
CIVIL WORKS PANEL TECHNICAL SPECIFICATION

MAIN CIVIL & BUILDING WORKS

**CIVIL WORKS PANEL
PART 1: SPECIFICATIONS**

**SECTION 1
STANDARDISED SPECIFICATION APPLICABLE TO THIS CONTRACT**

PART 1 : SPECIFICATIONS

SECTION 3 : STANDARDISED SPECIFICATIONS APPLICABLE TO THIS CONTRACT

1.1 LIST OF SABS 1200 SERIES STANDARDISED SPECIFICATIONS

The following SABS 1200 Standardized Specifications are applicable to this contract.

(Note: These are not issued with the enquiry document copies may be obtained from SANS, Private Bag X191, Pretoria, 001)

1200	A	General
1200	C	Site Clearance
1200	D	Earthworks
1200	DB	Earthworks (Pipe Trenches)
1200	DM	Earthworks (Road, Subgrade)
1200	G	Concrete (Structural)
1200	HA	Structural Steelwork (Small Works)
1200	H	Structural Steelwork
1200	L	Medium Pressure Pipelines
1200	LB	Bedding (Pipe)
1200	LC	Cable Ducts
1200	LD	Sewers
1200	LE	Stormwater Drainage
1200	MJ(C)	Segmented Paving
1200	MK	Kerbing and Channeling

1.2 BUILDING WORKS SPECIFICATION

The specification for building works shall comprise of SANS 10400 and The National Preambles for Trades. All other specifications are detailed on the specific building drawings for this project.

1.3 VARIATIONS AND ADDITIONS TO STANDARDISED SPECIFICATIONS

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

1.4 INTERPRETATION

1.4.1 In all Specifications

- a) Wherever reference is made to “Electricity Supply Commission” it shall be taken as “Eskom”.
- b) Wherever the term “The Engineer” is used, it shall be read to mean “Eskom” as defined in clause 1 of the General Conditions of Contract.
- c) Wherever the term “The Project Manager” is used it shall be read to mean “Eskom’s Project Manager” as defined in clause 1 of the General Conditions of Contract.
- d) Wherever the term “The Supervisor” is used it shall be read to mean “Eskom’s Representative” as defined in clause 1 of the General Conditions of Contract.

1.4.2 In all SANS 1200 Series Standardized Specifications

- a) In clause 2.1 “Supporting Specifications”

Wherever the term “Project Specification” is used it shall be read to Mean: “part 2 - Specifications”.

- b) In clause 2.2 - Application

The words “in Portion 2 of the Project Specification which proceeds this specification in the contract document” shall be read to mean “in part 2 - specification”.

- c) In all other clauses wherever the term “Project Specification” is used, it shall be read to mean “Specifications”.

SECTION 2 SANS 1200 A (1986) GENERAL

VA-A 2 INTERPRETATIONS

VA-A 2.8 ITEMS IN SCHEDULE OF QUANTITIES

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 2.9 MAINTENANCE

On completion of the Works and for a period of time stipulated in the Contract, Eskom shall be responsible for routine maintenance, while the Contractor shall be responsible for the rectification or repair of all defects, imperfections, shrinkages or other faults as described in clause 49 of the General Conditions of Contract.

VA-A 3 MATERIALS

VA-A 3.1 QUALITY

Add:

The Contractor shall at his own expense supply and provide all the Constructional Plant, Temporary Works, materials for both temporary and permanent works, labour and supervision, transport to or from the site and in and about the Works and everything required for the construction, completion and maintenance of the Works. The Contractor shall ensure that all the preceding constituent parts of the Works are to the standard and quality elsewhere specified in these documents or where not specified to the highest quality available and shall also ensure they are suitable for purpose intended by the Employer.

The Contractor shall be responsible for the strength and quality of all materials used and workmanship employed and for the stability of the permanent works and the temporary works and the fact that the Employer has not objected during the construction period to any materials and/or workmanship employed by the Contractor and even though such materials and/or workmanship has been inspected by the Supervisor shall not relieve the Contractor of such responsibility.

All work shall be carried out in accordance with Eskom's quality requirements as set out in this contract.

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 as specified. The employer's representative approval shall be obtained for any departure from this specification.

VA-A 5 CONSTRUCTION

VA-A 5.1 SURVEY

Add a new clause:

VA-A 5.1.3 Provision of Survey Instruments

The Contractor shall supply and keep continuously on

Site a level, staff, steel tapes, ranging rods and survey instruments in good working order, maintained in proper adjustment. These shall be made available free of charge for the Supervisor's use at all reasonable times, together with two survey assistants.

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

ADD:

Adequate prior notice in writing 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:

Refer to project EMP.

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 employer's representative and the Local Health Regulations. This shall apply to transportation, storage and operation of the equipment.

VA-A 5.8 *ROUND AND ACCESS TO WORKS*

Delete this clause.

Add new clauses:

VA-A 5.9 *SITE LEFT CLEAR*

At all times prior to the completion of the Works and including the period of maintenance the Contractor shall be solely responsible for maintaining the site in a clean, tidy and safe condition to the satisfaction of the Supervisor and is deemed to have made due allowance in the contract prices therefore. Eskom shall be entitled to instruct the Contractor at any time to remove any excess materials, debris, rubbish and the like from the site and the Contractor shall forthwith comply with such instructions and at no extra cost to the Employer.

On completion of the Permanent Works the Contractor shall, at his own expense, remove all surplus excavated materials, debris, unused materials, temporary erections and plant save that required for maintenance work which shall be removed, as aforesaid, on completion of the whole of the Works. However, no appliances, guards or other things provided in presence of the Machinery and Occupational Safety Act, or for securing the safety of persons may be removed if such removal constitutes a change to the safety of persons.

