
	NEC3 <i>Engineering</i> and Construction Detailed Specifications	Distribution
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Title:	Sasol Chem 88/11 kV Substation Breaker Room - New Cable Trench and Related Works – Detailed Specifications for Civil Works	Unique Identifier:	I.DOF2019.A.SS .09
		Alternative Reference Number:	N/A
		Area of Applicability:	<i>Engineering</i>
		Documentation Type:	Detailed Specifications
		Revision:	0
		Total Pages:	69
		Next Review Date:	N/A
		Disclosure Classification:	CONTROLLED DISCLOSURE

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C3 SCOPE OF WORK

C3.1 Works Information - Civil Works

C3.1.1 Description of the Works

Substation Breaker Room:

The building on which the works are to be constructed is the building located adjacent to Transformer bay 2A.

The works to be constructed shall include the following:

The existing floor and existing cable trenches shall be completely be demolished. The existing window frames shall also be removed and disposed of.

The area below the existing floor shall be excavated to the required levels as per the detailed drawing. The insitu base of the excavation shall be level and compacted to 90% of modified AASHTO density. The foundations on the substation side of the existing breaker room shall be exposed. The position of the new cable entry culverts shall be determined as per the detailed drawings.

A concrete lintel shall be installed in the building walls above the top of the culverts. The necessary building props, capable of withstanding the imposed loads, shall be installed and the sections of the existing foundations cut and removed. The foundation sections which need to be removed shall be cut using a suitable concrete cutter, at dimensions wider than the culvert to and precast culvert base slab overall dimensions to provide the required workspace.

The excavation for the precast culvert base slab, shall be 75mm lower than on the drawings and backfilled with fine selected granular material as per SANS 1200LE. The culvert shall extend into the new cable trench and shall be cast into the walls of the new cable trench.

All spaces between the new culverts and the existing building foundations and the building walls shall be filled with 15 MPa concrete.

A damp-proof membrane shall be placed below the new concrete cable trench and floor prior to casting. Steel formwork, with a smooth surface finish, shall be used to cast the new concrete cable trench using 25MPa concrete. The new cable trench shall be to the dimensions as detailed in the drawings. The required steel reinforcing shall be placed as per the detailed drawings using the required spacers to ensure stability and to maintain the required minimum concrete cover.

The required supports for the breaker panel base frames shall be constructed / cast as per the dimensions on the detailed drawings. Space for two additional base frames has been provided on either side of the breaker panels. This is to make provision for access space to the cable trench below the newly installed breaker panels. The additional base frames shall need to be manufactured and supplied by the Contractor as per the detailed drawing with additional checker plates installed to cover any openings in the standard base fame.

The new breaker room floor shall be cast using 30MPa as per the detailed drawings and shall be level in all directions with a high degree of accuracy due to the requirements of the MV breakers.

The floor shall have a cementitious floor hardener applied the new floor as per the requirements of the manufacturer. The completed floor shall be painted with a heavy industrial wearing floor paint as soon as working the breaker room has been completed.

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The widows which have been removed shall be closed using masonry brick with the same wall construction as that of the existing building. The newly placed bricks shall be plastered, primed and the entire room re-painted.

A 152 x 89 x 16 structural steel I-Beam shall be built into the existing walls just below the ceiling level. The I-beam shall run for the entire length of the building as per the drawings. From this I-beam a new ladder type cable rack shall be suspended. The cable ladder shall be suspended from the I-beam with a 50 x 50 x 5 angle iron bracket. The ladder shall also be supported by a 50 x 50 x 5 angle iron below the cable ladder. The two angle irons shall be suspended by means of a M12 threaded rod. Refer to the detail drawings for more details. The top angle iron shall be welded to the top of the I-beam prior to installation and painting. The I-beam and angle iron support brackets shall be installed below the ceiling level.

A masonry cable duct shall be constructed on the outside of the building where the control cable shall enter and exit the building. The cable duct shall be constructed complete with wooden frame and fibre cement covers as per D-DT-5239 Sheet 04.

The existing cable trenches in the substation yard shall be extended adjacent to the opening of the furthest cable entry culvert. The cable trench shall be constructed, complete as per drawing D-FS-887 Sheet 1, Detail 1, 3 and 5. The cable trench shall be tied-in with a mass concrete trench to the culvert opening below ground.

A complete electrical installation in the building shall be required with four light fittings inside the building and two external light fittings at each access door. Three plug socket outlets shall also be installed. The required sub-distribution board with the required circuit breakers shall also be installed.

