

EMALAHLENI LOCAL MUNICIPALITY

UPGRADING OF FERROBANK WASTEWATER TREATMENT WORKS

EMPLOYER TENDER NUMBER: ELM 45/2020



THE CONTRACT

PART C3. SCOPE OF THE WORKS

THE CONTRACT PART 3: SCOPE OF THE WORKS

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THE CONTRACT PART 3: SCOPE OF THE WORKS

C3.1: DESCRIPTION OF THE WORKS

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C3.1: DESCRIPTION OF THE WORKS

Status

In the event of any discrepancy between the Scope of Works and a part or parts of the SANS 1200 Standardized Specifications, the Bill of Quantities or Drawings, the Project Specifications shall take precedence and prevail in the Contract.

1.1 EMPLOYER'S OBJECTIVES

The Employer's objective is to upgrade the Ferrobank Wastewater Treatment Works (WwTW) in two phases and also refurbish the current Ferrobank WwTW. The existing Ferrobank Wastewater Treatment Plant is situated approximately 5 km West of Emalahleni CBD and has a 16 Ml/day plant capacity. The employer's objective is to ultimately upgrade the existing Wastewater Treatment Plant to process on average 24 Ml/day in phases as per available funding. The scope of work for this tender involves the first phase of the project. The upgraded Wastewater Treatment Plant will have a targeted design to meet the special limit standards in accordance with the General Authorisation discharge requirements and it is aimed at complying with the green drop requirements and regulations. The Plant requires to be upgraded and expanded to deal with the increased wastewater loading to the plant with a focus to address the projected hydraulic and organic loading.

1.2 OVERVIEW OF THE WORKS

This Contract will comprise of Civil, Mechanical and Electrical Works. The Ferrobank WWTW is situated in the Emalahleni Local Municipality area in the Ferrobank area. The present capacity of the plant, of 16 Ml/day, is based on the recently upgraded attached growth trickling filter works and it is suitable for meeting an effluent quality of General Limit. Attached Growth treatment systems are very temperature sensitive, and the treatment system struggles to meet General discharge limits specifically ammonia and nitrate during low temperatures in winter months. Several residential and industrial developments are planned to be added to the plant catchment area. Below is list of the major works which need to be carried out to complete the full scope of the Ferrobank Wastewater treatment plant upgrade project. The upgrades required involve the following:

- Mechanical and Electrical Refurbishment Package;
 - Construct a new Inlet works and integration with balancing tanks;
 - Construction of a Primary Settling Tank;
 - Construction of an Anaerobic Tank;
 - Construction of a SND Orbal Reactor;
 - Construction of a post Anoxic Tank and Reaeration Tank;
 - Construct two new High rate clarifiers;
 - Construction of a RAS/WAS pump station;
 - Construction of the Trickling Filter pump station;
 - Construct new Control/Laboratory Building;
-

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- Construct new Motor Control Building;
- Construct new Chlorination Building;
- Construct new Chlorination Channels;
- Construct a sludge dewatering facility;
- Construct 10 000m² composting slabs;
- Construction of a leach pump station;
- Installation of interconnecting pipe work;
- Construction of various small flow division and process structures; and
- Construction of access and access roads;

The above is a brief summary of the Works and may not be the limit of the Works that will be carried out under this Contract.

1.4 LOCATION OF THE WORKS

The site of the works is situated in the town of Ferrobank Region of Emalahleni LM. The existing Ferrobank Wastewater Treatment Plant is situated approximately 5 km West of Emalahleni CBD and about 400 m North of the N4 highway. The co-ordinates of the entrance to the plant can be located at 25° 52' 30.9" S and 29° 09' 44.9" E.

The following site conditions shall be taken into consideration:

Altitude above sea level	:	approximately 1500m
Operating Voltage	:	400V – 3 Phase
Electrical Supply Frequency	:	50 Hz
Maximum Temperature	:	45°C
Minimum Temperature	:	-5°C
Maximum Relative Humidity	:	80%
Lightning	:	Moderate
Rainfall	:	Summer

There is a good road access to the site. Electricity and treated water are available on site however the Contractor shall make his own arrangements with the necessary authorities for the use of these services. The contractor will have to make his own arrangements regarding ablution facilities.

1.5 NATURE OF GROUND AND SUBSOIL CONDITIONS

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A Geotechnical investigation was completed and the information is included in Part C4: Site Information for the Tenderer's information. The interpretation of this report is the responsibility of the Contractor.

1.6 TEMPORARY WORK

The Contractor shall be responsible for designing and providing any temporary works required, which shall be approved by a professional engineer or engineering technologist.

Such works and the positioning thereof are to be approved by the Engineer before erection and operation on site.

Such temporary works shall be removed upon completion of the Works and the site of such temporary works re-instated to a pristine condition acceptable to the Environmental requirements.

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THE CONTRACT PART 3: SCOPE OF THE WORKS

C3.2: ENGINEERING

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C3.2: ENGINEERING

2.1 DESIGN SERVICES AND ACTIVITY MATRIX

Design responsibilities through to contract completion are as follows:

DESCRIPTION	RESPONSIBLE
Concept, feasibility and overall process	Employer's Representative
Basic Engineering and detail layout to tender stage, including drawing up of necessary specifications and performance specifications.	Employer's Representative
Tendering and providing the necessary information required in terms of the Tender Documents including compliance with the Specifications.	Tenderers
Adjudication of tenders and submission of results of adjudication to the Employer	Employer's Representative
Final design to approval for construction stage	Employer's Representative
Construction of the Works including necessary Temporary Works	Contractor
Commissioning of the Works	Contractor
Preparation of as-built drawings	Employer's Representative
Preparation of Operation and Maintenance Manuals	Employer's Representative
Training of Employer's staff in the correct managing and operation of the water works.	Employer's Representative

2.2 DRAWINGS

2.2.1 General

Limited number of drawings will form part of this tender document and all work will be described in detail at the pretender meeting and this information shall be used for tender purposes only.

The Contractor will be supplied with all information required for tendering including drawings. It is expected that the contractor will supplement the information by taking own dimensions of the works for tendering purposes and the cost of this will be borne by the contractor.

Any information in the possession of the Contractor necessary for the Resident Engineer to complete his as-built drawings shall be supplied to the Resident Engineer before a Certificate of Completion will be issued.

Only figured dimensions shall be used and drawings may not be scaled unless so instructed by the Engineer. The Engineer will supply any figured dimensions, which may have been omitted from the drawings.

2.2.1 List of Drawings prepared by Employer

The list of drawings prepared for the Tender purposes is found in Annexure 4.

2.3 DESIGN PROCEDURES

The Contractor shall be responsible for the design and specifications for the following aspects of the Works.

- Any temporary works requirements,
- Design integration before and during construction
- Procedures for all necessary approvals
- Environmental Management
- Design change procedures, and
- Record keeping and tracking of documents

2.4 DOCUMENT TRACKING SYSTEM

The Contractor shall establish a document tracking system to record the dates for the supply and receipt of all design drawings, calculations and requests for information.

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THE CONTRACT PART 3: SCOPE OF THE WORKS

C3.3: PROCUREMENT

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C3.3: PROCUREMENT

3.1 PREFERENTIAL PROCUREMENT PROCEDURES AND REQUIREMENTS

The system of measurement of preferential procurement points shall be as defined in the Section T1.3: Tender Data.

3.2 USE OF LOCAL LABOUR

It is a requirement of the Employer that the maximum possible use is made of local labour.

The Contractor is therefore required to limit the use of non-local labour to key personnel only and to employ only local labour on this Contract.

The Contractor shall fill in the relevant forms regarding “Key Personnel” and state how many non-local key personnel he intends to employ in the various categories.

The numbers stated in the “Key Personnel” forms shall be strictly controlled during the Contract Period and any increase in numbers shall be subject to the approval of the Engineer.”

3.3 SUB CONTRACTORS, SMME's, FEMALES AND YOUTH

The Contractor shall seek approval of all subcontractors prior to them starting work on site.

At least 20% of the contract value must be awarded to and be carried out by SMME's.

The female component of the total labour force, including labour employed by SMME's must be maximised.

The youth (35 years and under but out of school) component of the total labour force, including labour employed by SMME's must be maximised and must take up not less than 30% of the total labour days expended on the contract.

The disabled component of the total labour force, including labour employed by SMME's must be maximised and must take up not less than 2% of the total labour days expended on the contract.

The Contractor shall submit with his monthly payment statement the “Monthly Data Sheet” (Included in Part C1.2) detailing the SMME's and the breakdown of labour, including labour employed by SMME's utilised on the contract to date.

The Employer reserves the right to delay payments to the Contractor should the Contractor fail to provide any item of the required documentation timeously.

In the event of any discrepancy between the requirements of this Clause and the Local Municipality's Procurement Policy, the Procurement Policy shall take precedence.

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THE CONTRACT PART 3: SCOPE OF THE WORK

C3.4: CONSTRUCTION SPECIFICATION

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CONSTRUCTION SPECIFICATIONS

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C3.4: CONSTRUCTION SPECIFICATION

PART A: GENERAL

A1 NATURE OF THE GROUND

Geotechnical investigation has been carried out over the site and the details of the geotechnical report will be made available to the Tenderers on request.

The Contractor is to make his own assessment of the materials to be excavated from his inspection and interpretation of the information. The Contractor is to note that the positions of trial pits are based on a schematic representation of the works layout and do not necessarily relate to the exact positions of the various elements of the works.

No warranty is implied that materials over the whole site are consistent with those indicated in the trial holes. The Contractor may undertake further investigations or trial excavations for his tender purposes provided that the prior approval of the Engineer is obtained.

A2 CONSTRUCTION PROGRAMME

The successful Tenderer shall submit a detailed, comprehensive and realistic Works Programme within 14 days after the award of the contract showing the order of construction and method by which he proposes to carry out the Works. The format of the programme shall be to the Engineer's approval, but shall be in the form of a bar chart showing the critical path. In addition, the Contractor shall provide a schedule of the forecast value of completed work, month by month.

The programme shall include the critical construction path and an estimate of the anticipated cash flow.

The successful Tenderer shall complete the Works within the stipulated times in order to avoid the payment of penalties as provided for in Clause 42 of the General Conditions of Contract.

The Contractor shall not depart from the order in which the various items of work have been agreed without the prior written consent of the Engineer. If the programme is to be revised by reason of the Contractor falling behind he shall produce a revised version showing the modifications to the original programme necessary to ensure completion of the Works or any part thereof within the time for completion as defined, or any extended time granted, as well as a revised schedule of the forecast value of completed work, month by month.

Failure on the part of the Contractor to submit or to work according to the programme or revised programmes shall be sufficient reason for the Employer to take steps as provided for in the General Conditions of Contract for Construction Works (First Addition 2004).

The approval by the Engineer of any programme shall have no Contractual significance other than that the Engineer would be satisfied if the Work is carried out according to such programme and that the Contractor undertakes to carry out the Work in accordance with the programme. It shall not limit the right of the Engineer to instruct the Contractor to vary the programme should circumstances make this necessary.

Cognisance shall be taken of the frequency of rain days, inclement weather and material delivery delays when formulating a programme of works.

A3 SITE FACILITIES AVAILABLE

A3.1 Water Supply

The Contractor will have to make his own arrangements for the provision of potable water for human consumption as well as water required for construction, testing of pipelines and structures, commissioning etc. and his tender will be deemed to include for all costs in this regard.

No water shall be abstracted from any source without the prior written approval of the relevant authorities.

A3.2 Power Supply

The Contractor will have to make his own arrangement for power supply to his construction camp and construction site and his tender will be deemed to include for all costs in this regard.

A3.3 Camp Sites

The Contractor will be allocated an area for his use in the establishment of a yard, storage, offices, etc. The Contractor shall be responsible for fencing and securing his own area. On completion of the Works and removal of the depot, the site shall be cleaned and restored to its natural condition immediately it is vacated.

A3.4 Telephone Facilities

The Contractor will have to make his own arrangements for a landline if so desired.

A3.5 Housing

The contractor will not be permitted to accommodate his employees on site save for security guards employed for the safe keeping of the works during construction.

A3.6 Soil Laboratories

Commercial laboratories operate from Nelspruit.

A4 SITE FACILITIES REQUIRED

A4.1 Engineer's Office

The Contractor shall be required to provide an office and dedicated toilet facilities and undercover parking facilities for the sole use of the Engineer.

A4.2 Engineer's Accommodation

Contractor to provide accommodation for the engineer's staff.

A4.3 Engineer's Laboratory

No testing laboratory is required for use by the Engineer but all quality control testing shall be carried out by the Contractor at his own cost.

The Contractor shall arrange for process control testing to be undertaken by a laboratory to be approved by the Engineer. A provisional sum will be allowed for in the schedules to allow for the use of an independent laboratory to effect check tests as required by the Engineer.

A4.4 Sanitary Facilities

The Contractor shall provide adequate ablution and toilet facilities for all workmen on site.

All latrines shall comply with the requirements of the Local Authorities and shall be placed where directed by the Engineer. All sanitary fees and costs payable shall be paid by the Contractor. All latrines must, for the duration of the contract, be kept continuously in a clean and hygienic condition by the contractor to the satisfaction of the Engineer.

