not be less than 18kN/m³. Maximum soil bearing pressure 300kPa.
 - 3.1.3 "Type 2" soils: A less competent soil than "Type 1", with equal or weaker consistency than one would encounter in firm to stiff swelling cohesive soils, or dry poorly graded loose to medium dense cohesionless soils above the water table. The minimum un-drained shear strength shall be 40kN/m², and the minimum natural specific weight shall not be less than 16kN/m³. Maximum soil bearing pressure 150kPa.
 - 3.1.4 "Type 3" soils: Dry loose cohesionless soil or very soft to soft cohesive soil. Maximum soil bearing pressure 100kPa.
 - 3.1.5 "Type 4" soils: Submerged cohesionless and cohesive soils. This includes all soils below the permanent water table, including soils below a re-occurring perched water table, or permeable soil in low-lying areas subjected to confirmed seasonal flooding. Maximum soil bearing pressure 50kPa.

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3.1.6 Summarised Geotechnical design parameters for various soil types:

Design Parameter Unit	Soil Type			
	Type 1	Type 2	Type 3	Type 4
Maximum Soil Bearing Pressure (kPa)	300	150	100	50
Maximum Toe Bearing Pressure (kPa)	375	200	125	65
Internal Angle Of Friction / Frustum Angle (degrees)	30°	20°	0°	0°

3.1.7 For maximum soil bearing pressure and maximum toe bearing pressure, use the tabled pressure or 80% of the ultimate tested bearing pressure determined from appropriate tests.

3.2 Oil containment area (bunded area), Oil holding dam and Fire Trap foundations

3.2.1 All reinforced concrete elements shall be constructed, measure and paid for under SANS 1200G: Concrete (Structural), as amended.

PC 4 WALLS

4.1 Oil containment area (bunded area), Oil holding dam and Fire Trap foundations walls

4.1.1 Bund Walls

4.1.1.1 Bund walls shall be constructed using Face Bricks complying with SANS 227 and approved by the Eskom *Project Engineer*

4.1.1.2 Brick force shall be used on every third layer.

4.1.1.3 All jointing must be 10mm wide, raked and constructed with a 1:4 (Cement:Sand) Mortar Mix.

4.1.1.4 Knockout wall shall be grouted in place with a 1:4 (Cement:Sand) Mortar Mix and sealed.

4.1.1.5 Top layer of bricks to be constructed in a "Roller" Course.

4.1.2 Fire Trap, Sump and Manhole Walls

4.1.2.1 Exposed bricks for oil holding dams shall be "SilverGrey Travertine Face bricks complying with SANS 227. The face bricks shall continue till the second course below the ground level.

4.1.2.2 Bricks below ground level shall be an approved stock brick.

4.1.2.3 All bricks shall be submitted to the Eskom *Project Engineer* for acceptance.

4.1.2.4 All jointing must be 10mm wide, raked and constructed with a 1:4 (Cement:Sand) Mortar Mix.

4.1.2.5 Brick force shall be used on every third layer.

4.1.2.6 All jointing must be 10mm wide, raked and constructed with a 1:4 (Cement:Sand) Mortar Mix.

4.1.3 Brick built Oil holding Dam Walls

4.1.3.1 Exposed bricks for oil holding dams shall be "SilverGrey Travertine Face bricks complying with SANS 227. The face bricks shall continue till the second course below the ground level.

4.1.3.2 Bricks below ground level shall be an approved stock brick.

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- 4.1.3.3 All bricks shall be submitted to the Eskom *Project Engineer* for acceptance.
- 4.1.3.4 All jointing must be 10mm wide, raked and constructed with a 1:4 (Cement:Sand) Mortar Mix.
- 4.1.3.5 Cavity walls shall be filled using Class A1 concrete using 9mm stone, reinforced with REF 245 welded steel mesh.
- 4.1.3.6 Brick force shall be used on every third layer.

PC 5 JOINTS

- 5.1 All joints are to be sealed using an approved oil resistant sealant with a minimum fire rating of 1 hour such as SIKAFlex-PRO 2hp or an approved equivalent.

PC 6 DRAINAGE – SELF CONTAINED OIL CONTAINMENT AREA

- 6.1 All reinforced concrete elements shall be constructed, measure and paid for under SANS 1200G: Concrete (Structural), as amended.

6.2 CONTAINMENT AREA TRENCH

- 6.2.1 All reinforced concrete elements shall be constructed, measure and paid for under SANS 1200G: Concrete (Structural), as amended.