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 Sasol Chem substation:

- i) Demolition and disposal of the existing breaker room floor.
- ii) Excavation, compaction, and casting of new concrete cable trench.
- iii) Excavation and installation for new cable entry culverts.
- iv) Construction of new 30MPa Concrete floor.
- v) Installation of new I-Beam, cable rack support brackets and ladder type cable rack.
- vi) Removal and disposal of the existing breaker room windows.
- vii) Closing of widow openings with masonry construction, plastering and painting.
- viii) Construction of masonry cable duct o the building exterior.
- ix) Electrical and lighting installation for the existing relay room.
- x) Construction of cable trenches in the substation yard.

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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 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

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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 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

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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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C3.5 STANDARD SPECIFICATIONS

C3.5.1 LIST OF SANS 1200 SERIES STANDARDISED SPECIFICATIONS..... 14

C3.5.2 VARIATION AND ADDITIONS TO STANDARDIZED SPECIFICATIONS 16

C3.5.1 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 Sub- <i>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)
D-DT-5240		Earthing Standard
		EMP for this project

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C3.5.2 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	24
5.	SANS 1200G: CONCRETE STRUCTURAL	33
6.	SANS 1200LB : BEDDING (PIPES)	46
8.	SANS 1200LE : STORMWATER DRAINAGE	47

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.

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

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- 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:

- 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.

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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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5. 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/TAP Alliance for its approval, samples 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

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writing the aforesaid materials.

VA-G 3.2 CEMENT

VA-G 3.2.2 Alternative Types of Cement

Delete this clause and replace with:

a) 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 the following cements or blends of cements as constituting the cementitious portion of the concrete mix.

i) Ordinary Portland Cement (OPC)

ii) Portland Cement 15 (PC 15)

In such case the use of other cements or cement blends may be permitted only on the written approval of the PE/TAP Alliance.

b) Where the aggregates have been shown in terms of clause VA-G 3.1 to have a potential for Alkali-Silica Reaction the concrete shall be manufactured using:

i) Low Alkali OPC which will fulfil the requirements of Clause VA-G 5.5.1.7 or

ii) PBFC or a 50:50 blend of OPC and Slagment or

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:

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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:

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.

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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

b) 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.

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*.

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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:

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

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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:

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*.

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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.
- 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.

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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 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.

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Add new clause:

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.

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

Delete and replace with:

- a) All elements except Transformer Plinths 3mm

- b) Transformer Plinths 2mm

- ii) Abrupt changes in a continuous surface

Add:

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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

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

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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.

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

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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 transformer plinth complete with
Bund wall and drainage system as indicated:***

(a) Normal entrance:

- 1) 5 – 20 MVA D-DT-5231 sheet 1 Unit: no
- 2) 20 – 40 MVA D-DT-5232 sheet 1 Unit: no
- 3) 40 – 80 MVA D-DT-5236 sheet 1 Unit: no

(b) Side entrance:

- 1) 5 – 20 MVA D-DT-5231 sheet 2 Unit: no
- 2) 20 – 40 MVA D-DT-5232 sheet 2 Unit: no
- 3) 40 – 80 MVA D-DT-5236 sheet 2 Unit: no

The unit of measure shall be number of transformer plinths and bundwalls constructed complete as indicated on the drawings.

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

VA-G 8.10 *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 D-FS-887 sheet 1 Unit: m

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

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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.

VA-G 8.11 Repair of existing Oil Dam Walls and reinstating fill

- (a) Repairing of walls Unit: m²
(b) Reinstating of fill Unit: m³
(c) Clearing of debris in oil dam Unit: 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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6. 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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C3.6 Particular Specifications

Particular specifications are given in the following sections.

1.	PB PARTICULAR SPECIFICATION: BUILDING WORK.....	50
2.	PZ PARTICULAR SPECIFICATION : OH&S SPECIFICATIONS AND STANDARDS	63

1. 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. Eskom Accepted cementitious dry shake surface 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 REF 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 an Eskom accepted transparent floor 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 brandering 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 600m 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 bu 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® tp be on external skin of wall, facing outwards.
- 11.3.** Winlouvre® WL (A)66 fitted with nat anodized aluminium louveres externally.
- 11.4.** Burglar bars to be 20m 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 of an Eskom accepted durable PVA. 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. Floor primer be a 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 withstand 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 220V 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 220V, 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, Storeroom 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. Construction of control building complete as indicated Unit: m² on drawing D-DT-5239,m long.

The unit of measurement will be the square meter area of the variable length control room building, complete as indicate in the standard drawings. The final length of the building is to be indicated.

The rate is to include the cost of procurement of all the required materials, transport, labour, equipment and finishing, complete as indicated on the standard drawings.