If at any time the Contractor neglects to comply with the abovementioned requirements and after he has been requested to do so by the Engineer, fails to rectify the matter about which the Engineer has complained, the Engineer shall have the right to immediately order such material, employ such workmen and take such measures as he regards necessary to ensure clean and hygienic conditions all at the expense of the contractor.

A 4.5 Disposal of Waste

The Contractor shall be responsible for disposal of refuse and waste generated by his staff on a daily basis. The site is to be kept clean, neat and tidy to the Engineer's satisfaction. Refuse and waste shall not under any circumstance be buried on the site, but shall rather be collected in suitable skips and disposed of at the nearest suitable landfill site.

The disposal of waste shall be carried out in accordance with the requirements of the relevant Local Authority.

A4.6 Engineer's Survey Equipment

The Contractor shall provide on request from the Engineer or his Representative, survey equipment for temporary use such as an automatic level, tachometer, level staff, 100 m tape, ranging rods, pegs, etc and any labour required for this purpose. Instruments provided shall be in a good state of repair and accuracy.

The Contractor shall maintain the equipment in good working order and keep it clean until the completion of the Works.

The Contractor shall keep the equipment continuously insured against any loss, damage or breakage, and he shall indemnify the Engineer and the Employer against any claims in this regard. Upon completion of the Works the survey equipment as listed above shall revert to the Contractor.

A5 FEATURES REQUIRING SPECIAL ATTENTION

A5.1 Use of Explosives

Prior to the use of explosives at any specific location, the Contractor shall obtain permission for blasting from the Engineer. The safety of existing Works and services, and of persons, etc., shall remain the responsibility of the Contractor, who shall abide by all the relevant laws and regulations.

A5.2 Existing Services and Buildings

Although the plans may show the approximate position of existing services and buildings, neither the Employer nor the Engineer will accept the responsibility for the accuracy thereof.

Where the Contractor anticipates that it will be impossible for him to carry out the work without causing damage to existing services, Works or buildings he shall forward a proposal on the method of construction for approval by the Engineer.

Where any existing services are crossed or temporarily removed, the Contractor shall be responsible for the repair and / or reinstatement of the crossings to the satisfaction of the Engineer.

Any damage done to existing Works or buildings shall be immediately notified to the owners concerned and to the Engineer.

Unless it is established by the Engineer that the Contractor exercised reasonable care and damage was unavoidable, the Contractor shall be held responsible for the damage to any existing Works or buildings and for the costs of repair, including any claims which may arise as a result thereof.

A5.3 Pegs, Beacons and Engineer's Marks

No survey mark, peg or beacon shall be disturbed without the Engineer's consent. The cost of replacing any survey mark, peg or beacon disturbed or damaged during construction shall be borne by the Contractor. The Engineer shall be advised immediately when boundary pegs are found to be missing. If this is not done, the Contractor will be liable for the replacement thereof and shall bear the cost.

A5.4 Compliance with Statutory Requirements

The Contractor shall allow for all costs necessary to ensure that all work is undertaken in a safe and healthy working environment and in compliance with the Occupational Health and Safety Act, (OHS Act No. 85 and Amendment Act 181) of 1993 and the Construction Regulations, 2003. The “minimum safety requirements “referred to shall be those contained in the Construction Regulations,2003 of the above OHS Act. Furthermore, the contractor shall comply with all statutory and local regulations and requirements. The cost of complying with the requirements of this clause shall be included in the rates tendered.

A5.5 Permits

The Contractor shall be responsible for obtaining all necessary permits to transport materials to the area.

A5.6 Facilities to Other Contractors

In addition to the requirements of the General Conditions of Contract, the Contractor must make allowance for the presence of other Contractors on Site, which may involve, *inter alia*, the adaptation of his programme to fit in with work to be done by the other Contractor, as well as assuring other Contractors access to the site. The Contractor will be advised at tender stage of any other Contractors who may be engaged on other Works during the course of the Contract.

A5.7 Spoil Material

No indiscriminate spoiling of material or rubble will be allowed. All surplus or unsuitable material and rubble shall be spoiled, levelled and spread in designated areas as directed by the Engineer within a free haul distance of 2 km.

A5.8 Finishing and Tidying and Defects Liability Period

Progressive and systematic finishing and tidying will form an essential part of this Contract. On no account must spoil, rubble, materials, equipment or unfinished operations be allowed to accumulate in such a manner as to unnecessarily impede the activities of others, and in the event of this occurring, the Employer shall have the right to withhold payment for as long as may be necessary in respect of the relevant Works in the area(s) concerned without thereby prejudicing the rights of others to institute claims against the Contractor on the Grounds of unnecessary obstruction.

All finishing and tidying shall be carried out to the best advantage of the project as a whole and in the closest co-operation with other contractors and residents.

A5.9 Security of Contractor's Site

The provision and sustainment of security for the Contractor's Site Establishment shall be his own responsibility, and no claims for additional security measures taken during the currency of the Contract will be considered other than as provided for in the General Conditions of Contract.

A5.10 Contractor's Site Agent

- a. Within 14 days of the award of Contract, the Contractor shall advise the Employer in writing of the name of the responsible person in charge of this Contract.
- b. In amplification of Clause 7.5 of the General Conditions of Contract: -

It shall be noted that the Contractor shall be required to strictly observe his obligations regarding adequate full time superintendence of the Works, with particular reference to accuracy of setting out, excavations, correct steel fixing, properly constructed formwork, positioning of foundation bolts, and / or bolt pockets, placing of concrete, etc. in order to achieve the high standard of workmanship required of him.

Adequate facilities for superintendence of his work shall be provided by the Contractor and the Engineers engineering staff must under no circumstances be expected to act in this capacity on his behalf.

A5.11 Attendance at Site Meetings

The Contractor will be required to attend site meeting as and when these are required by the Engineer. The objectives of such meetings will be to review progress and ensure compliance with the programme, discuss and where possible solve any problems that may arise, and generally to liaise with all parties concerned with the Works.

The cost of attending such meetings shall be deemed to be included in the rates. Instructions given by the Engineer or agreement reached at such meetings and confirmed in the minutes shall be considered as a "written instruction by the Engineer" as referred to in the General Conditions of Contract.

Site meetings will generally be held once every month.

A5.12 Liaison Officer

If required in terms of the contract, the Contractor shall employ a Liaison Officer for the full duration of the contract. In the event that a Liaison Officer is required, a provisional sum will be provided in the Schedule of Quantities to cover the cost of the CLO.

A5.13 Courtesy

In all dealing with the public the Contractor shall bear in mind their right to enjoy the use of the roads and services and access to their properties and that the Employer desires to interfere as little as possible with these rights.

At all points of contact with the public, the Contractor and his staff are requested to handle discussions and disputes with deliberate courtesy and understanding. To assist the Contractor in his dealings with the public, use should be made by him of the Liaison Officer and the Engineer's Representative on site. On occasions where the Contractor liaises directly with the public, the Liaison Officer and the Engineer's Representative should be informed of the outcome to be able to maintain a coherent picture of developments in the area.

A5.14 Dealing with Landowners

It is of paramount importance that good relations be maintained at all times between the Contractor and the landowners in the area. In order to preserve these good relations, the following routine shall be observed throughout the works:

- (a) At least one week's notice shall be given by the Contractor to the Engineer before entering upon any property for the purpose of commencing construction.
- (b) On receipt of such notice, the Engineer will, as far as possible, arrange for a meeting between the Engineer, Contractor and the landowner concerned during which the programme of construction will be discussed. The landowners will be advised of the times of commencement and completion of work on their land and will be acquainted with the Contractor's intentions with regard to the cutting down of trees, temporary lowering of fences, temporary access roads, and all other matters affecting the owners' land and farming operations.

Any requests from owners which are reasonable and which will not affect the economical construction of the works in accordance with the Specification shall be met if at all possible.

- (c) The Contractor shall negotiate directly with the landowners with regard to alternative access over private property to the site of the works, borrow pits and any dumping site for surplus excavation. All such sites shall be subject to the approval of the Engineer and the Engineer shall also be kept fully informed of all negotiations that are in progress between the Contractor and the landowners. The Contractor shall make prompt payment to the landowners for any royalties for borrow pits and for any agreed amounts to be paid to the farmer for the use of borrow pits, dumping sites, access roads, etc. No separate payment shall be made to cover royalties and all costs in this regard shall be deemed to be included in the tendered rates.

The Contractor shall, within a period of 3 months of completing the construction work on any private property produce to the Engineer a certificate, signed by the landowner in question, that all the Contractor's obligations to the landowner have been completely discharged in terms of the servitude agreements and any private agreements that may have been arranged between the Contractor and the landowners.

If such evidence is not produced within the stipulated period, the Employer reserves the right to investigate any agreement entered into between the landowner in question and the Contractor and any claims made by the landowner. If the Employer is then satisfied that the Contractor is in default in terms of the contract and any private agreements made, all justifiable claims shall be paid to the landowner by the Employer from retention money held and shall be deducted from the amount payable to the Contractor.

A5.15 Working Within the Road Reserve and Landowners' Property

The Contractor shall observe the following when operating within private property, roads and road reserve:

- (a) The Employer will acquire servitudes from the owners of all properties crossed by new services, or has permission to occupy where the servitudes will not be obtained.
- (b) At all times the Contractor shall confine his operations to the area of the servitude

unless he has made prior arrangements with adjoining land owners to the Engineer's approval.

- (c) No damage shall be done to buildings, dwellings, crops, cultivated lands, dams, watercourses, roads, fences and the like outside the servitude.
- (d) When working within existing road reserves the Contractor shall ensure that as little inconvenience as possible is caused to residents and traffic. Extra care shall be taken with regard to the siting of the excavated material and materials to be built in to the Works so that disturbances will be minimised.
- (e) The area within the road reserves and servitudes shall be restored to the same standard and state as it was before construction at the Contractor's expense.
- (f) Every precaution must be taken by the Contractor to prevent any flooding and erosion damage to adjoining property resulting from uncontrolled run-off during construction.

A5.16 Drawings and Specifications to be provided

Any information in the possession of the Contractor which is necessary for the Engineer's Representative to complete his "As Built" or "Record" drawings must be submitted to the Engineer's Representative in accordance with the General Conditions of Contract.

Only figured dimensions shall be used and drawings shall not be scaled unless so instructed by the Engineer. The Engineer will supply any figured dimensions which may have been omitted from the drawings.

A5.17 Certificates of Payment

The statement submitted by the Contractor in terms of the General Conditions of Contract shall be prepared in accordance with the standard payment certificates prescribed by the Employer and shall consist of at least **two** sets of A4-sized paper copies.

All costs for preparation and submission of statements shall be borne by the Contractor.

A5.18 Extension of Time Arising from Abnormal Rainfall and Weather

If during the time for completion of the Works or any extension thereof, abnormal rainfall or weather conditions occur, the Contractor may submit a claim for an extension of time in accordance with Clause 42 of the General Conditions of Contract. The method whereby an extension of time due to abnormal rainfall shall be determined is as follows: -

- (1) Abnormal rainfall and weather for each calendar month shall be the total working days in the month under consideration during which the Contractor is unable to proceed with his operations as specified under (2) below, less the number of days representing normal rainfall for the month under consideration as shown on the following table. When drawing up the programme of work, the Contractor shall make provision for the expected delays shown in the table.
- (2) The claim for extension of time shall be the sum of all the positive net monthly number of abnormal rainfall days (as calculated in the previous paragraph) over the Contract Period. Negative monthly totals shall be disregarded. A day shall be considered as lost when the Engineer agrees that no work was done or was capable of being done on any item shown on the critical path and have been affected by

rainfall will not be considered as lost when the Engineer agrees that no work was done or was capable of being done on any item shown on the critical path of the current construction programme. Items which are not shown on the critical path and have been affected by rainfall will not be considered for extension of time.

Annual holidays, Sundays, Saturdays when no work is programmed and the special non-working days as listed in the Appendix to the Tender shall be considered as non-working days.

Calendar Month	Expected No of Working Days Lost Due to Normal Rainfall	Calendar Month	Expected No of Working Days Lost Due to Normal Rainfall
January	3	July	1
February	3	August	1
March	3	September	2
April	2	October	3
May	1	November	3
June	2	December	3

A6 REPORTING BY CONTRACTOR

The Contractor shall be required to submit updated reports together with each Monthly Payment Certificate. Copies of employment contracts for all workers engaged during that month are also to be included.

Payment to the Contractor is conditional upon this information being accurately and timeously submitted.

The following schedules will be provided to the contractor to complete and maintain: -

- The requirements as listed in Form F of Part C1.2
- Contractor's Monthly Report
- Overall Project Worker Schedule
- Monthly Project Worker Schedule
- Weekly Task Wage Register
- Local Labour Schedule

A7 APPLICABLE STANDARDISED AND PARTICULAR SPECIFICATIONS

The latest edition as at date of tender of the following Standardised Specifications for Civil Engineering Construction as published by the South African Bureau of Standards shall apply.

A8 EXISTING SERVICES

A8.1 Known Services

The position of the known existing services is indicated on the layout drawings as far as reasonably possible. The Contractor shall, however, take note of the fact that this is a developed site which is adjoined and crossed by many services. The Contractor must therefore make provision for suitable means of locating and accommodating all services,

including those not known or shown on the drawings. This, however, does not relieve the Contractor from responsibility of verifying if any additional services are present in the area by searching and probing the terrain in question for any existing services or indications of the presence of such services. The Contractor shall at all times exercise the utmost care when working in their vicinity and shall take all necessary steps to protect any existing services whatsoever against damage which may arise as a result of his operations on site. The Contractor shall bear the cost of the repair of damage to any service the possible existence of which could reasonably have been ascertained by him in good time. All cables and pipes shall be considered "live" unless confirmed otherwise by the relevant service authority.