6.2.2 GRATING AND FRAMEWORK

- 6.2.2.1 The containment area frame and gratings shall be galvanized in accordance with SANS 121.
- 6.2.2.2 The containment area trench shall be constructed in such a manner that a frame for the steel grating is constructed as detailed in the drawings. The frame shall consist of an embedded galvanized mild-steel angle iron on the containment area sides / edges and a bolted galvanized steel angle iron on the bund wall sides / edges.
- 6.2.2.3 The details regarding the sizes, lengths, positions and methods of embedding and fixing shall be as detailed in the drawings.
- 6.2.2.4 Embedded items shall be dealt with as indicated in SANS 1200G: Concrete (Structural), as amended.
- 6.2.2.5 Gratings to be installed such that, minimum, 5mm and maximum, 10mm clearance is provided between the frameworks angle iron and the grating. The gratings should be able to be raised without being constrained / constricted by the angle iron frame. Gratings that cannot be raised out of the angle iron frames shall be replaced at the *Contractor's* cost.
- 6.2.2.6 Dimensions are provided on the detail drawings for the various entry options and transformer ratings. These detailed dimensions are to be checked against sub-clause 7.2.2 e) and amended accordingly. All amendments are to be provided to the *Engineer* for acceptance.

6.3 DRAIN SUMP

6.3.1 SUMP AND OUTLET PIPE

- 6.3.1.1 The drain sump shall be constructed such that the outlet pipe can drain unassisted, towards the outside of the substation at a slope of, minimum 1:200. The outlet pipe shall discharge the clean run-off water onto an outlet slab with embedded bricks.
- 6.3.1.2 The outlet pipe shall be a uPVC Class 6 pipe of Ø: 75mm.

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- 6.3.1.3 The sump pipe between the containment area and the drain sump shall be a galvanized steel pipe of nominal diameter of 3". The pipe diameter will such that the outlet valve and sensor can be installed without any modification whatsoever. Refer to item 7.3.2 for information regarding the outlet valve.
- 6.3.1.4 The sump pipe shall have a puddle flange welded to the pipe as detailed in the drawings. The flange shall be manufactured from mild steel and galvanized, after manufacturing, in accordance with SANS 121.
- 6.3.1.5 The puddle flange shall have dimensions of 150mm x 150mm.
- 6.3.1.6 The opening of the sump pipe on the inlet side shall have mesh flattened to fit the pipe diameter and welded to the pipe prior to galvanizing.

6.3.2 VALVE AND SENSOR

6.3.2.1 VALVE DETAILS

- a) The outlet valve shall be a GEMU ® Ball valve and detailed in the drawings. The valve shall be supplied with a proprietary mounting bracket as well as an electric position indicator switch suited to the specific valve to be installed.
- b) Approved equivalent valve types may be installed once approval has been received from the *Engineer*.

6.3.2.2 ELECTRIC SUPPLY TO VALVE

- a) All Electrical work shall be carried out in strict accordance with the latest revision and requirement of the SANS 10142-2017: The Wiring of Premises.
- b) The *Contractor* shall ensure that the required electric supply to the valve position indicator is provided, tested and commissioned.
- c) A Certificate of Compliance (CoC) in accordance with the SANS 10142 shall be issued for the installation. This CoC can be issued with the certificate provided for the building electrical installation.

6.3.3 GRATING AND COVER

- 6.3.3.1 The drain sump shall be constructed with embedded galvanized mild steel flat bar in the brick walls. The flat bars are to be orientated such that the dimension denoting the width shall be orientated vertically.
- 6.3.3.2 The flat bars shall be embedded, minimum 25mm on either side.
- 6.3.3.3 A Type RS40 (25mm x 4.5mm) galvanized steel grating shall be installed on the flat bars. The grating dimensions and manufacturing details shall be as detailed on the drawings.
- 6.3.3.4 A 4.5mm galvanized steel chequered plate drain sump cover shall also be manufactured as per the dimensions detailed on the drawings, complete with the angle iron frame and cover plate handles. The cover shall be installed on the drain sump and indicated on the drawings.

6.3.4 OUTLET SLAB AND OUTLET STRUCTURE

- 6.3.4.1 All reinforced concrete elements shall be constructed, measure and paid for under SANS 1200G: Concrete (Structural), as amended.
- 6.3.4.2 An outlet slab as detailed in the drawings shall be constructed at a position outside of the substation yard. The final position shall be such that storm water run-off shall not flow back towards the substation, but shall drain away from the substation freely.
- 6.3.4.3 The scheduled length of outlet in the bill of quantities is an estimated length and the final length of pipe required may vary from that scheduled due to the fact that the outlet position may vary.
- 6.3.4.4 The outlet pipe shall have a headwall and wing walls constructed prior to the outlet slab to protect the outlet pipe from damage. The headwall and wing walls shall be constructed as detailed on drawing D-FS-877 sheet 2 detail 6A and 6B.