Refer to project EMP.

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 7 ***TESTING***

Add new clause:

VA-A 7.5 ***CONTROL TESTS***

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

- a) by the Employer if the result 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.

SECTION 2 : SANS 1200C (1980) SITE CLEARANCE

VA-C 1 SCOPE

VA-C 1.1 Add:

- This specification covers the demolition and material recovery plan .

VA-C 2.3 DEFINITIONS

Add:

- Demolition and recovery plan. A drawing that indicates all the various types of demolitions or removals of the material .and the disposal or recycling thereof.

VA-C 3 Delete: Material obtained.....in terms of the act.

And replace with:

All spoil material shall be disposed of at registered dumps as per EMP for this project.
All haul will be free haul.

Add:

Materials removed from demolitions shall be re-used, disposed of, or recycled as follows:

A: Materials to be used for crushing:

- Masonry,
- Concrete kerbs,
- Roof tiles,
- Paving bricks and
- Foundations.

B: Materials to be recycled and/or spoiled:

- Glass windows,
- Tree stumps,
- Precast walls,
- Trusses and flooring,
- Timber,
- Steel window frames and gutters,
- Diesel bowser,
- Underground diesel tank,
- Palisade fencing,
- Telephone cables and
- Streetlights.
- Asbestos Fascia Boards

VA-C 5.8 Add:

Rodent extermination must commence prior to demolition.

Use neither dynamite, nor powder on site and do no blasting.

No combustible material shall be permitted to accumulate on site. If in the opinion of the environmental officer that the site is becoming a fire hazard, the activities on site can be stopped immediately.

Demolition work must be done in accordance with Occupational Health and Safety Act Paragraph 12:

- 1.) *A contractor shall appoint a competent person in writing to supervise and control all demolition work on site.*
- 2.) *A contractor shall ensure that prior to any demolition work being carried out, and in order to ascertain the method of demolition to be used, a detailed structural engineering survey of the structure to be demolished is carried out by a competent person and that a method statement on the procedure to be followed in demolishing the structure is developed.*
- 3.) *During demolition, a competent person shall check the structural integrity of the structure at intervals determined in the method statement contemplated in sub regulation (2), in order to avoid any premature collapses.*
- 4.) *Every contractor that performs demolition work shall –*
 - a.) *with regard to a structure being demolished, take steps to ensure –*
 - i.) *no floor, roof or other part of the structure is overloaded with debris or material in a manner which would render it unsafe;*
 - ii.) *all reasonably practicable precautions are taken to avoid the dangers of the structure collapsing when any part of the framing of the framed or partly framed building is removed, or when reinforced concrete is cut; and*
 - iii.) *precautions are taken in the form of adequate shoring or such other means as may be necessary to prevent the accidental collapse of any part of the structure or adjoining structure;*
 - b.) *not require or permit any person to work under overhanging material or structure, which has not been adequate supported, shored or braced;*
 - c.) *take steps to ensure that any support, shoring or bracing contemplated in paragraph (b), is designed and constructed so that it is strong enough to support the overhanging material;*
 - d.) *where the stability of an adjoining building, structure or road is likely to be affected by demolition work on a structure, take such steps as may be necessary to ensure the stability of such structure or road and the safety of persons;*
 - e.) *ascertain as far as reasonably practicable the location and nature of electricity, water, gas or other similar services which may in anyway, be affected by the work to be performed, and shall before the commencement of demolition work that may affect any such service, take the steps that may be necessary to render circumstances safe for all persons involved;*
 - f.) *cause every stairwell used on every floor where work is being performed in a building being demolished, to be adequately illuminated by either natural or artificial means;*
 - g.) *cause convenient and safe means of access to be provided to every part of the demolition in which persons are required to work; and*
 - h.) *erect a catch platform or net above and entrance or passageway or above a place where persons work or pass under, or fence off the danger area if work is being performed above such entrance, passageway or place so to ensure that all persons are kept safe where there is a danger or possibility of persons being struck by falling objects.*
- 5.) *A contractor shall ensure that no material is dropped to any point, which falls outside the exterior walls of the structure, unless the area is effectively protected.*
- 6.) *Waste and debris shall not be disposed from high place by a chute unless the chute –*
 - a.) *Is adequately constructed and rigidly fastened;*
 - b.) *If inclined at an angle of more than 45 degrees to the horizontal, is enclosed on its four sides;*
 - c.) *If of the open type, is inclined at an angle of less than 45 degrees to the horizontal;*
 - d.) *Where necessary, is fitted with a gate at the bottom end to control the flow of material; and*
 - e.) *Is discharged in a container or an enclosed area surrounded by barriers.*
- 7.) *A contractor shall ensure that every chute used to dispose of rubble is designed in such a manner that rubble does not free-fall and that the chute is strong enough to withstand the force of the debris travelling along the chute.*

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VA-C 8.2.8 *Demolish and remove structures - n/a.*

* Brickwork and concrete are to be measured in cubic meters in place and will be scheduled separately.

The rate shall cover the cost of splicing the fencing wires and joining the mesh with stainless steel clips, of reconnecting any electrical cables or fittings and all other operations necessary to restore the security fences to working condition.

SECTION 2 SANS 1200 D (1988) EARTHWORKS

VA-D 2 INTERPRETATIONS

VA-D 2.3 DEFINITIONS

Restricted excavation

Add:

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

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

VA-D 5.1 PRECAUTIONS

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

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 5.2.5 Transport for Earthworks

VA-D 5.2.5.1 Freehaul

Delete this clause and substitute the following:

All haul shall 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 test 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.

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 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 days 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) Testing shall be in accordance with the applicable requirements of TMH 1: Technical Methods for Highways (1986) (Standard methods of testing road construction materials).