A8.2 Treatment of existing services

All the work will be carried out in the vicinity of existing services and all such services shall remain in operation at all times, except where arrangements have been made for the interruption of the service for the purposes of carrying out the Works under this Contract.

Existing overhead and underground services may be indicated on drawings held by the respective service providers. Should the Contractor find evidence of possible buried services, he shall notify the Engineer immediately thereof. The Engineer will assess the situation and instruct the Contractor on an appropriate course of action to be taken. The Contractor shall be responsible for checking the locations of all services and to ensure that no damage is caused by construction operations.

The Contractor, before starting any excavations or where indicated in the scope of work or site information that underground services either cross or are located adjacent to the Works that is to be constructed, such services shall be exposed by hand ahead of trenching operations to enable any changes that might be needed in the design of the pipelines to be made timeously. Care shall be taken in exposing such services to avoid damaging them. An item has been allowed for in the Bill of Quantities for hand excavation or other methods to search for existing services.

All cables and pipes shall be considered "live" unless confirmed otherwise by the relevant service authority.

A8.3 Use of detection equipment for the location of underground services

The Contractor shall be allowed to use non-intrusive equipment for the location of existing services if so agreed. Should excavation be required to identify and or expose any services this shall be for the account of the contractor and shall only proceed once the relevant permits or approvals have been issued by the Employer.

A8.4 Damage to services

Should any existing services be damaged by the Contractor, the Engineer shall be informed immediately. The Contractor shall repair the damaged service if so instructed by the Engineer or shall assist in the repair of the service as instructed by the Engineer.

A8.5 Refurbishment of services and structures damaged during construction

Unless otherwise instructed, the Contractor shall be responsible for the repair and reinstatement of all services and structures damaged during construction.

UPGRADING OF FERROBANK WASTEWATER TREATMENT WORKS

EMPLOYER TENDER NUMBER: ELM 45/2020

SANS 1200

1200	A	-	General
1200	AB	-	Engineer's Office
1200	C	-	Site Clearance
1200	D	-	Earthworks
1200	DB	-	Earthworks (Pipe Trenches)
1200	DK	-	Gabions and Pitching
1200	G	-	Concrete (Structural)
1200	GA	-	Concrete (Small Works)
1200	L	-	Medium Pressure Pipelines
1200	LB	-	Bedding (Pipes)

Variations and additions to the SANS 1200 Standardised Specifications are given in Section C3.4 - Part B of these document.

Copies of the above listed SANS specifications are not bound into this document but may be purchased by Tenderers at their own cost from: -

SA Bureau of Standards
Private Bag X191
PRETORIA
0001

For all Building Works, the latest edition (1999) of the "Model Preambles for Trades" as recommended and published by the Association of South African Quantity Surveyors shall apply. This Standardised Specification is not bound into this Document but may be purchased by Tenderers from the Master Builders Association, Natal Building Centre, 40 Essex Terrace, Westville (031 - 266 70706).

In the event of any discrepancy between the "Model Preambles for Trades" and the SANS 1200 Standardised Specifications or Project Specifications, the SANS 1200 Standardised and Project Specifications shall take precedence.

In addition, the following Particular Specifications that are bound into this document under Section C3.4 – Part C shall apply: -

PA	-	Fencing
PB	-	Building Works and Service

EMALAHLENI LOCAL MUNICIPALITY

UPGRADING OF FERROBANK WASTEWATER TREATMENT WORKS

EMPLOYER TENDER NUMBER: ELM 45/2020



C 3.4 CONSTRUCTION SPECIFICATIONS

PART B: VARIATIONS TO THE STANDARDISED SPECIFICATIONS

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PROJECT SPECIFICATION

C3.4: CONSTRUCTION SPECIFICATION

PART B: VARIATIONS TO THE STANDARDISED SPECIFICATIONS

PSA GENERAL (SANS 1200 A)

PSA 1 Scope

“1.1 This specification covers requirements, principles and responsibilities of a general nature which are normally applicable to all civil engineering contracts as well as the requirements for the Contractor’s establishment on Site”

PSA 2 Interpretations

PSA 2.1 Definitions

(a) General

“**General Conditions:** The General Conditions of Contract specified for use with this Contract and the Special Conditions of Contract as applicable.

Specified: As specified in the Standardised Specifications, the Drawings or the Project Specifications. Specifications shall have the corresponding meaning, as provided for in sub-clause 1(1)(u) of the General Conditions of Contract”.

(c) Measurement and Payment

“**Fixed Charge:** A charge that is not subject to adjustment on account of variation in the value of the Contract amount or the Contract time for completion. This charge includes all requirements as pre the Contract Conditions, General Conditions and Special Conditions of Contract”

Time-related Charge: A charge, the amount of which is varied in accordance with the time for completion of the work as adjusted in accordance with the provisions of the Contract. This charge includes all requirements as pre the Contract Conditions, General Conditions and Special Conditions of Contract”

Value-related Charge: A charge, the amount of which is varied pro rata the final value of the measured work executed and valued in accordance with the provisions of the Contract.” This charge includes all requirements as pre the Contract Conditions, General Conditions and Special Conditions of Contract”

PSA 2.2 *Abbreviations*

- a) Abbreviations relating to standard documents

Add the following abbreviations: -

“CSK: SANS Co-ordinating Specification”

PSA 3 *Materials*

PSA 3.1 *Quality*

“All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified in accordance with SANS Specifications shall bear the SANS mark, whether so specified or not.

The Contractor shall arrange for all necessary process control tests for soil properties, density, etc, and concrete cube tests and is responsible for the cost of all testing to ascertain that the materials do comply with the relevant minimum requirements and all such costs shall be deemed to be included in the tendered rates. The cost of acceptance control tests done by the Engineer, of which the results do not comply with the minimum requirements, shall be for the Contractor's account. The tests must be carried out by an independent laboratory approved by the Engineer.

The Contractor shall inform the Engineer of any process control testing to be done at least 48 hours before such test are required and must allow in his programme for the time necessary for the tests and the processing of the results thereof.”

PSA 3.2 *Ordering of Materials*

“The quantities set out in the Schedule of Quantities have been carefully determined from calculations based on data available at the time and should therefore be considered to be only approximate quantities. The liability shall rest entirely and solely with the Contractor to determine before ordering, the required types and quantities of the various materials required for completion of the Works in accordance with the Specifications and the Drawings issued to the Contractor for construction purposes.

Any reliance placed by the Contractor on the estimated quantities stated in the Schedule of Quantities issued for tendering purposes, or measurements made by the Contractor from the drawing issued for tendering purposes, shall be entirely at the Contractor's risk, and the Employer accepts no liability whatever in respect of materials ordered by the Contractor on the basis of Tender Documents.”

PSA 4 *Plant*

PSA 4.1 *SILENCING OF PLANT*

"The Contractor's attention is drawn to the applicable regulations pertaining to noise and hearing conservation, framed under the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) as amended.

The Contractor shall at all times and at his own cost, be responsible for implementing all necessary steps to ensure full compliance with such regulations, including but not restricted to the provision and use of suitable and effective silencing devices for pneumatic tools and other plant which would otherwise cause a noise level in excess of that specified in the said regulations.

Where appropriate, the Contractor shall further, by means of temporary barriers, effectively isolate the source of such noise in order to comply with the said regulations."

PSA 4.2 CONTRACTOR'S OFFICES, STORES AND SERVICES

"The Contractor's buildings, sheds and other facilities erected or utilised on the Site for the purposes of the Contract shall be fenced off and shall contain all offices, stores, workshops, testing laboratories, toilet facilities, etc. as may be required by the Contractor. The facilities shall always be kept in a neat and orderly condition.

No personnel may reside on the Site. Only night-watchmen may be on the Site after hours."

"The Contractor shall provide on the Site and in close proximity to the actual locations where the work is being executed, one toilet per 10 workmen, which toilets shall be effectively screened from public view and their use enforced. Such toilets shall be relocated from time to time as the location of the work being executed changes, so as to ensure that easy access to the toilets is maintained.

The Contractor shall, where applicable, make all necessary arrangements and pay for the removal of night soil."

PS A 4.3 SITE SECURITY

The area within the Wastewater Treatment Works security area used by the Contractor for the establishment of his camp site may be subject to a security risk beyond the control of the Authorities normal protection system. The Contractor and the Employer will assess the additional risk and decide if any additional protection is required. The site safety as a whole is the responsibility of the Employer, but the Contractor is responsible for his own and his employee's safety within the Construction area.

PSA 5 Construction

PSA 5.1 *Survey*

PSA 5.1.1 Setting out the Works

"The Contractor will be required to set out the various sections of the Works in the order that he proposes to undertake the work as per his programme, at least one week prior to commencing work on these sections, to enable the Engineer to check the design proposals in the field and thereafter to make any minor changes which he may deem necessary. Any additional survey work or setting out required as a result of these changes shall be undertaken on a day work basis."

PSA 5.1.2 Preservation and replacement of survey beacons and pegs subject to the Land Survey Act

"The Contractor and the Engineer shall record on the said list, their concurrence or disagreement (as the case may be) regarding the completeness and accuracy of the details recorded therein."

"At the completion of the Contract, the Contractor shall expose all pegs that were listed at the commencement of the construction as being in order and the Contractor shall arrange with a registered Land Surveyor for the checking of the positions of all such pegs and the replacement of those that the Land Surveyor's check reveals have become disturbed or damaged. The Contractor shall, as a precedent to the issue of the Certificate of Completion, provide to the Engineer, a certificate from the registered land surveyor, certifying that all the pegs listed at the commencement of construction in accordance with the provisions of this clause, have been checked and that those found to have been disturbed, damaged or destroyed have been replaced in their correct positions, all in accordance with the provisions of the said Act.

The costs of all checking, replacement and certification as aforesaid shall be entirely for the Contractor's account. This, with the provision always that the Contractor shall not be held liable for the cost of replacement of pegs which:

- (a) cannot reasonably be re-established in their original positions by reason of the finished dimensions of the permanent works, and
- (b) the Contractor can prove beyond reasonable doubt to the satisfaction of the Engineer, were disturbed, damaged or destroyed by others beyond his control."

"PSA 5.2 LOCATION AND PROTECTION OF EXISTING SERVICES

PSA 5.2.1 Location of existing services

Before commencing with any work in an area, the Contractor shall ascertain the presence and actual position of all services which can reasonably be expected by an experienced and competent contractor to be present on, under, over or within the Site. Without in any way limiting his liability in terms of the Conditions of Contract in relation to damage to property and interference with services, the Contractor shall, in collaboration with the Engineer, obtain the most up-to-date plans as are available, showing the positions of services existing in the area where he intends to work. Neither the Employer nor the

Engineer offers any warranty as to the accuracy or completeness of such plans and because services can often not be reliably located from plans, the Contractor shall ascertain the actual location of services depicted on such plans by means of careful inspection of the Site. Thereafter, the Contractor shall, by the use of appropriate methodologies, carefully expose the services at such positions as are agreed to by the Engineer, for the purposes of verifying the exact location and position of the services.

The aforesaid procedure shall also be followed in respect of services not shown on the plans but which may reasonably be anticipated by an experienced Contractor to be present or potentially present on the site. All services, the positions of which have been determined as aforesaid at the critical points, shall henceforth be designated as 'known services' and their positions shall be indicated by the Contractor on a separate set of drawings, a copy of which shall be furnished to the Engineer without delay.

As soon as any service which has not been identified and located as described above is encountered on, under, over or within the site, it shall henceforth be deemed to be a known service and the aforesaid provisions pertaining to locating, verifying and recording its position on the balance of the site shall apply. The Contractor shall notify the Engineer immediately when any such service is encountered or discovered on the Site.

Whilst he is in possession of the Site, the Contractor shall be liable for all loss of or damage as may occur to:

- (a) known services, anywhere along the entire lengths of their routes, as may reasonably be deduced from the actual locations at which their positions were verified as aforesaid, due cognizance being taken of such deviations in line and level which may reasonably be anticipated, and
- (b) any other service which ought reasonably to have been a known service in accordance with the provisions of this clause,

The Contractor shall also be liable for consequential damage in regard to (a) and (b), whether caused directly by the Contractor's operations or by the lack of proper protection. No separate payment will be made to the Contractor in respect of his costs of providing, holding available on the Site and utilising the said detecting and testing equipment, nor for any costs incurred in preparing and submitting to the Engineer the Drawings as aforesaid. These costs shall be deemed included in the Contractor's other tendered rates and prices included in the Contract.

Payment to the Contractor in respect of exposing services at the positions agreed by the Engineer and as described above will be made under the payment items (if any) as may be provided for in the respective sections of the specifications pertaining to the type of work involved.

PSA 5.2.2 Protection during construction

The Contractor shall take all reasonable precautions and arrange its operations in such a manner as to prevent damage occurring to all known services during the period which the Contractor has occupation and/or possession of the Site. Services left exposed shall be suitably protected from damage and in such a manner as will eliminate any danger arising there from to the public and/or workmen, all in accordance with the requirements of the prevailing legislation and related regulations.