6.3.5 OIL CUSHION

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- 6.3.5.1 Oil cushions shall be supplied and installed on the drain sump grating in order to intercept any possible oil that may have been in the containment area prior to the discharge of storm water.
- 6.3.5.2 The type and size of the cushions shall match the size of the drain sump.
- 6.3.5.3 The *Contractor* shall contact a supplier and provide the details of the proposed cushion to be installed prior for approval by the appointed Eskom Environmental Officer. Only once approval has been received shall the proposed oil cushion be ordered and installed.

PC 7 EARTHING

- 7.1 The transformer plinth and oil containment area shall be connected to the substation main earth mat as detailed in the drawings.
- 7.2 In order for the transformer to be connected to the earth mat Earthing Bolt assemblies shall be installed as detailed.
- 7.3 All Earthing shall conform to the D-DT-5240.

PC 8 CONSTRUCTION LEVELS

- 8.1 Construction levels will be set out as detailed in the drawing using the level control beacons / pegs provided on site.
- 8.2 The *Contractor* is to take note that the detailed drawings provide levels at an absolute elevation in order to illustrate the required minimum level differences and slopes. The *Contractor* shall use the information and the illustrated principle to set out the containment areas to the local survey elevations encountered on site.
- 8.3 The *Contractor* is shall indicate the proposed levels to the *Engineer* or *Clerk of Works* prior to setting out or construction activities commencing on the containment area in order to confirm that the planned levels are correct.

PC 9 CABLE RACKS

9.1 CABLE ENTRY

- 9.1.1 Cable entry shall be done through the containment area bund walls at positions as determined on site.
- 9.1.2 All cable entries shall be 80mm above the containment floor area.
- 9.1.3 All cable entry positions are to be sealed or chalked once the cable installations have been completed.

9.2 CABLE RACKS

- 9.2.1 Cable rack positions shall be as direct as possible avoiding unnecessary bends or direction changes. Refer to drawing D-DT-5231 SH 1C for proposed positions.
- 9.2.2 All cable racks shall be manufactured and installed as detailed in the drawings.
- 9.2.3 All cable racks shall be manufactured from mild steel and galvanized after manufacturing is completed.
- 9.2.4 All steel work shall be fabricated, erected and levelled to a tolerance of $\pm 1.5\text{mm}$.

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PC 10 MEASUREMENT AND PAYMENT

10.1 Scheduled items:

10.1.1 **Brickwork** Unit: m²

Separate items shall be scheduled for the varying wall thicknesses and type of bricks to be used for brickwork.

The unit of measurement will be the square meter (m²) area of the brickwork to be constructed as detailed in the drawings.

The rate shall include full compensation for all materials, labour, transport and equipment and plant required to construct brickwork as detailed on the drawings.

10.1.2 **Drain sump cover, Grating and Grating Support – D-DT-5231 SH1A**

a) Drain Sump Cover Unit: no

b) Grating A Unit: no

c) Steel support – flat bars Unit: kg

The unit of measurement for sub-items a) and b) shall be the number (no) of items as scheduled.

For sub-item c) the unit of measure shall be the kilogram (kg) of steel support flat bars required as detailed in the drawings.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, supply and install the scheduled items.

10.1.3 **Containment Area Trench Grating and Framework – D-DT-5231 SH1A**

a) Bolted Angle Iron Unit: kg

b) Embedded Angle Iron Unit: kg

c) Trench Grating Unit: no

Separate items shall be scheduled for the various sizes of gratings to be supplied and installed.

The unit of measurement for sub-items a) and b) shall be the kilogram (kg) of framework angle iron to be manufactured, fabricated, supplied and installed.

For sub-item c) the unit of measure shall be the number (no) of trench gratings to be supplied and installed as detailed in the drawings.

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The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, fabricate, supply and install the scheduled items.

10.1.4 Drain Sump Plumbing and Oil Cushion – D-DT-5231 SH1A

a) Sump Pipe..... Unit: no

The unit of measure shall be the number (no) of sump pipes to be installed complete , as detailed on the drawings.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, fabricate, supply and install the scheduled items.

b) Outlet Pipe Unit: m

The unit of measure shall be the metre length (m) of outlet pipes to be laid on Class B Bedding as per SANS 1200 DB and as detailed on the drawings.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, fabricate, supply and install the scheduled items.

c) Valve and Sensor..... Unit: no

The unit of measure shall be the number (no) of valves and sensors to be installed, as detailed on the drawings.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, fabricate, supply and install the scheduled items.

d) Electricity Supply to Valve

a. Supply and complete installation of electric supply to valve..... Unit: Sum
and sensor in accordance with SANS 10142

b. Test and Commissioning of Valve and Sensor Unit : no

c. Issue Certificate of Compliance (CoC) in terms Unit: Sum
of the SANS 10142

The unit of measure for sub-item 1) and 3) shall be the sum required to supply and install a complete electrical installation in terms of sub-item 1) and the sum required to prepare and issue the Certificate of Compliance for sub-item 3).