VA-D 8 *MEASUREMENT AND PAYMENT*

VA-D 8.1 *BASIC PRINCIPLES*

Add new clauses:

VA-D 8.1.5 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*

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 8.3.6 *Overhaul*

Delete.

Add new clauses:

All haul is to be deemed free haul.

SECTION 2 SANS 1200 DB (1989) EARTHWORKS (PIPE TRENCHES)

VA DB 3 MATERIALS

VA DB 3.3 SELECTED GRANULAR MATERIAL

VA DB 3.4 SELECTED FILL MATERIAL

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

VA DB 3.6 MATERIALS FOR REINSTATEMENT OF ROADS AND PAVED AREAS

VA DB 3.6.1 Sub-base and Base

Add:

Whenever a pipeline excavation necessitates damaging the existing road surface, the contractor shall set aside and stockpile separately material excavated from the upper 300 mm of the road for re-use as sub base during reinstatement of each road crossing.

VA-DB 5 CONSTRUCTION

VA-DB 5.5 TRENCH BOTTOM

Add:

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

VA-DB 5.6 BACKFILLING

VA-DB 5.6.2 Material for Backfilling

Delete the last paragraph and replace with:

Under roadways and paved areas and for a distance of at least 2 m on either side, material for backfilling trenches and around structures such as manholes, catch-pits and the like, shall comprise selected gravel with a PI not exceeding $10 + 3 \times \text{GM}$ and a CBR at 93% Mod. AASHTO density of at least 15.

VA-DB 5.6.3 Disposal of Soft Excavation Material

VA-DB 5.6.4 Disposal of Intermediate and Hard Rock Material

Delete both clauses and replace with:

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

VA-DB 5.7 COMPACTION

VA-DB 5.7.2 Areas Subject to Traffic Loads

Add:

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

VA-DB 7 *TESTING*

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

The testing of backfill and bedding shall be done as specified in SANS 1200 D clause 7. Compaction is to be tested at the rate of at least one sand replacement field density test or two nuclear density tests for every 200 m³ of compacted backfill and bedding material in layer work not exceeding 150mm in thickness after compaction. The provisions of SANS VA-D 7.2 shall apply to the use of a nuclear density meter.

VA-DB 8 *MEASUREMENT AND PAYMENT*

VA-DB 8.1 *BASIC PRINCIPLES*

VA-DB 8.1.2 *Add:*

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

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

VA-DB 8.3 *SCHEDULED ITEMS*

VA-DB 8.3.2 *Excavation*

- a) Excavate in all materials for trenches, backfill, compact and dispose of surplus material

Add:

The rate shall include the cost of testing and of compacting the bottom of the trench.

VA-DB 8.3.3 *Excavation Ancillaries*

SECTION 2 SANS 1200 G - CONCRETE (STRUCTURAL) (1982)

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 Eskom 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 aggregates comply with the requirements of SANS 1200 G clause 3.4.

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

- a) That the aggregates do not exhibit excessive shrinking properties, in accordance with clause C.14, Appendix C of SANS 1083.
- b) 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.

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

VA-G 3.2

CEMENT

VA-G 3.2.1

Applicable Specifications

Add:

Where the use of PFA in concrete is approved by Eskom the PFA shall be obtained from a source approved by Eskom and shall be supplied from only one Power Station. Should the Contractor wish to change the source of PFA during the contract he shall advise Eskom accordingly in advance, submit the results of tests on the PFA from the proposed new source, including relevant concrete trial mixes and obtain Eskom's approval in writing.

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 Eskom.
- 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
 - iii) a 70:30 blend of OPC and PFA.

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 Specification***

Add:

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

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

Coarse aggregate for use in mass concrete may be larger than 40 mm, if 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.

Add new clause:

VA-G 3.9 **HOLDING DOWN BOLTS**

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

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

VA-G 5 **CONSTRUCTION**

VA-G 5.1 **REINFORCEMENT**

VA-G 5.1.1 **Bending**

Add new clause:

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

Cutting torches shall not be used.

VA-G 5.1.2 **Fixing**

Add:

No welding of reinforcement shall be permitted.

VA-G 5.1.4 **Splicing**

Add:

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

VA-G 5.2 **FORMWORK**

VA-G 5.2.1 **Classification of Finishes**

VA-G 5.2.1 **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 25 x 25 mm 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.

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 0100, Part II, 1980, appendix B. 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 0,5 m³. 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 blend 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 even so comply with all other requirements of the specification, and failure to comply shall result in the rejection of such concrete.

VA-G 5.5.3.2 *Ready-mixed concrete*

Add:

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

VA-G 5.5.5 *Placing*

VA-G 5.5.5.1 *Delete and replace with:*

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

Concrete shall be placed within one hour of the start of mixing (and not "within one hour of its discharge from the mixer"). Concrete shall not be retempered 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 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 jeopardizes the design of the works, Eskom shall have the right to instruct the Contractor to break down and remove all such concrete to a point to be determined by Eskom.

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

Add new clauses:

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

Joints shall be formed using material specified on the drawings.

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

Sealing compounds shall be as indicated on the drawings.

A sub-contractor approved by the Engineer shall supply the sealing compounds.

The sub-contractor selected by the Contractor shall be considered a preferred subcontractor in accordance with the provisions of sub-clause 4(2)(b) of the General Conditions of Contract.

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. Tolerances shall be to Degree of Accuracy I.

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:

Special attention should be paid to Clause 5.5.9.2. with respect to the curing of concrete and sunlight protection of all metal templates in contact with concrete.

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 of thickness 50 mm or less need not 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 off and floated and finished with a steel float to a smooth and uniform surface, free of trowel marks, to Degree of Accuracy I.