Unless otherwise instructed by the Engineer, no services shall be left exposed after its exact position has been determined and all excavations carried out for the purpose of exposing underground services shall be promptly backfilled and compacted. In roadways,

the requirements of subclause 5.9 of SANS 1200 DB should be observed. In other areas compaction is to be to 93% modified AASHTO density.

PSA 5.2.3 Alterations and repairs to existing services

Unless the contrary is clearly specified in the Contract or ordered by the Engineer, the Contractor shall not carry out alterations to existing services. When any such alterations become necessary, the Contractor shall promptly inform the Engineer, who will either make arrangements for such work to be executed by the owner of the service, or instruct the Contractor to make such arrangements himself.

Should damage occur to any existing services, the Contractor shall immediately inform the Engineer, or when this is not possible, the relevant authority, and obtain instructions as to who should carry out repairs. In urgent cases, the Contractor shall take appropriate steps to minimise damage to and interruption of the service. No repairs of telecommunication cables or electric power lines and cables shall be attempted by the Contractor.

PSA 5.3 SAFETY

"Pursuant to the provisions of the Conditions of Contract, and without in any way limiting the Contractor's obligations there under, the Contractor shall at his own expense (except only where specific provision (if any) is made in the Contract for the reimbursement to the Contractor in respect of particular items), provide the following:

- (a) Provide to its Employees on the site of the works, all safety materials, clothing and equipment necessary to ensure full compliance with the provisions of the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) as amended (hereinafter referred to as the Act) at all times, and shall institute appropriate and effective measures to ensure the proper usage of such safety materials, clothing and equipment at all times;
- (b) Provide, install and maintain all barricades, safety signage and other measures to ensure the safety of workmen and all persons in, on and around the site, as well as the general public;
- (c) Implement on the site of the works, such procedures and systems and keep all records as may be required to ensure compliance with the requirements of the Act at all times;
- (d) Implement all necessary measures so as to ensure compliance with the Act by all subcontractors engaged by the Contractor and their employees engaged on the works;
- (e) Full compliance with all other requirements pertaining to safety as may be specified in the Contract.

The Employer and the Engineer shall be entitled, although not obliged, to make such inspections on the site as they shall deem appropriate, for the purpose of verifying the Contractor's compliance with the requirements of the Act. For this purpose, the Contractor

shall grant full access to the site of all parts of the site and shall co-operate fully in such inspections and shall make available for inspection all such documents and records as the Engineer and/or Engineer's may reasonably require.

Where any such investigations reveal, or where it comes to the Engineer's attention that the Contractor is in any way in breach of the requirements of the Act or is failing to comply with the provisions of this clause, the Engineer shall, in accordance with the provisions of GCC 2015 of the Conditions of Contract, be entitled to suspend progress on the works or any part thereof until such time as the Contractor has demonstrated to the satisfaction of the Engineer, that such breach has been rectified.

The Contractor shall have no grounds for a claim against the Employer for extension of time and/or additional costs if the progress on the works or any part thereof is suspended by the Engineer in terms of this clause, and the Contractor shall remain fully liable in respect of the payment of penalties for late completion in accordance with the provisions of GCC 2015 of the Conditions of Contract should the Contractor fail to complete the Works on or before the specified due completion date in consequence of the suspension.

Persistent and repeated breach by the Contractor of the requirements of the Act and/or this clause shall constitute grounds for the Engineer to act in terms of GCC 2015 and for the Employer to terminate the Contract in accordance with the further provisions of GCC 2015.

"PSA 5.4 SITE MEETINGS

The Contractor or his authorised agent will be required to attend regular site meetings, which shall normally be held once a month on dates and at times determined by the Engineer, but in any case, whenever reasonably required by the Engineer. Unless otherwise indicated in the Contract or instructed by the Engineer, such meetings shall be held at the Contractor's offices on the site. At such monthly meetings, matters such as general progress on the works, quality of work, problems, claims, payments, and safety shall be discussed, but not matters concerning the day-to-day running of the Contract.

PSA 6 TOLERANCES

PSA 6.1 USE OF TOLERANCES

No guarantee is given that the full specified tolerances will be available independently of each other, and the Contractor is cautioned that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work. Except where the contrary is specified, or when clearly not applicable, all quantities for measurement and payment shall be determined from the 'authorised' dimensions. These are specified dimensions or those shown on the Drawings or, if changed, as finally prescribed by the Engineer, without any allowance for the specified tolerances.

Except if otherwise specified, all measurements for determining quantities for payment will be based on the 'authorised' dimensions. If the work is constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the calculation of quantities will be based on the 'authorised' dimensions, regardless of the actual dimensions to which the work has been constructed.

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Engineer may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be calculated based on the actual dimensions as constructed."

PSA 7 TESTING

PSA 7.1 PRINCIPLES

PSA 7.2 APPROVED LABORATORIES

"Unless otherwise specified in the relevant specification or elsewhere in the Project Specification, the following shall be deemed to be approved laboratories in which design work, or testing required in terms of a specification for the purposes of acceptance by the Engineer of the quality of materials used and/or workmanship achieved, may be carried out:

- (a) Any testing laboratory certified by the South African National Accreditation Systems (SANAS) in respect of the nature and type of testing to be undertaken for the purposes of the Contract;
- (b) Any testing laboratory owned, managed or operated by the Employer or the Engineer;
- (c) Any testing laboratory established and operated on the Site by or on behalf of the Employer or the Engineer.
- (d) Any other laboratory that the Engineer approves in his absolute discretion."

PSA 8 Measurements and Payment

PSA 8.1 *Measurement*

PSA 8.1.1 Preliminary and General Items or Section

PSA 8.1.1.1 Tendered Sums

“The Contractor’s tendered sums under items PSA 8.3 and PSA 8.4 shall collectively cover all charges for: -

- Risks, costs and obligations in terms of the General Conditions of Contract and of this Standardised Specifications, except to the extent that provision is made in these Project Specifications to cover compensation for any of these items of work.
- Complying with the Occupational Health and Safety Act (Act No. 85 of 1993) and in particular with its Construction Regulations 2003 and Part 5 – Section PSA 5.3: Health and Safety Specification, providing the required health and safety measures
- Head-office and site overheads and supervision.
- Profit and financing costs
- Expenses of a general nature not specifically related to any item or items of permanent or temporary work
- Providing facilities on Site for the Contractor’s personnel, including offices, storage facilities, workshops, ablutions, for providing services such as water, electricity, sewerage, sewerage and rubbish disposal, for access roads and all other facilities required, as well as for the maintenance and removal of completion of the Works of these facilities and the cleaning up of the camp site on completion of the works.
- Dealing with water.
- Providing facilities for the Engineer and his staff as specified in SANS 1200 AB and in these Project Specifications.
- Two name boards as specified. These boards are to be erected in positions to be indicated by the Engineer.

PSA 8.2 *Payment*

PSA 8.2.1 Fixed-Charge and Value-Related Items

Payment for the sum tendered under item PSA 8.3.1 will be made in three separate instalments as follows: -

- a. The first instalment which is 50% of the sum, will be paid when the Contractor has met all his obligations to date under this Specification, the General Conditions of Contract and the Special Conditions of Contract, and where the

value of work certified for payment, excluding Materials on Site and any payments under preliminary and general items is equal to not less than 5% of the total value of the work listed in the Schedule of Quantities.

- b. The second instalment, which is 35% of the sum, will be made when the amount certified for payment, including retention monies but excluding the second instalment referred to herein, exceeds 50% of the tender sum.
- c. The final payment, which is 15% of the sum, will be made when the Works have been certified as completed and the Contractor has fulfilled all his obligations to date under this Specification, the General Conditions of Contract and the Special Conditions of Contract.

No adjustment will apply to item 8.3.1 in respect of variations in the value of work done or the time for completion finally authorised.

Payment for the sum tendered under PSA 8.3.2 will be made in monthly instalments in relation to the value of the work done (excluding the value of any price adjustments in terms of Clause 49 of the General Conditions of Contract).

Should the value of the measured work finally completed be more or less than the tender sum (excluding the value of any price adjustments in terms of Clause 46 of the General Conditions of Contract), then the sum tendered under Item PSA 8.3.2 will be adjusted pro-rata up or down and this adjustment shall be applied to the final instalment.

PSA 8.2.2 Time-Related Items

“Payment under item PSA 8.4.1 (time-related item) will be made monthly, pro rata for parts of a month, from the Commencement Date, until the end of the period for completion of the works, plus any extension of time awarded. provided always that the total of the monthly amounts so paid for the item is not more than in proportion to the progress of the work as a whole.

Should the Engineer Grant an extension of time for completion of the Works, the Contractor will be entitled to an increase in the sum tendered for the time-related item, which increase shall be in the same proportion to the original tendered sum as the extension of time is to the original time for completion of the Works.

Payment for such increased amounts will be taken to be in full compensation for all additional time-related preliminary and general costs that result from the circumstances pertaining to the extension of time Granted.”

PSA 8.3 *Schedule Fixed-Charge and Value-Related Items*

PSA 8.3.1 **Fixed Preliminary and General Charges**..... Unit: Sum

The sums tendered shall include full compensation for all fixed and value-related preliminary and general charges as described in sub-clause PSA 8.1.2.2. Payment will be made as described in sub-clause PSA 8.2.1.”

PSA 8.3.2 Value-Related Preliminary and General Charges..... Unit: Sum

The sums tendered shall include full compensation for all fixed and value-related preliminary and general charges as described in sub-clause PSA 8.1.2.2. Payment will be made as described in sub-clause PSA 8.2.1.”

PSA 8.4 *Scheduled Time-Related Items*

PSA 8.4.1 Time-Related Preliminary and General Charges

(a) General Obligations Unit: Sum

(b) Health and Safety Obligations..... Unit: Sum

The sum tendered for item PSA 8.4.1(a) shall include full compensation for all time-related preliminary and general charges as described in sub-clause PSA 8.1.2.2, excluding health and safety.

The sum tendered for item PSA 8.4.1 (b) shall include full compensation for any and all costs related to complying with the Occupational Health and Safety Act and in particular with its Construction Regulations 2003 and Part PG of the Project Specification.

Payment will be made as described in sub-clause PSA 8.2.2.”

PSA 8.5 *Temporary Works*

PSA 8.5.1 Dealing with Traffic

This item shall include supply, erection and maintenance of all temporary road signs, delineators and for flagmen that may be required, in terms of the South African Road Traffic Signs Manual, for any and all interfaces with public roads. Construction of road crossings shall be carried out using the method of half widths and the road shall be re-opened to its full width for two-way traffic overnight. Under no circumstances will the half-widths closure be permitted to remain after normal working hours.

All road signs and delineators shall be new.

PSAB ENGINEER'S OFFICE (SANS 1200 AB)

PSAB 3 Materials

PSAB 3.1 *Office Building*

"The Contractor shall provide a single office for the use of the Engineer that shall be situated within the security area enclosing the Contractor's camp. The office shall be fitted with a suitable air conditioning unit for both heating and cooling. The Engineer's office shall be cleaned on a daily basis. In addition, the offices for the Engineer shall be supplied with approved burglar proofing, the cost of which shall be taken as included in the relevant tendered rates.

Furthermore, the Contractor shall supply a single shaded carport for the exclusive use of the Engineer. The carport shall be constructed with gum pole uprights with IBR or corrugated iron roofing with 80% shade cloth cladding to the sides. The surface bed of the carport shall be free draining and constructed with a 100 mm layer of 19 mm stone".

PSAB 3.2 *Engineer's Survey Equipment*

The Contractor shall provide on request from the Engineer or his Representative, survey equipment for temporary use such as an automatic level, tachometer, level staff, 100 m tape, ranging rods, pegs, etc and any other labour required for this purpose. Instruments provided shall be in good state of repair and accuracy.

The Contractor shall maintain the equipment in good working order and keep it clean until the completion of the Works. The Contractor shall keep the equipment continuously insured against any loss, damage or breakage, and he shall indemnify the Engineer and the Employer against any claims in this regard. Upon completion of the Works the survey equipment as listed above shall revert to the Contractor."

PSAB 4 Construction

PSAB 4.1 *Telephones*

"The Contractor shall provide, for the sole use of the Engineer, a cellular telephone complete with an approved airtime contract, sim card etc. The tendered fixed and time related Preliminary and General Charges in the Schedule of Quantities shall be deemed to include for all costs in this regard and shall include for an amount of R 700.00 per month to cover the cost of calls."

PSAB 4.2 *Survey Assistants*

The Contractor shall make available two suitably educated survey assistant for use on and about the site at all reasonable times.

PSAB 4.3 Measurements and Payment

All measurement and payment for Engineer's office to be done under PSA 8.3 and PSA 8.4.

PSC SITE CLEARANCE (SANS 1200 C)

PSC 1 Materials

PSC 1.1 *Disposal of Material*

Prior written approval to be obtained from the Engineer with regards to the following:

“The Contractor shall make his own arrangements for the disposal of material obtained from clearing and Grubbing and from the demolition of structures, which material shall be removed from the site.

The disposal site shall meet with the approval of the Local Authority within whose area it falls, and the spoiling shall comply with all the statutory and municipal regulations. No burning of material will be allowed on site.