The unit of measure for sub-item 2) shall be the number (no) of valves to be tested and commissioned.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, fabricate, supply and install the scheduled items.

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- e) Oil Cushion..... Unit: no

The unit of measure shall be the number (no) of oil cushions to be supplied and installed, as detailed on the drawings.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, fabricate, supply and install the scheduled items.

10.1.5 Cable Racks

- e) Mounting Plates – D-DT-5231 SH1C..... Unit: no

Separate items shall be scheduled for the various mounting plates as per the detailed drawings.

- f) Cable Racks – D-DT-5231 SH1C Unit: no

Separate items shall be scheduled for the various lengths of cable racks as per the detailed drawings.

- g) Erection Bolts – D-DT-5231 SH1C Unit: no

Separate items shall be scheduled for the various bolts types, sizes and lengths as per the detailed drawings.

- h) Earthing of Cable Rack – D-DT-5231 SH1C Unit: no

Separate items shall be scheduled for the earthing of the cable racks as per the detailed drawings.

The unit of measurement shall be the number (no) of items to be supplied and installed as per the detailed drawings.

The rate shall include full compensation for all materials, labour, transport, equipment and plant required to order, manufacture, fabricate, supply and install the scheduled items.

10.1.6 Earthing

- f) Earthing Bolt Assembly – D-DT-5231 SH1A Unit: no

The unit of measure shall be the number (no) of earthing bolt assemblies supplied and installed, complete as detailed on the drawings.

The rate shall include full compensation for all labour, materials, transport, equipment and plant and any specialist sub-*Contractors* required to supply and install the earthing bolt assemblies, complete, as detailed on the drawings.

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10.1.7 Repair of existing Oil Dam

- a) Clearing of debris in oil damUnit:
m³
- b) Repairing of walls.....Unit:
m²
- c) Reinstating of fill in accordance with SANS 1200D: EarthworksUnit:
m³

The unit of measure for sub-item (a) shall be the square meter area of wall to be repaired in accordance to detailed drawings D-DT-5234.

The unit of measure for sub-item (b) shall be the cubic volume of fill layers to be reinstated at a maximum depth of 150mm layers. The quantities are to be measured in final compacted layers only.

The unit of measure for sub-item c) shall be the cubic volume of removed material measured in place prior to the removal thereof.

The rates are to include full compensation for all materials, labour, equipment and tools to work in restricted areas, transport and the making good of any damage to the oil dam during the reinstating of fill and removal of debris. The rates are to also included costs for spoiling the debris at registered dump sites should this be necessary.

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4. PE PARTICULAR SPECIFICATION : OH&S Specifications and Standards

PE 1 Constraints on how the *Contractor* Provides the Works

1.1 Constraints on how the *Contractor* Provides the Works

1.1.1 Quality Plan

- 1.1.1.1 The *Contractor* shall submit a quality plan indicating the control points for quality to ensure that the works are done according to specification.
- 1.1.1.2 The *Contractor* shall employ a competent Supervisor or Foreman on site for the duration of the project to implement workmanship quality checks.
- 1.1.1.3 Eskom shall do inspections and quality checks on installations completed by the *Contractor* prior to hand-over of each project.

1.1.2 Access to the site

- 1.1.2.1 The *Employer* shall provide the *Contractor* with an Access Certificate to formally provide access to the site and works implementation. Copy of the signed Access Certificate is to be kept on site for the duration of the project.

1.1.3 Interaction with Customers / Parties affected

- 1.1.3.1 The *Contractor* shall be responsible for negotiation with customers with regard to use of access routes on farms etc.
- 1.1.3.2 The *Contractor* shall be responsible for negotiation with land or business owners and / or the Local Authority with regard to the works.
- 1.1.3.3 The *Contractor* will be responsible for external disputes which may occur with regard to the works.
- 1.1.3.4 The *Contractor* is required to make all the necessary arrangements with the Local Authorities for road crossing structures and removal thereof, eg. Removal of pavements, thrust boring under roads, way leaves, etc.