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

VA-G 5.5.13

Grouting

Delete and replace with:

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

a) Surface Preparation

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

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

b) Mixing

All grouting shall be done using a non-metallic, non-shrink, proprietary grout having a minimum compressive strength at 28 days of 35 MPa. The grout shall be mixed to 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 leveling 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.

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

Add new clause:

VA-G 5.5.16

Holding Down Bolts

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

Templates shall not be removed within 7 days after the concrete has been placed.

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

VA-G 6

TOLERANCES

VA-G 6.2

PERMISSIBLE DEVIATIONS

VA-G 6.2.3

Specified Permissible Deviations

VA-G 6.2.3

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 -10 mm + 0 mm

and replace with 4 mm

- 7) Exposed Concrete Surface:

DEGREE OF ACCURACY I

- i) Flatness of Plane surface 3 mm

Delete and replace with:

- a) All elements except Transformer Plinths 3 mm

- b) Transformer Plinths 2 mm

- ii) Abrupt changes in a continuous surface

Add:

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

Permissible deviations in Degree of Accuracy I for items not specified in SANS 1200 G subclause 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 2 mm.
- 2) the top of the bolt from its designated elevation +5 -3 mm.

Add new clause:

h) Location of built-in-Items

- 1) From the defined positions in plan - 25 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

Add:

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.

Samples shall be taken at the point of placing.

VA-G 8 MEASUREMENT AND PAYMENT

VA-G 8.1 MEASUREMENT AND RATES

VA-G 8.1.1 Formwork

**VA-G 8.1.1.2 Delete "20 mm x 20 mm" and replace with
"25 mm x 25 mm".**

VA-G 8.1.2 Reinforcement

VA-G 8.1.2.2 a. Delete and replace with:

Each reinforcement bar size and type will be separately scheduled and no extra-over rates will be scheduled. The unit rates shall cover the costs as specified in SABS 1200 G subclause 8.1.2.3.

Additional splice lengths or swage type connections introduced at the Contractors request shall not be measured and will be to the Contractor's account.

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 schedule 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 the 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 leveling 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 meter of length, as applicable, the rate shall cover all the costs associated with the construction of the unit or per meter, 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 SABS 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 excavation Unit: m2
(b) Cast against intermediate excavation Unit: m2
(c) Cast against hard rock excavation Unit: m2

VA-G 8.7

GROUTING

Amend the unit of measurement to liter (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.

SECTION 2 SANS 1200 H (1983) STRUCTURAL STEELWORK

VA-H 1 SCOPE

VA-H 1.2 Add:

Corrosion protection is covered by SANS 1200 HC.

VA-H 3 MATERIALS

VA-H 3.1 STRUCTURAL STEEL

VA-H 3.1.1 To the first sentence add "or SABS 1431" after "BS 4360".

(a) Add "240 WA and 300 WA" after "43A and 43B".

(b) Add "350 WA and 450 WA" after "50B and 55C".

Add a new clause :

(e) The thickness of the grades of steel listed below shall not exceed the following :

Grade	Plates	Sections, etc. mm mm
300 WC	63	50
300 WDD	63	50
350 WC	100	40
350 WDD	100	40
450 WC	100	20
450 WDD	40	20

VA-H 3.1.2 Delete this clause and replace with:

Steel grades and section profiles shall comply with the requirements for properties and dimensions given in the tables issued by the SA Institute for Steel Construction.

VA-H 3.2 SPECIAL STEELS

Add after "BS 4360" in the first line: "or SABS 1431".

VA-H 3.3 STEEL USED FOR COLD FORMED SECTIONS

At the end of the sentence change "200 MPa" to "220 MPa".

VA-H 3.4 WELDING CONSUMABLES

VA-H 3.4.2 Storage and Handling

To the end of the line add: "or SABS 044 as applicable".

Add a new clause :

VA-H 3.8 ***TUBULAR AND HOLLOW SECTIONS***

All steel used in the manufacture of tubular and hollow sections shall comply with SANS 657.

VA-H 4 ***PLANT***

VA-H 4.1 ***PLANT***

To the end of the first sentence add : "or the Machinery and Occupational Safety Act, Act 6 of 1983".

VA-H 5 ***CONSTRUCTION***

VA-H 5.1 ***DRAWINGS AND SHOP DETAILS***

VA-H 5.1.2 ***Contractor Provides Shop Details***

* Delete this clause.

* Add:

In preparing shop details the Contractor shall comply with the cladding and Architectural details. All connections shall comply with SABS 0162 and welding details shall be fully described.

All drawings shall be submitted in triplicate to the Engineer for approval at least four weeks before the start of fabrication. Two copies of each drawing will be kept by the Engineer and one copy will be returned to the Contractor with comments or written approval, within two weeks of submission.

VA-H 5.1.3 ***Engineer Provides Shop Details***

* Delete this clause.

* Add:

Should the Contractor wish to supplement or give alternatives to the shop details provided by the Engineer, he is at liberty to do so, provided that the supplementary or alternative drawings are detailed and submitted for scrutiny in accordance with the following:

In preparing shop details the Contractor shall comply with the cladding and Architectural details. All connections shall comply with SABS 0162 and welding details shall be fully described.

All drawings shall be submitted in triplicate to the Engineer for approval at least four *weeks before the start of fabrication. Two copies of each drawing will be kept by the Engineer and one copy will be returned to the Contractor with comments or written approval, within two weeks of submission.

Add a new clause:

VA-H 5.1.5 *Design by Contractor*

The design of flooring, platforms, stairways, ladders and handrails shall be the responsibility of the Contractor as specified in SABS 1200 HA.

VA-H 5.2 *FABRICATION*

VA-H 5.2.3 *Cutting*

To the first paragraph add: Flame cutting, where used, shall not adversely affect the strength or serviceability of the member.