22.1.2. Construction of switchgear building complete as indicated Unit: m² on drawing D-DT-5238,m long.

The unit of measurement will be the square meter area of the variable length switchgear building, complete as indicate in the standard drawings. The final length of the building is to be indicated.

The rate is to include the cost of procurement of all the required materials, transport, labour, equipment and finishing, complete as indicated on the standard drawings.

22.1.3. 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

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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.

22.1.4. Control / Relay Room Building Refurbishment or Extension:

- a) Masonry Unit: m³

Separate items as scheduled

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

Separate items as scheduled

- c) Floors 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.

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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 Sheetting Unit: m²

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

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 sheetting 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 rainwater 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.

e) Structural I-Beam for Cable Rack Support

- 1) Supply and installation of I-Beam, XXX x XXX x XXX of nominal length of XXm Unit: no

The unit of measure shall be the number (no) structural I-Beams supplied and installed as per the project drawings.

The tendered rate shall include full compensation for, all labour, all materials, all transport and all plant and equipment required to supply, deliver, and install the scheduled structural element in accordance with the detailed drawings.

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- f) Installation of temporary building support props Unit: no

The unit of measure shall be the number (no) of temporary building support props to be installed to support the building during the installation of other permanent works.

The tendered rate shall include full compensation for, all labour, all materials, all transport and all plant and equipment required to supply, deliver, and install the temporary building support props.

- g) Manufacture, supply, and installation of additional cable trench support Unit: no
base frames as per Drawings CORP 2826 A002. Supplied complete
with mounting bolts and additional checker plate covers.

The unit of measure shall be the number (no) of base support frames manufactured, supplied, and installed.

The tendered rate shall include full compensation for, all labour, all materials, all transport and all plant and equipment required to supply, deliver, and install the additional support base frames.

22.1.5. 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

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

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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.

22.1.6. Repair of existing Control Room and Relay Room:

- a) Water proofing and sealing of roof..... Unit: m²

- b) Clean, prime and paint roof..... Unit: m²

- c) Repair of existing Control Room / Relay Room Door Unit: no

- d) Replacement of Control Room / Relay Room Door Unit: no

- e) Remove and replacement of existing Control Room / Unit: m
Relay Room Door roof gutters

- f) Control / Relay Room Roof

- 1) Roof Trusses and battensUnit: sum

Separate items as scheduled

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2) Roof Sheetting Unit: no

Separate items as scheduled

3) Brandering, Ceiling and Roof Insulation Unit: m²

Separate items as scheduled

g) Control / Relay Room Wall and Wall Finishes Unit: m²

Separate items as scheduled

h) Control / Relay Room Floor and Floor Finishes Unit: m²

Separate items as scheduled

i) 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 unit of measurement will be as scheduled above. Reference is to be made to the standard substation Control Room / Relay Room drawings for details.

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

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2. PZ PARTICULAR SPECIFICATION : OH&S SPECIFICATIONS AND STANDARDS

PZ 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	No
Close proximity work to live equipment	No
Work in elevated positions/on ladders/from crane buckets	No
Operating of cranes/vehicle mounted	No
Static electricity/induction , step potential etc	Yes
Work with chainsaws/mechanical cutters	No
Materials handling/ heavy equipment handling	Yes
Conductor stringing and tensioning	No
Vehicle risks	Yes
Work in open trenches/excavations	Yes
Biological/Health risks (camps)	No
Weather related risks (UV, heat, cold)	Yes
Environmental risks	No
Ergonomic risks (body position, fatigue)	Yes
Work on/dismantling of rusted & rotten poles and structures	No
Fire risks	No

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Typical Risk	Yes/No
Public safety risks	No

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-FS-887	1	DETAIL 1, 3, 5 – CABLE TRENCHES
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	1 – 2	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-18176	1-2	SASOL CHEM 88/11KV SS BREAKER ROOM FLOOR AND CABLE TRENCH MODIFICATION

3. Specifications

Title	Date or revision	Tick if publicly available
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	SCSAMAAE5 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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Title	Date or revision	Tick if publicly available
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 CONTRACTORS 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 INCIDENTS ACCIDENTS	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: Substation Locality

The substation is located adjacent to the Omnia Fertilizer truck staging area. It is approximately 3.8km east of the Sasolburg CBD.

C4.1.2 Access limitations

Arrangements shall need to be made with the local CNC supervisor prior to any access to site.

C4.1.3 Ground conditions in areas affected by work in this contract

Various Soil conditions to be determined by Contractors Civil Engineer

C4.1.4 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 commencing.

C4.1.5 Details of Existing Buildings / Facilities Which Contractor is required to Work On

Sasol Chem Substation Breaker Room.

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