No overhaul will be paid for any spoil materials and the Contractor shall allow for all haulage in his tendered rates. All costs relating to this activity shall be deemed to be included in the rates tendered for site clearance.”

PSC 2 Construction

PSC 2.1 *Clearing*

“Where the any Portion of the Works traverses existing fences these shall be carefully uplifted, if required, and reinstated during the course of activities in that specific area. Where an uplifted fence interferes with the security of what it controls a temporary fence shall be installed and operated to the satisfaction of the Engineer or his Representative. Prior to removal or dismantling of any fence, the contractor will be required to photograph the fence for future reference.”

PSC 3 Measurement and Payment

PSC 3.1 *Basic Principles*

“No separate payment will be made for topsoil removal along pipeline routes. The Contractor is to excavate trenches in such a manner that the top 150 mm of material is kept separate from other excavated material, for replacement on completion of backfill operations. All costs related to excavating this vegetation and topsoil, and separate stockpiling shall be deemed to be included in rates tendered for trench excavation.”

PSC 4 Take down existing fences

“The tendered rate shall also include for the re-erection of the fence, photographing and temporary fencing where required all as specified.”

PSD EARTHWORKS (SANS 1200 D)

PSD 1 Interpretations

PSD 1.1 Definitions

“Borrow material: Material, other than materials obtained from excavations required for the Works, obtained from sources such as borrow pits or the authorised widening of excavations. ‘Borrow’ shall have a corresponding meaning.”

“Stockpile (Verb): The process of selecting and, as may be necessary, loading, transporting and off-loading material in a designated area for later use and a specific purpose.”

“Fill: An embankment or terrace constructed from material obtained from excavations or borrow. In roads it includes the earthworks up to the underside of the selected sub-Grade level.

Fill (Material): Material used for the construction of an embankment or terrace.

Roadbed: The natural in-situ material on which the fill, or in the absence of fill, any pavement layers, are to be constructed.”

PSD 3 Materials

PSD 3.1.1 Method of Classifying

“Classification of material other than ‘soft excavation’ shall be agreed upon before excavation may commence.

The Contractor shall immediately inform the Engineer if and when the nature of the material being excavated has changed to such an extent that a new classification for further excavation is warranted. Failure on the part of the Contractor to advise the Engineer thereof in good time shall entitle the Engineer to classify, at his discretion, such excavation as may have been executed in material of a different nature.”

PSD 3.3 Selection in borrow pits and excavations

The approval of a borrow area for a certain purpose does not necessarily mean that all material within that area is suitable for the specified purpose. What it does mean, is that the borrow area contains some suitable material. The onus is on the Contractor to ensure that only material that is indeed suitable is removed and used for the specified purpose.

Where the Contractor is required to select material from excavations for a specific purpose, the above provisions relating to borrow areas shall apply *mutatis mutandis* to excavations.

The Contractor shall not waste or contaminate material that has been selected for a specific purpose”.

PSD 5 Construction

PSD 5.2 *Methods and Procedures*

PSD 5.2.2.1 Excavation for general earthworks and for structures

"When the nature of the material precludes the above procedure, additional excavations shall be carried out to provide working space for the erection of formwork. In general, payment will be made for excavating a working width of 1000 mm, but the Contractor may excavate a greater working width at no additional cost to the Employer."

"Where excavations have been carried below the authorised levels, the Contractor shall backfill such excavations to the correct level with approved gravel compacted to 90% of modified AASHTO density or to the density of the surrounding material, whichever is the higher density. This will be done at the expense of the Contractor.

Where excavations for structures have been carried out in hard material, the Engineer may direct that over-excavation be backfilled with weak concrete if there is a danger of settlement or differential settlement of the foundations.

Where the sides of excavations against which concrete is to be cast have been over-excavated or have collapsed partially, the Contractor shall re-trim the excavations if necessary and, unless other remedial measures are agreed to by the Engineer, shall cast the concrete for the structure, including the additional concrete that may be required as a result of the over-excavation or partial collapse. The cost of the additional concrete or remedial measures shall be for the Contractor's account."

Additional excavation for the Inlet Works, Biological Reactors and Clarifiers will be executed to 1000mm below the levels indicated on the drawings for the blinding layer to be placed on. Backfill and compaction with approved imported material to 93% of modified AASHTO density or to the density of the surrounding material, will then be executed over the whole excavated area, whichever is the higher density.

PSD 5.2.5 Transport for Earthworks

PSD 5.2.5.1 Freehaul

"The freehaul distance for disposal of materials shall be 5km and for importation 10km."

"All movement of materials from commercial sources, borrow pits selected by the contractor, cut, fill and spoil materials will be regarded as freehaul."

PSD 5.2.2.2 Borrow Pits

"A commercial source shall, for the purposes of this Specification, mean a source of material provided by the Contractor, not the Employer.

Where it is specified that material shall be obtained from commercial sources, the Contractor shall be responsible and include in his price for fill from commercial sources, for finding a source of suitable material, for making all arrangements for procuring the material with the owner of the source, for the payment of any royalties, charges or damages and for transporting the material to the site regardless of the distance involved.

No payment will be made for the removal of overburden or stockpiling at the commercial source and no extra over payment for excavating in intermediate, hard or boulder material shall apply."

PSD 5.2.2.3 Disposal

"The Contractor shall make his own arrangements for the disposal of excess or unsuitable materials. The disposal / spoil site shall meet with the approval of the Local Authority within whose area it falls, and the spoiling shall comply with the statutory and municipal regulations. The cost of all loading, hauling, dumping, spreading, compacting and any other costs or charges will be deemed to be included in the rates tendered for spoiling of material."

PSD 5.2.4 Finishing

PSD 5.2.4.3 Grass or other Vegetation

"The type of Grass to be used shall be Cynodon Dactylon, Cynodon Royal Blue or Pennisetum Clandestinum (Kikuyu) as agreed with the Engineer.

- a) General - Grassing shall be carried out at the earliest convenient stage of the construction and shall be arranged to suit the seasonal weather conditions. Fertiliser shall be supplied by the Contractor.
- b) Planting Grass cuttings - The areas to be Grassed by means of Grass cutting shall, unless already moist, be thoroughly watered before cuttings are planted to ensure that the soil will be uniformly moist to a depth of at least 150 mm when the planting is done. This method shall only be used on flat areas, such as sidewalks and platforms.

An approved variety of Grass cuttings shall be evenly planted by hand or mechanically at a rate of at least 600 kg of cuttings per hectare and shall be covered with 30 mm of approved soil. Fresh cuttings only shall be used but not any Grass cuttings that have been allowed to dry out. Immediately after having been planted, the Grass cuttings shall be given a copious watering, and, when sufficiently dry, shall be rolled with a light agricultural roller.

- c) Sodding - Areas to be Grassed by sodding shall be given a layer of topsoil of at least 50 mm in thickness unless, where suitable soil is present, the Engineer orders the topsoil to be omitted. The areas to be sodded shall be thoroughly watered beforehand so that it will be moist to a depth of at least 150 mm during sodding. The surface shall be roughened slightly to ensure a good penetration of roots into the soil. Sods shall be protected against drying out and kept moist from the time of harvesting until they are finally placed. The handling of the sods shall not result in the sods losing their prescribed soil thickness.

The first row of sods shall, where possible, be laid in a straight line, and if on a slope, laying the sods shall start at the bottom of the slope. The sods shall be butted tightly against each other, and care shall be taken not to stretch or overlap the sods. Where a good fit cannot be obtained, any intervening spaces shall be filled with topsoil. The next row shall be similarly placed tightly against the bottom row with staggered joints, and so on until the entire area has been covered with sods. Sods shall be laid in such a way that unnecessary trampling over areas previously laid is prevented. To this end, a diagonal method of laying sods is preferred, moving up the slope and behind previously laid sods. On steep slopes and batters the sods shall be held in position by a sufficient number of wooden stakes approximately 300 mm long by 20 mm in thickness and these stakes shall be knocked into a depth of 100 mm into the subsoil.

Sods laid adjacent to concrete side drains and concrete kerbs shall be laid in such a manner that the sodding will be 20 mm higher than the concrete. When strip sodding is required, the sods shall be laid in such a manner that the sods are proud of the surrounding Ground level. During strip sodding the areas in between shall be planted as specified in item B5.2.4.3(f)(b) above. Strip sodding shall at all times be staked as specified above.

As sodding is completed each section shall be lightly rolled or firmly pressed to ensure a proper bond with the underlying material, and thoroughly watered afterwards.

- d) Maintenance of Grassed areas - Maintenance shall include watering, weeding, mowing, re-fertilisation where necessary, re-grassing of areas that, in the opinion of the Engineer, are unsatisfactory, and any other work that is necessary to achieve full, healthy and weed-free Grass cover to banks and plateaux before the end of the defects liability period.

Mowing shall be undertaken with an approved power mower. All established Grass cover shall be cut to a height of 25 mm above Ground level. Mowing shall be undertaken initially with the mower set to cut 50 mm above Ground level, the height of cut being reduced to 25 mm when adequate cover has been achieved."

PSD 5.2.5.2 Overhaul

"No overhaul shall apply."

PSDB EARTHWORKS (PIPE TRENCHES) (SANS 1200 DB)

PSDB 3.1 *Classes of Excavation*

“For this contract, the classes of excavation will be subdivided as follows:

(a) Labour Intensive Excavation

(i) Soft Excavation

Soft excavation shall be that excavation in material, which in the opinion of the Engineer, can be efficiently excavated and loaded by means of hand-held tools excluding pneumatic or hydraulic breaking tools. Soft excavation shall include all boulders with a volume of less than 0.125 m³ and a maximum dimension of 500 mm, which can still be removed by hand methods.

(ii) Hard Excavation/Hard Rock

Hard excavation shall be excavation in material, which in the opinion of the Engineer, can only be removed efficiently with mechanical equipment such as jackhammers, drilling and blasting etc. Hard excavation shall also include boulders with a volume exceeding 0.125 m³ and the maximum dimension exceeding 500 mm, which cannot be broken down and removed by hand methods.

(b) Machine Based Excavation

In cases where heavy excavation equipment is permitted, only two classes of excavation shall be applicable, i.e. hard rock excavation and soft excavation.

Hard rock excavation shall be as specified in Subclause 3.1.2 (c) of SANS 1200 D, while excavation in all other materials shall be classified as soft excavation.

Boulders which require individual drilling and blasting in order to be loaded by a front-end loader or back acting excavator, shall be classified as hard rock and will be measured individually as they are removed.”

PSDB 3.7 *Selection*

Replace the words “if he so wishes” in the first line of the second paragraph with the words “at his own cost”.

PSDB 5 Construction

PSDB 5.6 *Backfilling*

PSDB 5.6.1 General

“Notwithstanding the requirements of sub-clause 5.6.1 and 5.6.6, no pipe joint or pipe filling shall be covered by either the blanket fill or the main fill prior to the successful completion of the visual inspection, and the pressure testing of the relevant section of the pipeline.”

PSDB 5.6.4 Disposal of Intermediate and Hard Rock Material

“Intermediate and/or hard rock material shall be disposed of to sites approved by the Engineer”

PSDB 5.7 *Compaction*

PSDB 5.7.2 Areas subject to Traffic Loads

“All backfill to pipes under roads and in road reserves or future road reserves shall comply with the requirements of sub-clause 3.5(b) and shall be compacted in accordance with sub-clause 5.7.2.”

PSDB 5.9 *Re-Instatement of Surfaces*

PSDB 5.9.7 Cross Drainage Berms

Cross drainage berms are required along all steeply inclined pipeline routes at intervals to be determined by the Engineer, to minimize possible flood damage.”

PSDB 8 Measurements and Payment

PSDB 8.2 *Computation of Quantities*

PSDB 8.2.3 Excavation will be measured lineally (m).

PSDB 8.3 *Scheduled Items*

PSDB 8.3.1 Site Clearance and Topsoil Removal

No separate payment shall be made for topsoil removal along pipeline routes. See clause PSC 8.1.

“PSDB 8.3.8 Cross Drainage Berms.....Unit : No

The tendered rate shall include all material, labour, and plant for the construction of cross drainage berms. A cross drainage berm shall be 300 mm high, 800 mm wide and 2000 mm long. The berms shall be constructed of selected excavated material compacted to 93 % MOD AASHTO or to the approval by the engineer, with no stones or rocks exceeding 100 mm diameter in the largest dimension. Cross drainage berms shall be placed at all steeply inclined pipeline sections at intervals to be determined by the Engineer.”

PSG CONCRETE (STRUCTURAL) (SANS 1200 G)

PSG 3 Materials

PSG 3.2 Cement

PSG 3.2.1 Applicable Specifications

“Where reference is made in this specification or the Standard Specifications to the cement specifications, e.g. SANS 471: Portland cement and rapid hardening Portland cement, it shall be replaced with the new specification.

SANS ENV 197-1: Cement-composition, specifications and conformity criteria.