VA-H 5.3 *ASSEMBLY*

VA-H 5.3.4 *Welding*

From this clause delete "SANS 0162 " and replace with "SABS 044 or AWS D 1".

Add:

- (a) All slag and weld spatter shall be removed.
- (b) Visual acceptance of welds shall be as described in Part III of SANS 044, 1983.

VA-H 5.3.5 *Bolting (other than Friction Grip)*

VA-H 5.3.5.2 Delete from first paragraph, third line, "washers shall not be used" and replace with "washers need not be used".

Add a new clause:

VA-H 5.3.5.4 All shear connectors used in composite design shall comply with the requirements of SANS 0162 1984 table 38.

VA-H 5.3.6 *Friction Grip Fastening*

* Add:

The turn of nut method for tensioning shall be used unless other methods are approved.

VA-H 5.3.9 *Protective Treatment*

Delete this clause and replace with: Protective treatment shall be carried out in accordance with SABS 1200 HC.

VA-H 5.5 *ERECTION*

VA-H 5.5.3 *Safety During Erection*

- * Delete the first sentence and replace with: While it is incumbent on the Engineer to ensure that the structure or element thereof can be erected without loss of stability or overstress, the Contractor is responsible for the maintenance of safety standards during erection.

VA-H 5.6 **GROUTING OF SUPPORTS**

VA-H 5.6.1 **Responsibility**

Delete this clause and replace with: The Contractor shall be responsible for grouting and bedding, which shall be carried out in terms of SANS 1200 G and variations thereto. All grouting shall be completed and cured before cladding and other loading is applied.

VA-H 5.6.2 **Preparation**

Delete "by others" from the first line.

VA-H 6 **TOLERANCES**

VA-H 6.2 **TOLERANCES ON DIMENSIONS, ACCURACY OF
ERECTION, ETC.**

Add:

Tolerances shall not be cumulative

VA-H 7 **TESTING**

VA-H 7.3 **TESTING OF WELDS**

- (b) Delete the reference to "BS 5135" and replace with "SANS 044 or AWS D1.1".

Add new sub clause :

- (c) Approval tests for welding procedures and production welds shall be carried out as required by SABS 044 Part III.

VA-H 8 **MEASUREMENT AND PAYMENT**

VA-H 8.2 **COMPUTATION OF QUANTITIES**

VA-H 8.2.1 In the first sentence, second line, replace "manufacturer's handbook "with "South African Institute of Steel Construction: Structural Steel Tables"

VA-H 8.3 ***SCHEDULED ITEMS***

VA-H 8.3.1 ***Supply and Fabrication of Steelwork***

Delete this clause and replace with:

Separate items will be scheduled for each type of member.

Members will be subdivided to distinguish between different methods of jointing, eg. welding and bolting. The type of fastener will be stated where necessary.

- * The rate shall cover the cost of the preparation by the Contractor of supplementary or alternative shop detail drawings, supply and fabrication of the steelwork complete with all the necessary cleats, brackets, gussets, shop fasteners, welding and weld testing (if relevant), packs, base plates and the like and loading ready for dispatch to the Site.

VA-H 8.3.3 ***Erection on Site***

- * Add:

The rate shall include erection bolts.

VA-H 8.3.4 ***Erection Bolts***

- * Delete this clause.

VA-H 8.3.6 ***Protective Coatings***

Delete this clause and replace with: See SANS 1200 HC.

APPENDIX A - APPLICABLE STANDARDS

Add :

SANS 044	Welding
SANS 657	Steel Tubes for Non Pressure Purposes
SANS 1200 HC	Corrosion Protection of Structural Steelwork
SANS 1431	Weldable Structural Steel
AWS D1.1	Structural Welding Code
BS 4848 Part 2	Hot Rolled Structural Steel Sections, Hollow Sections.

SECTION 2 SANS 1200 LB (1983) 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 3.4 *SELECTION*

VA-LB 3.4.2 *Suitable Material not Available from Trench Excavation*

Delete and replace with:

- * Suitable material for use as selected granular material and selected fill is not available from the trench excavations and shall be obtained from the designated dolerite borrow pits.

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*

- * 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.

SECTION 2 SANS 1200 LD (1982) SEWERS

VA-LD 3 MATERIALS

VA-LD 5 CONSTRUCTION

VA-LD 5.6 MANHOLES, INSPECTION CHAMBERS, ETC.

VA-LD 5.6.1 General

Add:

- * f) Manhole covers shall be set to the following heights:

roadways - flush with surface
housing areas - 150 mm above ground
parks and open areas - 300 mm above ground

VA-LD 5.7 CONCRETE CASING TO PIPES

Delete the first sentence and replace with:

The grade of concrete used for pipe bedding and encasement shall be 20 MPa/25 mm.

VA-LD 7 TESTING

VA-LD 7.2 TESTS AND REJECTION CRITERIA

VA-LD 7.2.6 Water tightness of Manholes

Add:

The following test is to be carried out on each manhole, as and when required by the Supervisor. Pipes shall be plugged and the manhole shall be completely filled with water and allowed to stand for 24 hours. At end of this period enough water shall be added to refill the manhole and in the subsequent period of 24 hours the water shall not drop by more than 75 mm per meter of depth of the manhole measured from the channel invert to the underside of the concrete cover slab.

Rectification, if necessary, shall be carried out at the Contractor's expense.