1.1.4 Carrying out the works

- 1.1.4.1 The Scope of "Works" is an extension of the drawings, specifications and bills of quantities listed. The *Contractor* shall notify the *Employer* of any discrepancies before commencement of the works
- 1.1.4.2 The onus is on the *Contractor* to obtain the latest revision of standards applicable.
- 1.1.4.3 The *Contractor* is required to supply all material, labour, plant, equipment, loose tools, consumables and transport for the duration and completion of the project unless alternatively requested in the "Services Supplied - Section 5".
- 1.1.4.4 *Contractor* to provide summary of all costs for the execution of the works of the complete project.
- 1.1.4.5 The *Contractor* must immediately notify the *Employer* in writing of scope and site variations.
- 1.1.4.6 The *Contractor* will report all obstacles on site that could impact negatively on time and cost in writing to the *Employer*
- 1.1.4.7 *Contractor* to clear and de-establish total site on completion of proposed works.
- 1.1.4.8 *Contractor* is required to clear and cart away rubble and surplus works

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1.1.5 Clerk of Works (COW)

- 1.1.5.1 *Clerk of Works* has been appointed and will inspect Safety, Quality and Quantities. The COW is the Eskom *Representative* on site and his instructions must be followed. A COW inspection form will be completed on site. Should the team fail to comply with all the requirements, Clerks Of Works have all the rights to instruct that particular team to immediately vacate the site premises

1.1.6 Performance Management

- 1.1.6.1 The *Contractor's* Performance will be assessed in accordance with Eskom Performance Appraisal Process.

1.1.7 Health and Safety Management

- 1.1.7.1 The *Contractor* shall comply with:
- a) The Occupational Health and Safety Act, 1993, and all regulations made there under as per the standard clause A1, stipulated on page 4 of this contract.
 - b) The Construction Regulations, 2003.
 - c) The Health and Safety Requirements of the *Employer* more fully set out in Distribution Standards DISPVABF3 (The *Contractor* will sign the attached pages of the specification as acknowledgement of receipt and adherence) and SCSPVABN2.
 - d) All Eskom Safety and Operating Procedures as outlined in the ORHVS (Operating Regulations on High Voltage Systems) and the standards attached to this document.
 - e) The *Contractor* acknowledges that he is fully aware of the requirements of all of the above and undertakes to employ people who have been duly authorized in terms thereof and who have received sufficient safety training to ensure that they can comply therewith.
- 1.1.7.2 The *Contractor* undertakes not to do, or not to allow anything to be done which will contravene any of the provisions of the Act, Regulations or Safety and Operating Procedures
- 1.1.7.3 The *Contractor* shall ensure that a team member of the *Contractor* is authorized as a Responsible Person in terms of the ORHVS. This includes the completion of all the pre-authorization training required for ORHVS Responsible Person (at the *Contractor's* expense) as detailed in SCSPVBN2. The Responsible Person shall supervise the works at all times and be available to take permits where necessary.
- 1.1.7.4 The *Contractor* shall ensure that the Responsible person completes a training logbook (as per SCSPVBN2) and arrange with the appropriate Eskom *Representative* for evaluation of the authorized person prior to the Construction start date. This needs to be arranged by the *Contractor*.
- 1.1.7.5 The *Contractor* shall appoint a person who will liaise with the Eskom Safety Officer responsible for the premises relevant to this contract. The person so appointed shall:
- a) Supply the Eskom Safety Officer with copies of minutes of all Health and Safety Committee meetings (if relevant), on a monthly basis.
 - b) Supply the Eskom Safety Officer with copies of all appointments in respect of employees employed on this contract, in terms of the Act and Regulations and shall advise the Eskom Safety Officer of any changes thereto – to be handed over to the *Employer* prior to construction start.
- 1.1.7.6 Eskom may, at any stage during the currency of this agreement, be entitled to;
- a) Do safety audits at the *Contractor's* premises, its work-places and on its employees;