Part 1: Common Cements; Where reference is made in this Specification or the Standard Specifications to the different cement types, the following new names shall apply:

Old product nomenclature	Typical new product nomenclature	
	Cement type	Cement strength class
OPC	CEM I CEM I	32,5 32,5R
RHC	CEM I CEM I	42,5 42,5R
LASRC	No provision made	No provision made
PC15SL	CEM II/A-S CEM II/A-S CEM II/A-S	32,5 32,5R 42,5
PC15FA	CEM II/A-V CEM II/A-V CEM II/A-W CEM II/A-W	32,5 32,5R 32,5 32,5R
RH15FA	CEM II/A-V CEM II/A-V CEM II/A-W CEM II/A-W	42,5 42,5R 42,5 42,5R
PBFC	CEM III/A CEM III/A	32,5 32,5R
PFAC	CEM II/B-V CEM II/B-W	32,5 32,5
RH30SL	CEM II/B-S CEM II/B-S	32,5R 42,5
RH40SL	CEM III/A CEM III/A	32,5R 42,5
Masonry cement	MC MC MC	12,5 12,5X 22,5X

Only Ordinary Portland Cement (O.P.C.) shall be used on the Works. In the case of Strength Concrete and as a substitute for a portion of the cement it is required that between 15% and 30% of the O.P.C. be replaced by Pulverised-fuel ash (Pfa) complying

with ASTM C618 (Class F). The choice and proportions of pozzolans in substitution for a portion of the O.P.C. will form a part of the Strength Concrete mix design specified in clause PSG 3.2.4.”

PSG 3.2.3 Storage of Cement

“Cement for all Strength Concrete used in structural elements shall be stored in weatherproof silos. Cement drawn for use shall be measured by mass. The Contractor shall ensure that cement for Strength Concrete is not stored on Site for longer than six weeks. Copies of all waybills for cement deliveries shall be submitted to the Engineer.”

PSG 3.4 *Aggregates*

PSG 3.4.1 Applicable Specification

The aggregates shall comply with the requirements of SABS 1083. The maximum water absorption of the coarse aggregate shall not exceed 1% and the flakiness index shall not exceed 25 %. The maximum water demand of the fine aggregate shall be 190 l/ m³. Aggregates to be used in this contract shall be tested in accordance with subsection C-15 of SABS 1083 to determine whether they are potentially alkali-reactive. If they are alkali-reactive they shall either be replaced with aggregates that are non-reactive or the requirements of PSG-3.2.2.1 in respect of alkali-reactiveness shall apply.

The content of chloride ion in the aggregates shall be determined and shall be within the limits specified in SABS 1083. Test results in this regard shall be submitted to the Engineer. At tender stage the Contractor shall assure himself by means of tests and test mixes by an accredited laboratory that the fine and coarse aggregates that he intends to use comply with the specification. The tendered rates shall therefore be deemed to allow for the importation of aggregates, if necessary, that do comply with the Specification.

The Contractor shall be responsible for locating the sources of all aggregates.

PSG-3.4.3 Storage of aggregates

• ***Add the following additional sub-clauses:***

“(c) The aggregate to be used for water-retaining structures shall at all times be stored in a cool environment and, if at time of mixing, the ambient temperature exceeds 30°C, only the coarse aggregate shall be sprayed with water to assist cooling. It is advisable that all aggregate stockpiles be shaded from the sun by means of 80% shade netting.”

The Contractor shall ensure adequate drainage of the coarse aggregate stockpile.

PSG-3.5 *Admixtures*

PSG-3.5.1 Approval of Admixtures Required

The Contractor shall, by way of the information required in sub-clause 3.5.1, prove to the satisfaction of the Engineer that proposed admixtures are non-toxic, suitable for potable water structures, and beneficial and not detrimental to the durability of the concrete. The use of plasticizers with air-entraining properties will not be allowed.

PSG-3.5.2 Air-entraining Agents

Air-entraining agents shall not be used.

“PSG 3.9 Jointing Materials

PSG 3.9.1 Waterstops

Waterstops shall be a proprietary design consisting of flexible polyvinylchloride.

Tensile strength	:	15 MPa (min.)
Elongation at break	:	250% (min)
Hardness (ASTM D1706)	:	70 ±5
Cold crack temperature	:	25°C
Water absorption (48h at 50°C)	:	0,5 % (max.)

PSG 3.9.2 Joint Sealer

Joint sealer shall be a two-component polyurethane base sealing compound or similar approved sealer. The joint sealer shall have a movement tolerance of 25% (min) and shall be capable of withstanding extension and compression over a wide range of moisture and temperature conditions without deterioration. Two component polyurethane sealers shall comply in all respects with SANS 1077-1984, "Sealing Compounds for the Building and Construction Industry, Two-Component Polyurethane - Base."

PSG 3.9.3 Joint Filler

Joint filler shall be a non-absorbent, closed cell, polyethylene filler, having a density of at least 45 kg/m³. The joint filler shall have a load bearing capacity of 0,2 Mpa for 50% compression; moisture absorption shall not exceed 3% by volume. Fillers shall be provided with a tear out strip for forming the specified recess for the sealant, inclusive of the bond breaker, which shall be an approved PVC tape."

PSG 3.9.4 Bitumen Impregnated Soft board

The bitumen impregnated softboard shall be 13 mm thick. The softboard shall have a density of 420 kg/m³, a maximum water absorption rate of 28% and a minimum bitumen content of 20%. Masonite SA is a supplier of a product called "Flexijoint" that complies to this specification.

PSG 4 Plant

PSG 4.5 Formwork

PSG 4.5.3 Ties

Formwork ties in water-retaining structures shall be of the 12mm Extended Coil Tie with Water-Bar type by Form-scaff or similar approved. No ferrules or ferrule pipes may be used in structural elements of water-retaining structures. The Contractor shall allow in his rates for the specified formwork ties and ensure that his formwork is compatible with these ties.

After removal of plastic spacing cones of the extended coil ties from concrete, the openings in the concrete shall be roughened with a mechanical wire brush. Thereafter the openings in the concrete shall be roughened with a mechanical wire brush. Thereafter the openings shall be painted with cement mortar and filled with a non-shrink grout such as "Standard Bedding Grout" by Samson or a similar approved non-toxic product compatible with the chemicals used in the water. The grout filling shall be applied in such a way as to protect the ties against corrosion.

PSG 5 Construction

PSG 5.1 Reinforcement

PSG 5.1.2 Fixing

"Sufficient joints shall be made so that the entire reinforcement cage is rigid and to the satisfaction of the Engineer. Tie wire shall not encroach on the specified minimum cover by more than a single strand thickness.

Welding of the reinforcement shall not be permitted.

Spacers to be used shall be of approved design.

Where mortar blocks are used as spacers, they shall be properly shaped so as not to slip out of position and shall be made of the same mix as the mortar of the concrete in which they are to be placed.

The mortar shall be well compacted by approved means into the moulds and the mortar blocks shall be cured in water for at least 7 days before being fixed in place."

PSG 5.1.3 Cover

The minimum concrete cover to reinforcement in water-retaining structures shall be 50 mm unless otherwise noted on the drawings.

The cover blocks for water-retaining structures shall be manufactured from concrete of grade, durability, density and impermeability at least equal to that specified for the respective elements except that 12mm stone instead of 19mm stone shall be used. The size of the cover blocks shall be 60 mm x 60 mm, with a thickness equal to the specified cover. Wires shall be fully galvanized Class A as per SABS 675- 1993. The wires shall be carefully held in position while the concrete is setting to ensure that all the wires are inserted to a uniform and consistent depth of 50% of the thickness of the cover block for all the cover blocks.

The concrete shall be thoroughly compacted by means of a vibrator or vibratory table and the blocks shall be protected against early drying and shrinkage due to sun and wind, by being kept continually wet while still in the mold. After the blocks have been removed from the mold they shall be kept in water continuously until being used, and this period shall not be less than 14 days.

A proper mix design for concrete in cover blocks shall be submitted to the Engineer for approval.

PSG 5.1.4 Splicing

Splice lengths for reinforcement in the case of water-retaining structures shall not be less than 50 diameters and in non-water-retaining structures not less than 40 diameters. Where applicable in water-retaining structures, splices shall be staggered so that they are evenly spread throughout the structure.

PSG 5.2 ***Formwork***

PSG 5.2.1 Classification of Finishes

“Smooth rubbed finish shall be produced on freshly hardened concrete. All necessary patching shall have been done immediately after the forms have been removed and rubbing shall be completed not later than the following day. Surfaces shall be wetted and rubbed, first with a coarse carborundum stone followed by a smooth carborundum stone, or other similar abrasive until a uniform colour and texture is produced. No cement Grout or slurry shall be used during the rubbing process. The character of the materials used and the care with which forms are constructed and concrete placed are factors in determining the amount of rubbing required.”

(i) Special off-shutter finish

Special off-shutter formwork shall produce a finish that will comply with the requirements of degree of accuracy 1 according to SABS 1200 G clause 6.2. For this contract the special off-shutter finish is applicable to all visible concrete.

Formwork for all classes of finish shall be made of steel panels. Small approved laminated wooden board inserts to steel framed panels may only be used in confined places and the use thereof will be subject to approval by the Engineer. The panels shall be free from rust, ridges, fins, bulges, imperfections, irregularities, chips and holes. The concrete surface shall be smooth and free from irregularities, bulges, ridges, imperfections, air bubbles, honeycomb or surface discolourations. Grout checks shall be used at all construction joints and chamfers at all corners.

Joints between panels shall be sealed tightly to prevent local honeycombing or leaching of concrete. Joints between panels shall form straight horizontal and vertical lines which shall be spaced evenly on the formed concrete surface, and shall be even and smooth and require minimal or no finishing. The layout of all formwork panels and construction joints shall be discussed with the Engineer before application and shall be approved in writing prior to erection of formwork.

(ii) Top of wall footings and floor slabs

The top of the wall footings and the floor slabs shall have a steel-floated or power-floated finish.

(iii) Top of walkways

The top of walkways shall have a wood-floated finish.

(iv) Top of walls

The top of walls shall have a steel-floated finish except where they form part of walkways, in which case they shall have a wood-floated finish.

(v) Top of clarifier wall

The top of the clarifier wall shall have a steel-floated finish to Degree I Accuracy with no abrupt changes in the continuous surface.

When the wall of the clarifier has become dry, but at least 28 days after its completion, the contractor shall apply a chemical hardening and dust proofing compound, similar to Nitroflor of Fosroc, to the top of the wall. Three coats shall be applied, at a rate of one liter per 6 m² each.

(vi) Visible corners

All visible corners shall have a 25 mm x 25 mm chamfer included in formwork rates

PSG 5.2.2 Preparation of Formwork

"Panel joints for formwork shall be horizontal or vertical and arranged to match symmetrically throughout the structure."

PSG 5.5 Concrete

PSG 5.5.1 Quality

PSG 5.5.1.5 Durability

The exposure conditions shall be considered as being "severe". The maximum water/cement ratio shall be 0,5.

PSG 5.5.1.7 Strength Concrete

- (a) Due to the design approach and assumptions adopted for this contract, it is of the utmost importance that good strength with consistent quality and composition is used throughout. All possible measures to limit shrinkage shall be applied.
- (b) In addition to the requirement that the Contractor design the mixes to the specified strengths, the cementitious material content shall be such as not to cause alkali-aggregate reaction and shall not exceed 380kg/m³ for 30Mpa/19 mm concrete or 460 kg/m³ for 40 Mpa/19 mm concrete.
- (c) All concrete shall be based on designed mixes. Trial mixes shall be made by an approved laboratory with suitable experience in the design of PFA concrete mixes and mix designs and cube results submitted to the Engineer.

"The Contractor shall employ the services of an approved materials laboratory for the design of strength concrete mixes.

The following shall be taken account of :

- (a) The intent of the mix design is to ensure for every part of the structure homogeneous concrete which will have the required strength and durability
- (b) The use of approved fine and coarse Aggregates
- (c) Compaction by vibration
- (d) Mass batching
- (e) Slump not exceeding the requirements stated in Table 3 of SANS 1200 G
- (f) The necessity to design the mix using O.P.C. and the part substitution with an approved pozzolan
- (g) Utilizing the minimum specified cement content for reasons of durability and imperviousness

“5.5.1.8 No Fines Concrete

The Contractor shall be responsible for the design of a no-fines concrete mix on the basis, and within the limitations, of certain parameters specified hereafter:

- (a) Classes of no-fines concrete

No-fines concrete shall be classified by the prefix NF and the size of aggregate to be used e.g. class NF-19 means a no-fines concrete with a 19 mm nominal size aggregate. For this contract class NF 19 shall be used.

The volume of aggregate per 50 kg of cement for each class of no-fines concrete shall be as follows:

<u>Class</u>	<u>Aggregate per 50 kg cement</u>
NF 26,5	0,32 m ³
NF 19	0,30 m ³

- (b) Aggregates

Aggregate shall be a single-graded aggregate in accordance with SABS 1083, provided that the particle size shall be less than 38 mm and greater than 13 mm. Aggregate shall not contain any dust. Aggregate not complying with these requirements will be summarily rejected.

- (c) Cementitious materials

Ordinary Portland cement as specified in PSG-3.2 shall be used in no-fines concrete. The addition of pozzolans other than PFA, in whatever form, will not be permitted.

(d) Cement Paste

The consistency of cement paste shall be such that all aggregate particle surfaces receive a uniform coating. Paste consistency shall be sufficiently viscous as to prevent the flow of paste through the placed concrete.

(e) Strength

Concrete cube strengths at 4 and 28 days shall be 3,0 and 4,0 Mpa respectively

(f) Permeability

Notwithstanding the preceding specifications, it is the Contractor's responsibility to ensure the permeability of the no-fines concrete. The Contractor shall be required to demonstrate the permeability of cast no-fines concrete on request of the Engineer. Any portion of the said no-fines concrete, deemed by the Engineer to be of insufficient permeability, shall be broken out and replaced at the Contractor's expense.