VA-LD 8 MEASUREMENT AND PAYMENT

VA-LD 8.2 SCHEDULED ITEMS

VA-LD 8.2.3 Manholes and

VA-LD 8.2.5 Inspection Chambers

Add:

The rate shall include the cost of testing for water tightness as specified in VA-LD 7.2.6

SECTION 2 SABS 1200 LE (1982) STORMWATER DRAINAGE

VA-LE 3 MATERIALS

VA-LE 3.1 CULVERT UNITS AND PIPES

a) Pre-cast Concrete Pipes

Add:

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

d) 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 to SANS 227.

VA-LE 5 CONSTRUCTION

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

VA-LE 8.2.2 Supply and Lay Portal and Rectangular Culverts

Delete the words "cutting on site and waste" from the rate description.

Add new clauses:

VA-LE 8.2.15 ***Extra Over Item 8.2.2 for Culvert Headwall Units***

- * a) Headwall unit to portal and rectangular culverts
Unit : No.
- b) Skew headwall unit to portal and rectangular culverts
Unit : No.

The rate shall cover the additional cost of manufacture, supplying and laying of the end unit with starter bars for a headwall (bar diameter and spacing as per drawing).

This specification is for **CONCRETE INTERLOCKING BLOCKS** in **PARKING AREAS ONLY** and **NOT** in **PEDESTRIAN** areas

SECTION 2 SANS 1200 MJ - SEGMENTED PAVING (1984)

VA-MJ 3 *MATERIALS*

VA-MJ 3.1 *UNITS*

VA-MJ 3.1.2 *Class, Strength and Type*

Add:

Blocks shall be class 25 type S-A fully interlocking units, capable of being laid in herringbone pattern. The block thickness shall be 80 mm in roadway areas.

VA-MJ 5 *CONSTRUCTION*

VA-MJ 5.4 *LAYING OF UNITS*

Add:

Closure units shall be used where ever possible to avoid the need to fill in gaps in the unit pattern with concrete. They shall consist of full depth closure units of special size or cut or part units split from whole units with a minimum dimension of 70 mm.

VA-MJ 5.5 *FILLING GAPS IN UNIT PATTERN*

Delete this clause.

VA-MJ 5.6 *COMPACTION OF UNITS*

VA-MJ 5.6.2 *Paving Subject to Wheel Loads Exceeding 30 kN*

Add :

All paved areas are subject to wheel loads in excess of 30 kN and requirements of SANS 1200 MJ clause 5.6.2 shall apply.

VA-MJ 6 *TOLERANCES*

VA-MJ 6.2 *PERMISSIBLE DEVIATIONS*

Add:

Degree of accuracy shall apply.

VA-MJ 7 TESTING

VA-MJ 7.4 BLOCKS

VA-MJ 7.4.1 Wet Strength Test

Delete and replace with:

The Contractor shall arrange for the inspection and tests specified in SANS 1058 clause 6 to be carried out on each lot of 20 000 blocks and the results shall be submitted to NamPower.

VA-MJ 7.4.2 Other Tests

Delete and replace with:

The Contractor shall arrange for the inspection and testing specified in SANS 1058 clause 6 to be carried out on each lot of 20 000 blocks. The test results shall be submitted to Eskom with each lot of blocks delivered. Any lot, which fails to comply with the requirements of SABS 1058, is liable to rejection by Eskom.

All costs of testing shall be included in the rates.

VA-MJ 8 MEASUREMENT AND PAYMENT

VA-MJ 8.2 SCHEDULED ITEMS

In addition to the items specified in clauses 8.2.1 and 8.2.2 the rate shall cover the cost of testing as specified in SABS 1200 MJ clause 7.

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<p>SECTION 3 PARTICULAR SPECIFICATIONS</p>
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- 3.1 Fencing
- 3.2 Earth Mat
- 3.3 Stone Surfacing of Yard
- 3.4 As - built Drawings

PART 1: SPECIFICATIONS

SECTION 3: PARTICULAR SPECIFICATIONS

3.1 FENCING

1. SCOPE

This specification covers the requirements for the construction of 2,4 m security, 1,8 m safety and 1,2 m high boundary fencing.

2. INTERPRETATIONS

2.1 SUPPORTING SPECIFICATIONS.

The fencing shall be constructed in accordance with:

- a) SABS 1200 DA Earthworks (Small Works)
- b) SABS 1200 G Concrete (Structural) and the relevant variations and additions to these.
- c) This specification

3. MATERIALS

3.1 FENCES FOR INLAND AND COASTAL AREAS

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

- a) Posts, stays and extension arms shall be of the dimensions shown on the drawings and as follows:
 - (i) Galvanized hot rolled mild steel sections for security and safety fences.
 - (ii) Galvanized mild steel tubular sections for boundary fences.
- b) Standards and Droppers
2,5 kg/m Y section steel standards and 0,56 kg/m ridgeback T section steel droppers protective coated with tar or bitumen for boundary fences.
- c) Wire
Wire for fencing shall comply with SANS 675, 1373 and CKS 592 as relevant and shall be:

Straining Wire	4, 0 mm dia galvanized MS
Barbed Wire -	2, 24 mm diam. galvanized HT champion class A barbed wire for boundary fence and security fence overhangs.
Rectangular Mesh -	3, 15 mm diam. galvanized HT mesh 50 x 50 openings for security fences with stainless steel jointing clips.
Diamond mesh	2, 50 mm x 64 galvanized MS
Barbed tape coils	760 mm diam. coils of 2, 5 mm galvanized wire with long blade profile galvanized barbs at 37, 5 mm spacing.

d) Gates

Galvanized steel tube frame

e) Metal Fittings

Bolts, nuts, washers, turnbuckles, hinges and similar metal fittings shall be of galvanized MS

Complying where relevant with SANS 135 and 1149.

3.2 GALVANISING

Galvanizing of steel members and metal fittings shall comply with SANS ISO 1461 for general applications.