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- b) Refuse any employee, sub-*Contractor* or agent of the *Contractor* access to its premises if such person has been found to commit any unlawful act or any unsafe working practice or is found to be not authorized or qualified in terms of the Act
 - c) Issue the *Contractor* with a work stop order or a compliance order should Eskom become aware of any unsafe working procedures or conditions or any non-compliance with the Act, Regulations and Procedures referred to in 1 above by the *Contractor* or any of its employees, sub-*Contractors* or agents.
- 1.1.7.7 No extension of time will be allowed as a result of any action taken by Eskom in terms of the above and the *Contractor* shall have no claim against Eskom as a result thereof. Furthermore, no amendments to the Act or the Regulations or reasonable amendment to Eskom's Safety and Operating Procedures will entitle the *Contractor* to claim any additional costs incurred in complying therewith from Eskom.
- 1.1.7.8 An authorized Eskom *Representative* will be on site for regular site visits to monitor the *Contractor's* implementation of health, safety and quality Standards.
- 1.1.7.9 The works to be enclosed with chevron barricade tape supplied and installed by the *Contractor* and set out by the *Employer*.
- 1.1.7.10 The *Contractor* shall be responsible for all expenses incurred to ensure adherence to Health and Safety Regulations as stipulated above which includes but is not restricted to ORHVS training courses, etc.
- 1.1.7.11 The *Contractor* shall adhere to the Standard on Working Clearances at MV Structures with pole-mounted auxiliary equipment as attached to this contract.
- 1.1.7.12 The *Contractor* shall comply with all the requirements of the CONSTRUCTION REGULATIONS.
- 1.1.7.13 Please Note: (Before carrying out work, *Contractor* to notify the provincial director in writing of the construction work if it is exceeding the limits as listed in the Construction Regulations)
- 1.1.7.14 It is an Eskom requirement that the *Contractor* shall use a Fall Arrest System (FAS) as defined in the Construction Regulations whenever a risk of falling exists. The *Contractor* shall adhere to the applicable standards and procedures attached to this contract.

Typically, the following identified risks could endanger the work constructed by the *Contractor*. The *Contractor* should identify mitigation actions for these risks, as well as identify any additional risks and notify the *Employer*.

Typical Risk	Yes/No
Live underground cables	Yes
Work in live chambers/restricted areas	Yes
Live overhead conductors/crossings	Yes
Close proximity work to live equipment	Yes
Work in elevated positions/on ladders/from crane buckets	Yes
Operating of cranes/vehicle mounted	Yes
Static electricity/induction , step potential etc	Yes
Work with chainsaws/mechanical cutters	Yes
Materials handling/ heavy equipment handling	Yes
Conductor stringing and tensioning	Yes
Vehicle risks	Yes
Work in open trenches/excavations	Yes
Biological/Health risks (camps)	Yes
Weather related risks (UV, heat, cold)	Yes
Environmental risks	Yes
Ergonomic risks (body position, fatigue)	Yes
Work on/dismantling of rusted & rotten poles and structures	Yes
Fire risks	Yes

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Typical Risk	Yes/No
Public safety risks	Yes

1.1.8 Construction Safety

- 1.1.8.1 The *Contractor* shall be responsible for ensuring that all equipment supplied and used and all work carried out under this contract shall be in accordance with the Occupational Health and Safety Act (Act 85 of 1993) and regulations remaining in force, as may be amended from time to time.
- 1.1.8.2 In addition, the *Contractor* shall comply with other Safety application provisions of Government, Provincial, Municipal Safety Laws, Building, Construction, Electricity Regulations and Eskom Distribution Standards.
- 1.1.8.3 The *Contractor* shall accept full responsibility for the means, methods, sequence or procedures of construction for safety precautions or programmes incident to the work of the *Contractor*.
- 1.1.8.4 The *Contractor* is required to submit a working methodology statement with regards to the Safety Standards while working within hazardous areas such as live substations or in close proximity of energized apparatus.
- 1.1.8.5 The *Contractor* shall indemnify the *Employer* and the *Engineer* against responsibility for safety on the site of the works.
- 1.1.8.6 The *Contractor* shall enter into an agreement to complete the work required for the construction of the works in accordance with the provisions of all pertinent legislation and in particular with the provisions of the Occupational Health and Safety Act (Act 85 of 1993) and the regulations promulgated there under.
- 1.1.8.7 Reference of the Safety Methodology Statement can be found in the Government Occupational Health and Safety Act (Act 8 of 1993) and Construction Regulations Document which is available publicly.
- 1.1.8.8 The safety of the *Contractors* personnel and employees acquire precedence over the construction works.
- 1.1.8.9 *Contractor* to assess and make provision for security services to protect the demolished material should the need arise

1.1.9 Compensation for Occupational Injury and Diseases Act

- 1.1.9.1 The *Contractor* shall submit with his tender proof of adherence to the above act.
- 1.1.9.2 General Environmental Management Requirements
- 1.1.9.3 The *Contractor* shall receive an Environmental Management Plan –EMP (normally as part of the DESD) and must adhere to all its requirements.
- 1.1.9.4 *Contractor* to provide toilet facilities, water and electricity.
- 1.1.9.5 All environmental legal Liabilities and claims arising from the negligent activities of the *Contractor* shall be for the *Contractors* expense.
- 1.1.9.6 The *Contractor* shall have an understanding of Eskom's basic environmental principles and commitments (covered during Eskom Environmental Law Course)