(g) Batching and mixing

Cement shall be measured by mass or full bags of 50 kg each and aggregate shall be measured by volume in approved measuring boxes or barrows.

The quantity of water added shall be just sufficient to form a smooth grout that will adhere to and completely coat each and every particle of aggregate and that is just wet enough to ensure that at points of contact of the aggregate the grout will run together to form a small fillet to bond the aggregate together. The mix shall contain no more than 20 liters of water per 50 kg of cement.

Mixing shall be carried out in an approved batch-type mechanical mixer.

(h) Placing

No-fines concrete shall be placed in accordance with the procedure agreed to by the Engineer. It shall be placed in a single operation in its final position within 30 minutes of mixing.

The concrete shall be worked sufficiently to ensure that it completely fills the space to be concrete and that adjacent aggregate particles are in contact with one another. Excessive tamping or ramming must be avoided and under no circumstances shall the concrete be vibrated.

(i) Protection

All no-fines concrete shall be protected from the elements and from loss of moisture. Protection against loss of moisture shall be accomplished in one or more of the following ways:

- Retaining formwork in place.
- Covering exposed surfaces with sacking or other approved material kept wet continuously.

- Covering exposed surfaces with plastic sheeting complying with the requirements of PSG-5.5.8.

No-fines concrete placed during cold weather shall be adequately protected against frost for at least 3 days.

PSG 5.5.3.2 Ready Mixed Concrete

The use of ready-mixed concrete for this contract shall be permitted provided that it complies with the requirements of this specification. Test results obtained by such a production facility shall not be regarded as part of the quality control systems, and the Contractor shall take his own samples of concrete on site and have them tested in accordance with clause 7 of SABS 1200 G and Clause PSG-7.1.2.

PSG 5.5.5 Placing

“For closed circuits such as circular or rectangular water retaining structures for which no vertical joints have been detailed on the drawings, work shall commence at one or more points in the circuit and proceed in opposite directions at the same time so that on completion of the circuit the junction or junctions are formed with freshly placed concrete. The height of the lift shall be carefully pre-planned so that the concrete can be placed in one continuous operation over the entire perimeter of the wall. No unauthorised vertical or inclined construction joints of any kind will be permitted in continuous walls.”

The Contractor shall give the Engineer at least 48-hours notice of his intention to cast concrete.

Concrete in water-retaining structures shall not be allowed to fall freely through a height of more than 2,4 m. This implies that walls in these structures may not be cast in heights exceeding 2,4 m in height.

PSG 5.5.6 Compaction

“The tops of all walls and columns shall be re-vibrated within 3 hours of the concrete having been placed”

PSG 5.5.7 Construction Joints

“PSG 5.5.7.1 Special note

Construction joints are a potential source of weakness in the strength, watertightness and appearance of the structure and they shall be positioned and treated with particular care.

PSG 5.5.7.2 Location

- (a) Construction joints shall be located as shown on the drawings or to the approval of the Engineer. The spacing of joints shall depend on the volume of concrete that can be properly placed in a normal shift.

- (b) Construction joints shall be fixed in advance of the concreting operation.
- (c) In general construction joints shall be positioned at the points of maximum compression, minimum shear and at right angles to the main reinforcement.
- (d) Where smooth shutter finishes are specified the joints shall coincide with the edges of the shutter boards or panels.
- (e) All joints shall be truly vertical or horizontal unless otherwise specified.

PSG 5.5.7.3 Bonding Fresh Concrete to Old

The following methods shall be used:

- (a) Existing concrete less than 4 hours old:
 - (i) Horizontal joints: Place original concrete 25 mm higher than level of joint and strike off surplus concrete as in Clause PSG 5.5.7.4. Place fresh concrete.
 - (ii) Vertical joints: Remove shutter 1 hour to 2 hours after fresh concrete is placed. Carefully roughen surface with wire brush or compressed air to expose coarse aggregates and remove loose material. Place fresh concrete.

- (b) Existing concrete between 4 hrs and 3 days

- (i) Horizontal joints: After removing 25 mm of surplus concrete as described in Clause PSG 5.5.7.4 brush the old concrete thoroughly with a wire brush to expose the coarse aggregates.

Alternatively use sand blasting. Wash joint with clean water to remove all laitance, dirt and loose particles.

Just before placing fresh concrete apply a thin layer of plastic mortar to the surface of the existing concrete. The mortar shall consist of cement and sand mixed in the same proportion as that contained in the concrete mix (i.e. omitting coarse aggregates). The mortar shall still be plastic when the fresh concrete is placed against it.

- (ii) Vertical Joints: Roughen the surface with a wire brush to expose coarse aggregates and remove loose material. Alternatively use sand blasting. Then treat as for horizontal joint in (b) (i) above.

- c) Existing concrete more than 3 days old:

- (i) Horizontal joints: As for (b) (i) above with the addition that the construction joint surface shall be kept continuously damp for 24 hours before the plastic mortar and fresh concrete are placed, but no free water shall be visible on the surface prior to placing the mortar.
- (ii) Vertical joints: As for (b) (ii) above with the addition that the construction joint surface shall be kept continuously damp for 24 hours before the plastic mortar and fresh concrete are placed.

- d) Adhesives:
Proprietary adhesives may be used for bonding concrete at easily accessible construction joints (e.g. slabs and beams) subject to the approval of the Engineer. The manufacturer's instructions shall be followed by the Contractor. In general the existing concrete shall be prepared as described in (b) (i) above.

PSG 5.5.7.4 Horizontal Joints

Unless otherwise specified or shown on the drawings all horizontal joints shall be formed by striking off the top 25 mm of concrete approximately 1 hour after it has been compacted, working to the top of the line formed by the gauge strips specified below.

PSG 5.5.7.5 Gauge Strips

To give all joints in the outer surface of the reservoir a straight-line finish where smooth shutter finishes are specified, 40 mm x 40 mm rebated gauge strips shall be fixed inside the shutters at the joint positions and removed before the new concrete is cast.

PSG 5.5.7.6 Keyed Joints

Joints in beams and slabs shall have keyed faces to transmit shear.

PSG5.5.7.7 Joints Parallel to Main Reinforcement

These joints shall be subject to the approval of the Engineer and shall be formed only when absolutely necessary. The Engineer may order additional splice bars and other load transfer devices to be provided at the joint. No extra payment shall be made for the additional material or labour if such construction joints are requested by the Contractor.

PSG 5.5.7.8 Column Joints

These joints shall be treated as for "Horizontal Joints" except at joints with slabs or beams. In this case it shall project 25 mm into the soffit of the slab or beam when the excess concrete has been struck off as described.

PSG 5.5.7.9 Shuttering at Joints

To obtain joints free from projections shutters for the new concrete shall be tightly fixed to the existing concrete by means of additional bolts, wedges or clamps. In all possible cases the shutters shall overlap the joint and not be disturbed until the new concrete has hardened."

PSG-5.5.8 Curing and protection

(a) Floor and roof slabs and wall footings

Floors and roof slabs and wall footings shall be covered with a layer of clean river sand, 20 mm to 25 mm thick, which shall be kept moist by means of an irrigation type mist spraying system as specified below. The sand shall be applied after the specified surface finishing has been completed and the concrete has gained sufficient strength to prevent any damage to the surface, but not more than 24 hours after the concrete has been cast. If the concrete is exposed to thermal shocks like high temperatures and/or dry, warm winds before the sand can be

applied, the concrete shall be protected with approved plastic sheets that comply with the requirements as specified below until the concrete surface can be covered with sand. Alternatively these elements may be cured by flooding with water, the depth of which shall not be less than 25 mm and not exceed 75 mm.

(b) Column footings

Above-mentioned structural elements shall be protected with approved plastic sheets that comply with the requirements as specified below immediately after the prescribed surface finishing has been completed. When the concrete has gained sufficient strength to prevent damage to the surface thereof, the plastic sheets shall be removed on a regular basis to allow the application of more water to the concrete to ensure that it is kept moist continuously. The plastic sheets shall be reinstalled after each wetting of the concrete.

(c) Columns

Columns shall be thoroughly sprayed with water directly after the removal of formwork. Immediately after this the concrete shall be covered with 100 micron thick Layflat Plastic Tubes provided by Plastic and Hessian Sales. These shall be removed on a regular basis to allow the application of more water to the concrete to ensure that it is kept moist continuously. The plastic sheets shall be reinstalled after each wetting of the concrete.

(d) Walls

Both sides of walls shall be kept moist by means of an irrigation type mist spraying system as specified below. Sprayers shall be spaced at such intervals to ensure that the whole concrete face is wetted. Curing shall commence the day after concrete has been cast and shall continue for at least 10 days. If formwork is to remain in position (e.g. to support subsequent lifts), it shall be loosened as soon as the concrete has gained sufficient strength (usually within a day) to allow curing water to thoroughly wet the surfaces of the concrete.

(e) Irrigation type mist spraying system

The irrigation type mist spraying system shall be controlled by an automatic timer with the capacity to activate the system for any chosen time period at any chosen time intervals, such that curing will be continuous over weekends, public holidays and builders' holidays. Sprayers shall be spaced at such intervals as to ensure that the whole area of concrete is wetted. The design of the system shall be submitted to the engineer for his perusal. Should the existing water pressure on site be insufficient, a pump should be installed to operate the mist spraying system. The Contractor shall allow therefore in his tendered rates and prices.

(f) Determination of intervals and duration of application of water

The duration of water application and the intervals of application will be determined on site by the Engineer, and shall be such as to prevent the concrete from drying out. The duration and intervals shall be adjusted to allow for adverse conditions such as high temperatures and/or dry, windy conditions.

(g) Plastic sheets and tubes

Plastic sheets and tubes used for curing shall be waterproof and may not be torn or be otherwise discontinuous. It shall be white or light-coloured. Black or other dark coloured plastic sheets will not be allowed under any circumstances. Sheets and tubes shall be held down or fixed securely to the elements being cured and joints in sheets shall be taped to prevent loss of moisture from the concrete. Care shall be exercised to prevent staining of exposed concrete.

(h) Duration of curing

The curing period shall be at least 10 days.

(i) General

Notwithstanding the preceding specifications, the Contractor shall also ensure that the concrete shall not be exposed to thermal shock during the first 28 days after casting and he shall take the necessary, additional precautionary measures to shield the concrete with plastic sheets or hessian during extreme warm, cold, dry or windy weather conditions. Hessian shall be wetted should the conditions necessitate this. Curing shall be done in such a manner as not to cause staining, contamination or marring of the surface of the concrete.

The Contractor shall take the necessary precautions to prevent water used for curing from penetrating the soil underneath or adjacent to the structures. The water shall be drained away affectively as soon as possible to prevent any ponding.

PSG 5.5.9 Adverse Weather Conditions

“If plastic shrinkage cracking occurs, the cracks shall be closed up by re-vibrating the concrete with a poker vibrator, within 3 hours of casting. Once the cracks have been closed, the concrete shall be kept thoroughly wet, or covered with plastic sheeting for at least a further 3 hours.”

PSG 5.5.11 Watertight Concrete

“All reinforced concrete structures in this Contract shall be deemed to be water retaining structures and have been designed accordingly. Water retaining structures are subject to the provisions of the following Sub-Clauses:

PSG 5.5.11.1 Pipes and Conduits Embedded in Concrete

Except with the written approval of the Engineer, no pipes other than those shown on the drawings shall be embedded in concrete and the approval of the Engineer for the position of all services to be embedded shall be obtained before concreting commences. The clear space between pipes of any kind embedded in reinforced concrete and the clear space between such pipes and reinforcement shall not at any point be less than;

(a) 40 mm or

(b) 5 mm plus the maximum size of coarse aggregates, whichever is the Greater.

PSG 5.5.11.2 Grouting of Pipes and Specials Through Walls:

Where entry holes for pipes/specials have been provided in walls the Contractor shall be responsible for the Grouting-in of such pipes/specials, regardless of whether or not these have been supplied by himself.

Before commencing the positioning in holes of any pipes/specials the Contractor shall;

- (a) remove all shuttering and boxing remaining in the holes;
- (b) make any alterations required to the position and shape of the holes;
- (c) thoroughly scabble and clean the sides of the holes so as to obtain a satisfactory bond surface for the new concrete; and
- (d) free all surfaces of the pipes/specials of all coatings, and thoroughly scrape and clean the pipes/specials.

After accurately positioning the pipes/specials in their respective holes, the Contractor shall fix the pipes/specials in the holes. Immediately before Grouting is carried out by the placing of mortar and concrete around the pipes, the surface of the existing concrete shall be saturated with water. All surplus water shall be removed and the surface covered with a layer, approximately 12 mm thick, of mortar consisting of 3 parts of concrete sand and 1 part of cement.

The concrete ingredients shall be mixed and placed as dry as possible to obtain a dense, waterproof concrete. Where a watertight seal is required, the concrete shall be carefully worked around the puddle flange, if any, and the pipe barrel or body of the special, and shall be vibrated in layers so as to obviate any falling away from pipe/special surfaces of the concrete already placed. The hole shall, when set, form a dense, homogeneous, and waterproof mass. A spare vibrator with an independent power source shall be kept in readiness to ensure continuity of placing in the event of the breakdown of the duty vibrator.