Galvanizing of mild steel and high tensile wire shall comply with SANS 675

Galvanizing of barbs on barbed tape shall comply with SANS 675.

3.3 HOLES

Holes in the steel members for fences shall not be punched or flame cut but shall be drilled (and burs removed) before the member is galvanized.

3.4 CONCRETE

Concrete for post foundations shall be grade 15 MPa/26 mm and for kerbs, grade 20 MPa/19 mm.

4. CONTRACTORS EQUIPMENT

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

5. CONSTRUCTION

5.1 General

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

5.2 Clearing Fence Line

Where the fence line has not already been cleared, it shall be cleared over a width of at least 1 m on each side of the centre line of the fence and surfacing irregularities shall be graded so that the fence will follow the general contour of the ground. The bottom of the fence shall be located a uniform distance above the ground line in accordance with the requirements shown on the drawings. All material removed shall be disposed of as specified in clause VA-D 5.2.2.3.

5.3 *Installing Posts and Standards*

The lengths of all posts above ground shall be such that the correct clearance between the lowest wire and the ground can be maintained.

Straining posts shall be erected at all ends and corners or bends in the line of the fence and at all junctions with other fences, provided that straining posts shall not be spaced further apart than the minimum distances shown on the drawings.

Spacing of intermediate posts, standards and droppers shall not be more than is indicated on the drawings, provided that the spacing of standards and intermediate posts between any two straining posts shall be uniform.

All posts and stays shall be set in dug holes of the dimensions shown on the drawings and provided with concrete bases. Holes shall be dug to the full specified depth, even in rock where blasting may be necessary to obtain the required depth.

Corner, tee-off, gate and straining posts shall be braced by stays bolted to the posts.

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

5.4 *Installing Fencing and Straining Wire*

All fencing wire shall be attached to the posts as detailed on the drawings. The wire shall be carefully stretched and hung without sag, and with true alignment, care being exercised not to stretch the wire so tightly that it will break or that posts will be pulled up or destroyed.

The maximum force in fencing wire after it has been stretched between straining posts shall be 0,9 kn.

Splices in the straining wire will be permitted if made using a splice tool. The wire ends shall be carried past the splice tool for at least 75 mm and wrapped snugly around the other wire for at least 6 complete turns, the two separate wire ends being turned in opposite directions. The unused wire ends shall be cut close to leave a neat splice.

5.5 *Installing Welded Mesh Sheets*

Welded mesh sheets shall be stretched against the fence posts and properly tied to the straining wire by means of 2,5 mm nominal diameter binding wire or stainless steel clips at 250 mm centers, or closer to remove excessive bulges in the mesh. The mesh shall be taken continuously past the face of all immediate posts, intermediate straining posts and corner posts. At the straining posts and corner posts the mesh is to be clamped on either side of the post using 20 mm wide galvanized flat bars, bolted together with galvanized bolts and nuts and fastened to the post by means of a hook bolt, as detailed on the drawings. Small bulges formed in the mesh between these clamps are acceptable. Mesh which has been distorted prior to erection e.g. egg shaped instead of circular coils will not be accepted.

The bottom 400 mm of the welded mesh shall be dipped in a bitumen solution, and when erected the bottom 300 mm (min. 250 mm) shall be buried in an excavated trench and backfilled with a granular material and neatly leveled off to the Supervisor's satisfaction. The joining of the welded mesh sheets shall be as shown on standard drawing number 0.54/5499 sht. 5. The screw threads on the stand-outs of all bolts, hook bolts and eye bolts to be turned over after erection to prevent the possible removal of the nuts.

5.6 *Installing Diamond mesh or Wire Netting*

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

5.7 *Installing Barbed Wire (Only if specified)*

Single strand barbed wire to be fitted to the top of the posts shall be installed along the upper face of the single overhang of fence. The barbed wire shall be stretched as described in clause 5, 4 and fixed to the immediate posts using 2, 5 mm diameter binding wire.

5.8 *Concrete Kerb (Only if specified)*

Where scheduled a concrete kerb of nominal dimensions 75 mm wide x 300 mm deep of Grade 20 MPa concrete (or precast concrete kerb fig 5 to SABS 927-1969) shall be constructed along the security fence line, as detailed on the drawings.

5.9 *Installing Gates*

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

5.10 *Transport and Storage*

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

5.11 *Earthing*

The fence shall be earthed across gate openings and removable panels by means of a 40 mm wide x 3 mm thick copper earthing strap, as shown on Drawing No. 0.54/398 or as otherwise detailed on the drawings.

6. *TOLERANCES*

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

Permissible Deviations shall be as follows:

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

gates shall be not further from the gate posts when closed than the dimensions shown of the drawings.

7. TESTING

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

8. MEASUREMENT AND PAYMENT

8.1 General

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

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

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

Payment will be made in accordance with clause 8.2.

8.2 Scheduled items

8.2.1 Fencing Unit: m or km

Fences will be classified by type or detailed description. The rate shall cover all the costs associated with the erection of the fence in compliance with the specification, including supply and erection of the fencing complete as described, provision of the mesh footing trench and filling, and complying with precautions and tolerances.

8.2.2 Gates Unit: m or km

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

The rate shall cover all costs associated with the supply and erection of the gate in compliance with the specification including posts, excavation of post holes in earth, disposal, filling with concrete, excavation in earth for the earth strap, backfilling and provision and installation of the earth strap, complying with precautions and tolerances.

8.2.4 Extra-over for excavation in:

- a) Soft rock Unit: m³
- b) Hard rock Unit: m³

The rate shall cover all the costs additional to the cost of excavating in earth disposing of surplus material and backfilling, where required.

8.2.5 Testing Concrete

Concrete compressive strength Unit: No

The rate shall cover the cost of making and testing groups of three test cubes in accordance with SANS Test Methods 861 and 862.