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2. Drawings

Detail Drawings		
Drawing no	Sheet	Title
D-DT-5237	1-9	FENCING
0.54/8282	-	NON-LETHAL ELECTRIFIED FENCING
D-DT-5238	1 – 16	BUILDINGS
D-DT-5239	1 – 4	BUILDINGS
D-DT-5240	1 – 21	EARTHING
D-DT-5231 / 5232 / 5233 / 5236	ALL	TRANSFORMER PLINTHS AND RELATED
D-DT-5234	1 – 9	OIL DAMS
D-DT-5233/41	1 – 2	OIL CONTAINMENT - OIL DAM
D-DT-5252 /5257/5260/5265	-	COLUMNS AND BEAMS
D-DT-5245 / 5247	-	CIVILS: KERBING, TRENCHING, LV CABLE CROSSING, GATE RAMPS
D-DT-5273 / 5274	1 – 4	LABELS AND SIGNS
D-DT-5275	-	FIREWALL (BRICK)
Project Specific Drawings		
Drawing no	Sheet	Title
D-FS-13574	ALL	ROUXVILLE 66/22 kV SUBSTATION
D-FS-18174	01-08	ROUXVILLE 66/22 kV SUBSTATION – CIVIL WORKS DRAWINGS

3. Specifications

Title	Date or revision
OCCUPATIONAL HEALTH AND SAFETY STANDARD FOR <i>CONTRACTORS</i> AND <i>SUBCONTRACTORS</i> WORKING FOR ESKOM	DISPVABF3
PROCEDURE FOR REFUSAL TO WORK ON GROUNDS OF HEALTH AND SAFETY	SCSPVABP6 REV 0
<i>CONTRACTOR</i> HEALTH AND SAFETY PLAN – TO BE COMPLETED AND SUBMITTED AT TENDER STAGE	
CONSTRUCTION, SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT IN ESKOM	EPC 32-136 REV0
ACKNOWLEDGEMENT OF OCCUPATIONAL HEALTH AND SAFETY STANDARD FOR <i>CONTRACTORS</i> AND <i>SUBCONTRACTORS</i> WORKING FOR ESKOM	
GOVERNMENT OCCUPATIONAL HEALTH AND SAFETY ACT – CONSTRUCTION REGULATIONS	PUBLICLY AVAILABLE
TRAINING, TESTING AND AUTHORIZATION OF PERSONS FOR THE OPERATION AND MAINTENANCE OF THE POWER SYSTEM	SCSPVABN2
THE TRAINING LOGBOOKS FOR AUTHORIZATION OF PERSONS FOR HIGH-VOLTAGE	SCSAMAEE5 REV 1
PROCEDURE TO FOLLOW WHEN THE INTEGRITY OF EARTH CONTINUITY CONDUCTORS CONNECTING APPARATUS TO THE EARTH MAT IS SUSPECT	SCSPVABFO REV 0
IDENTIFYING, ANALYSING, DOCUMENTING AND OBSERVING DANGEROUS / HAZARDOUS TASKS	SCSPVACKO REV 0
REPORTING, RECORDING AND INVESTIGATION OF INCIDENTS	ESKPVABN9 REV 1

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Detailed Specifications Rouxville Substation 66/22kV New Transformer Bay

Unique Identifier:

NW-STM-1606-2731

Revision:

0

Page:

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Title	Date or revision
PROCEDURE FOR BARRICADING	SCSPVABF4 REV 0
STANDARD FOR THE CONTROL AND APPLICATIONS OF MASTER LOCKS AND ISSUE OF MASTER KEYS	SCSASAAU1 REV 0
ROUTINE INSPECTIONS OF ELECTRICAL EQUIPMENT	SCSASABA8 REV 0
CLEARING AND MAINTENANCE OF SERVITUDE ROUTESSCSASAAZ9 REV 0 TRAINING, TESTING AND AUTHORIZATION OF PERSONS FOR THE OPERATION AND MAINTENANCE OF THE POWER SYSTEM	SCSPVABN2 REV 0
STANDARD APPLICABLE TO <i>CONTRACTORS</i> WORKING IN CLOSE PROXIMITY TO LIVE APPARATUS	SCSASAAW8 REV 1
PROCEDURE FOR THE IDENTIFICATION OF RISK PRIOR TO THE COMMENCEMENT OF WORK	SCSPVABB2 REV 1
STANDARD FOR THE USE OF EQUIPOTENTIAL EARTH FOOTPLATES	SCSASAAU5 REV 0
MV AND LV POLE IDENTIFICATION	SCSASABZ5
ACCESS TO FARMS	DGL_34-190
BUSINESS CONDUCT POLICY AND GUIDELINES	ESKPBAAN4 REV1
LOCAL STANDARD FOR THE OPERATING OF HIGH CUTTER / CHAIN SAW	NETOM7 REV 0
RELEVANT STANDARDS AS LISTED IN THE DOCUMENT CALLED THE DESIGN DOCUMENT	
PROCEDURE FOR THE REPORTING ,INVESTIGATION ,COSTING AND FOLLOW UP ON INCIDENCES VACCIDENTS	DPC -34-350
ENVIRONMENTAL LIAISON COMMITTEE (ELC) PERFORMANCE INDICATOR REPORTING PROCESS	EPC -32 -249
SAFETY ,HEALTH AND ENVIRONMENTAL POLICY	EPL 32-94
EMP GUIDELINE	EPC 32-248
WASTE MANAGEMENT PROCEDURE	EPC 32-245
PROCEDURE FOR CLEARING VEGETATION AND MAINTENANCE WITHIN OVERHEAD POWERLINES	EPC 32-247
HERBICIDES MANAGEMENT	ESKPBAAD4
ESKOM STANDARD ON THE SAFE USE OF PESTICIDES AND HERBICIDES	ESKASAA0
RECOMMENDED HERBICIDES	DISTIZAB4

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C4 Site Information

C4.1 Information about the site at time of tender which may affect the work in this contract

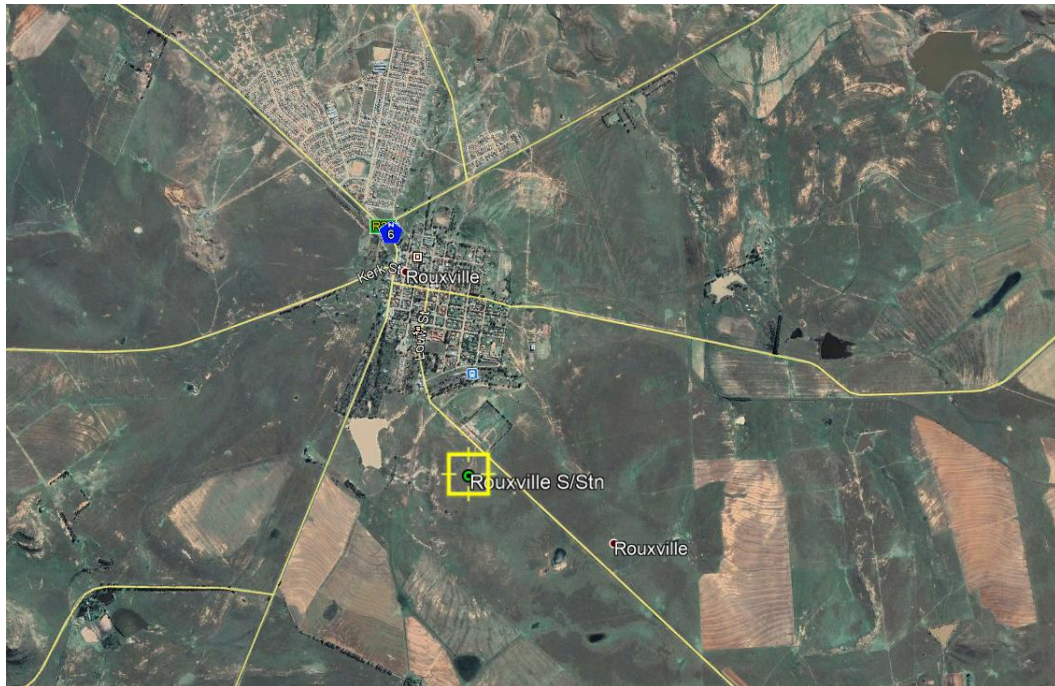


Figure 1: Rouxville 66/22kV Substation Locality

C4.1.1 Access limitations

Arrangements shall need to be made with the local CNC supervisor prior to any access to site.

C4.1.2 Ground conditions in areas affected by work in this contract

Various Soil conditions to be determined by Contractors Civil Engineer

C4.1.3 Hidden and Other Services within the Site

The risk for encountering hidden cables is high from inspections on site and thus the Contractor shall check and confirm any services prior to any construction activities commence.

C4.1.4 Details of Existing Buildings / Facilities Which Contractor is required to Work On

The Rouxville Substation and the Control Room. Also to note are the Asbestos Containing Cable Trench Covers which shall be disposed of.

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