3.2 EARTH MAT

3.2.1. SCOPE

This specification covers the requirements for the construction of the earth mat installation.

3.2.2. INTERPRETATIONS

The Earth mat shall be constructed in accordance with:

2.1 Supporting Specifications

- a) SANS 1200 DB: Earthworks (Pipe Trenches) and the variations and additions thereto.
- b) This specification.

3. MATERIALS

3.1 Copper Rod and Flat Strap

Annealed black copper rod and flat strap, as detailed in the Bills of Quantities and drawings shall be used. The Contractor shall purchase the required materials, transport it to the site and store it in clean, dry conditions.

4. CONTRACTOR'S EQUIPMENT

The contractor shall ensure the provision of suitable construction equipment for the installation of the earth mat in compliance with the requirements of the specification.

5. CONSTRUCTION

5.1 Trenches

Notwithstanding the minimum trench widths specified in SANS 1200 DB clauses 5.2 and 8.2.3, trenches for earth mats shall be excavated as narrow as possible, but wide enough to permit laying of the earth mat and compaction of the full depth of backfill in compliance with the specification.

Backfill shall consist of material complying with the minimum requirements set out in clause VA-D 5.2.3.2.

5.2 Installation

Installation of the earth mat, joining beneath the surface of the yard, earthing of steel structures, steel supports, building, security fencing and gates shall be done in a workmanlike manner by competent personnel, all according to the earthing standards as detailed on drawing no 0.54 / 393 and the project drawings.

5.3 *Sacrificial Anode*

Rail sections shall be connected to the main earth mat at locations and to details specified on drawings or as instructed on site.

5.4 *As Built Drawings*

On completion of the works the contractor shall submit all information as may be required for the completion by the Project Manager of “as built” drawings of the earth mat installation, including the positions of all joints below ground level and details of all deviations from the routes shown on the drawings.

6. *TOLERANCES*

The exact position of the earth mat is not critical, but it shall be laid as close as possible to the routes shown in the drawings.

The supervisor shall approve the positions of the trenches before excavation commences.

7. *TESTING*

The supervisor will arrange for the earth mat to be tested electrically and any part of the mat and connections found to be defective shall be repaired by the contractor at this own cost.

8. *MEASUREMENT AND PAYMENT*

The rates as scheduled in the Bill of Quantities shall cover the cost of all activities, labour, materials and testing required for the provision of the relative item in accordance with the drawings and specifications.

9. EARTHMAT CRIMPED CONNECTIONS

All new earthmat connections will comply to ieee std 837-1989.
The correct die and crimp will be used as per Eskom's specifications and requirements.

3.3 STONE SURFACING OF YARD

1. SCOPE

This specification covers the requirements for the stone surfacing of the yard.

2. INTERPRETATIONS

2.1 Supporting Specifications

The stone surfacing shall be constructed in accordance with:

- a) SANS 1200 D - Earthworks and the variations and additions
- b) This specification.

3. MATERIALS

3.1 Stone

Stone shall be clean, hard, durable and sound crushed stone of 19 – 37 mm nominal size, approved by the Project Manager and details of the stone being offered shall be submitted timorously.

Samples of the stone shall be submitted in good time to the supervisor for approval and no stone, other than the samples, shall be delivered to the site before the Project Manager's written approval has been obtained.

3.2 Weedkiller

Weedkiller shall be in accordance with the terms of clause 5.3.

4. CONTRACTOR'S EQUIPMENT

The contractor shall ensure the provision of suitable construction equipment for the construction of the stone surfacing in compliance with the requirements of the specification.

5. **CONSTRUCTION**

5.1 **Surface Preparation**

After the completion of the earthworks and just before the application of the stone surfacing the contractor shall clear the area of all vegetable growth and ensure that the underlying wearing course layer is compacted to 93% Mod AASHTO density.

5.2 **Laying of Stone**

The stone shall be spread over the compacted surface of the yard, leveled and lightly rolled to a finished thickness of 100mm or as otherwise specified on the drawings.

5.3 **Weedkiller**

A granular or liquid weedkiller suitable for the soil to be treated, the climate and the general site conditions shall be applied before or after the spreading of the stone surface.

Choice and application of the weedkiller to be used shall be carried out only by a pest control operator with a current registration certificate covering the field of weed control, issued in terms of Government notice R 1 449 dated 01 July 1983.

The application of weedkiller shall be guaranteed by the contractor to provide a 95% effective control of growth of all types of vegetation for a period of 2 years from the date of application.

Any growth, in excess of 5% of the area treated, which occurs within the guarantee period shall be removed and re-treated at the contractor's expense.

The contractor shall exercise due care while applying the weedkiller to ensure that vegetation, animals or persons on areas adjoining the site are not affected by movement of the weedkiller through wind, rain or transport by water. He shall be responsible for any claim which may be made by adjoining property owners for damages resulting from his activities.

6. **TOLERANCES**

The average finished thickness of the stone layer shall be at least 100mm or as otherwise specified on the drawings and nowhere shall the finished thickness be less than 15mm less than the specified average finished thickness.

7. **TESTING**

Not applicable

8. **MEASUREMENT AND PAYMENT**

The rates as scheduled in the Bill of Quantities shall cover the cost of all activities, labour, materials and testing required for the provision of the relative item in accordance with the drawings and specification.

3.4

AS-BUILT DRAWINGS

On completion of the works the contractor shall submit all information as may be required including marked up drawings, for the completion by the Project Manager of “as-built” drawings of the works.

The information shall be submitted within the period of maintenance and shall be subject to the Project Manager’s approval.

The cost of complying with this section is to be included in the “Contractual Requirements” item in the Bill of Quantities.