Smooth formwork that has been suitably strengthened for use with a vibrator shall be provided for facing the concrete around each pipe/special.

PSG 5.5.11.4 Cleaning and Disinfection

Before being put into use all structures which will contain potable water are to be thoroughly cleaned out and disinfected inside by brushing, removing all dirt, Grit and rubbish, hosing with clean water and finally washing with a solution of permanganate of potash mixed in the proportion of 1gm to 5 litres of water. Excess solution should then be run to waste before testing for water tightness.

In cases where there is a risk of discolouration of potable water by the permanganate solution, chloride of lime or other approved chlorinating chemicals shall be used for disinfection. Pipework installed by the Contractor and which is in direct or indirect contact with the potable water shall similarly be disinfected."

PSG-5.5.14 Defects

PSG-5.5.14.1 Repair of defects

The method of repair of defects in the concrete shall be by first applying an approved cement-based, epoxy-modified anti-corrosion and bonding agent like SikaTop-Armatec110 EpoCem by Sika to the prepared surface, followed by an approved one-component, non-sag, cement based patching and repair mortar like SikaRep LW by Sika. All products shall be applied strictly in accordance with the manufacturers specification or such other methods as may be acceptable to the Engineer. All repair materials shall be equivalent to concrete in respect of thermal properties and structural elasticity. Such repairs will only be allowed after the defects were inspected by the Engineer and his written approval has been obtained.

PSG 5.5.16 Expansion Joints

PSG 5.5.16.1 Location

- (a) Expansion joints shall be located as shown on the drawings.
- (b) Where smooth shutter finishes are specified the edges of the shutter boards or panels shall coincide with the joints.
- (c) All joints shall be truly vertical or horizontal unless otherwise specified.

PSG 5.5.16.2 Forming Joints

All expansion joints shall have a shuttered face. The shuttering shall be fixed firmly in position and shall be split as required to accommodate waterstops and/or dowel bars without loss of mortar at the joint. To obtain a joint free from projections the shutters for the new concrete shall be tightly fixed to the existing concrete. Where possible the shutters shall overlap the joint and not be disturbed until the new concrete has hardened.

Joint recesses are to be formed to the dimensions and shapes indicated on the drawings. The recesses are to be formed by means of untreated clean timber with rough sides and so shuttered that the shuttering is rigidly fixed during placing of concrete and can be removed without any timber having to be left in the recesses. Shuttering shall be left in the joint until these are ready for sealing, whereupon the shuttering shall be removed and the surfaces of the recesses shall be thoroughly cleaned by light hammering with a chipping hammer and wire brushing to remove all laitance oil and moisture traps, and by heating with a blow-lamp; care shall be taken not to overheat the concrete.

PSG 5.5.16.3 Construction

- (a) Each section of pre-moulded waterstop shall be of the maximum practicable length so that the number of end joints will be minimised. Continuous seals are to be obtained in the field by jointing the waterstops by heat fusion using suitable jigs and heating tools. Joints shall develop effective watertightness equal to that of the continuous material and shall permanently develop the full mechanical strength of the parent section and retain its flexibility. Waterstops shall be securely and

accurately located in position in the shutters before concreting commences. Nails, wires or other fastenings shall be used only in anchoring ribs.

Concrete around waterstops shall be properly placed and compacted to avoid honeycombing. To ensure full contact between the waterstop and the concrete around its periphery, concrete in the vicinity of the seal is to be well vibrated and the seal worked up and down by hand to expel entrained air, when the concrete has reached the level of the seal.

- (b) Joint filler to the sizes and thicknesses shown on the drawings shall be fixed to the joint face before the adjoining concrete is cast.
- (c) All recesses to receive joint sealer shall first be cleaned as described in Clause PSG 5.5.17.2. Thereafter a primer matched to the sealer, shall be applied by brushing it well into the sides of the joint to ensure complete coverage. Sealants shall be tooled into position for complete air-free filling of voids. The surface of the joint shall be smoothed with a clean spatula. To obtain neat straight line joints the adjacent concrete shall be suitably masked.

The preparation and priming of joint surfaces, the mixing of the components of the sealer, the application and tooling shall all be carried out strictly in accordance with manufacturer's instructions. Priming of joints shall not be commenced before the concrete has cured for at least 21 days.

- (d) Sliding joints shall be formed where shown on the drawings. The upper concrete surfaces forming the sliding surface are to be steel trowelled to a smooth and level surface. Only when thoroughly set and dry and prior to the upper layer of concrete being cast thereon, shall these surfaces receive two coats of an approved bituminous paint."

PSG 5.5.17 Pipes and conduits

Openings for pipes shall be left in the concrete members when so directed by the Engineer or when shown on the Drawings. Pipes shall be installed in such openings according to the details shown on the Drawings. The cost of such method will be deemed to be included in the rates tendered for.

The clear space between pipes of any kind embedded in reinforcement concrete and reinforcement shall not at any point be less than:

- a) 40mm, or
- b) 5mm plus the maximum size of coarse aggregate, whichever is the greater.

Pipes and specials to be set in concrete as shown on the drawings and listed in the Schedule of Quantities shall have all surfaces in contact with the concrete freed from all coatings and thoroughly scraped and cleaned. The pipes shall be set firmly in position on line and level and have formwork fixed around them.

Where the pipe or special is supplied by others, the Contractor shall provide a box-out in the wall and cast the unit in at a later stage. When constructing such as box-outs, reinforcement shall not be cut, but shall run through the opening. Reinforcement shall be

cut and/or bent out at a later stage to suite the items being cast in. After installation of the item the remaining reinforcement shall be bent back in position.

Where entry holes for pipes/specials have been provided in the walls, the Contractor shall be responsible for the concreting in of such pipes/specials regardless of whether or not these have been supplied by him.

Before commencing with the positioning in holes of any pipes/specials, the Civil Contractor shall:

- a) Remove all formwork and boxing remaining in the holes;
- b) Make any alterations required to the position and shape of the holes and cut reinforcement to suit the item, as directed by the Engineer; and
- c) Thoroughly scrubble and cement slush the sides of the holes so as to obtain a satisfactory bond surface for the new concrete and treat the surface as specified in Sub-clause 5.5.7.

Immediately prior to concreting being carried out by the placing of mortar and concrete around the pipes, the surface of the existing concrete shall be saturated with water. All surplus water shall be removed and the surface covered with a layer, approximately 12mm thick, of mortar made of the same mix as the concrete in which the pipe/specials are to be placed.

The concrete ingredients shall be mixed and placed as dry as possible to obtain a dense, waterproof concrete. The concrete shall be carefully worked around the puddle flange, if any, and the pipe barrel or body of the special, and shall be vibrated in layers so as to obviate a falling away from pipe/special surfaces of the concrete already placed. The whole shall, when set, form a dense, homogeneous and waterproof mass.

PSG 5.5.18 Fixing of equipment

- a) The Contractor will be responsible for the forming of pockets and grouting in of holding down bolts for equipment supplied under a separate contract. Holding down bolts will be supplied and positioned in the pockets by a Mechanical Contractor, unless otherwise specified by the Engineer.
- b) Upon completion of the positioning and alignment of equipment, the Contractor shall, in collaboration with the other Contractor, grout up pockets and base plates (subject to (c) below) necessary for the permanent installation of the equipment.
- c) Only after the Engineer is satisfied with the alignment and the level of each item of plant, shall the Contractor grout up the base plate with an approved non-shrink grout.

PSG 5.5.19 Soilcrete

Where soilcrete is specified for filling under floor slabs, the soilcrete shall comply with the requirements of subclause 3.5(d) of section 1200 DB as amended and shall be placed as specified in the subclause.

PSG-5.5.20 Plasterwork

Plasterwork shall consist of a single coat, comprising one application of a 1:6 cement to sand mixture with a woodfloat finish. The thickness of the plaster shall be between 13 and 20 mm. All plaster shall be finished smooth, shall be plumb and corners shall be rounded and square.”

PSG-5.5.21 Grouting of machine and structural base plates

PSG 5.5.21.1 Formwork

Formwork for grouting shall comply with the applicable requirements of Sub-clause 5.2. Forms shall be caulked where necessary. Adequate clearance between forms and bedplates shall be provided to enable the grout to be worked into place.

PSG 5.5.21.2 Mixing (all free-flowing grouts except epoxy grouts)

The grout shall be mixed to a homogenous uniform mixture and delivered ready for placing at a temperature between 15 °C and 25 °C. The materials and water shall be mixed in a mortar mixer for at least three minutes or, in the case of small jobs only, shall be thoroughly mixed by hand, the entire mass being turned over enough times to ensure even distribution of its components.

The mixing shall be done as close as possible to the place(s) where the grout is placed. No more grout shall be mixed at any one time that can be placed in a period of 20 minutes. After the grout has been mixed, it shall not be re-tempered by the addition of water.

PSG 5.5.21.3 Grouting (all free-flowing grouts except epoxy grouts)

The grout shall be placed quickly and continuously to avoid the undesirable effects of over-working. (These effects are segregation, bleeding and breaking-down of initial set.) The method of placement shall be subject to approval. The means of placing the grout shall be such that the grout will completely fill the space to be grouted, will be thoroughly compacted, will be free of air pockets and will be evenly distributed under the item to be supported. Wherever practicable, grout shall be placed from one side only and where this is not practicable, care shall be taken to ensure that any trapped air is released.

After the grout has taken its initial set,

- (a) The forms shall be removed;
- (b) Excess grout shall be so cut away as to leave a smooth and neatly finished job;
- (c) Except where the grout is intended to provide resistance to side thrust, all edges shall be trimmed at 45° to the vertical, from the bottom edge of the bedplate; and
- (d) All access grout on or about the bedplates shall be removed.

Damage to paintwork, if any, shall be repaired within 24 hours. Packing plates, shims and other levelling devices, shall remain in position.

PSG 5.5.21.4 Dry-packed grout (standard dry sand and cement grout)

Dry-packed grout shall have a minimum compressive strength at 28 days of 20MPa. The quantity of water added after placing shall be kept to a minimum consistent with placing conditions, and the cement, sand and, where applicable, pea gravel proportions by mass shall be as follows :

- a) Where the clearance between bedplate and foundation is 25 mm or less : 1 part of Portland cement and 2 parts of sand; and
- b) Where the clearance exceeds 25 mm : 1 part of Portland cement, 1 part of sand and 1 part of pea gravel.

Dry-packed grout shall be rammed by means of tamping rods against formwork placed along three sides of the bedplate.

PSG 5.5.21.5 Non-shrink grout with metallic aggregate

The manufacturer's instructions shall be observed when non-shrink grout with metallic aggregate is used.

Where the clearance between the bedplate and the foundation is less than 50mm, a sand-based mix shall be used. Where the clearance exceeds 50mm, the Engineer may order a mix with a base of sand, plus pea gravel to be used.

PSG 5.5.21.6 Expanding grout with powdered aluminium additive

The manufacturer's instructions shall be observed when an expanding grout with powdered aluminium additive is used.

Where the clearance between the bedplate and the foundation is less than 25mm, a sand-based mix shall be used.

Where the clearance exceeds 25mm, the Engineer may order a mix with a base of sand plus pea gravel to be used.

Each batch shall be mixed for at least 6 minutes after the powdered aluminium has been added. Where a ready-mixed grout is used, the powdered aluminium shall be added at the placing site and the batch mixed as specified in PSG 3.13.2. Grout shall be placed within 45 minutes after the addition of the powdered aluminium.

The Contractor shall not use powdered aluminium additive when the ambient temperature is below 5°C.

PSG 5.5.21.7 Epoxy grout (epoxy mortar type only)

The manufacturer's instructions shall be observed when an epoxy grout is used.

PSG-5.7 Items built into water-retaining structures (*Additional Clause*)

The building in of items, such as puddle pipes etc. into water-retaining structures may be executed in either of the following ways, viz:

- (a) the items shall be positioned prior to construction of the relevant part of the water retaining structure and subsequently cast in simultaneously with the concreting of the specific part of the water-retaining structure; or
- (b) recesses or holes may be blocked out in or through the relevant part of the water-retaining structure, and the item may then be positioned afterwards and grouted or concreted in, in an approved manner.

In the case of (b) above where pockets were left for the later casting in of items, the following procedure shall be followed:

The old concrete surface shall be treated with an approved bonding agent such as Baralutex. The pocket shall be filled with the same type and strength of concrete as the original type. After removal of the shutters, the area shall be sealed with an approved sealant to ensure that the concrete cures correctly, does not dry out quickly and therefore does not shrink and crack, which will be unacceptable.

The Contractor's attention is drawn to the fact that the decision as to which alternative to adopt is solely his and that finally the works shall be completed as specified and as detailed on the drawings with particular reference to the following:

- Some components with long delivery periods supplied under this contract may have to be built in at a later stage.
- Water-retaining structures shall be fully watertight, especially around cast in items, and no leaks or damp areas will be allowed.
- The concrete of the water-retaining structures around the built-in item shall be free of any honeycombing, shall have an acceptable smooth finish and the colour of the whole relevant part shall be uniform.
- Pipes passing through water-retaining structures shall be properly aligned as specified and as detailed on the drawings, and valve stems intended to be vertical shall, for example, be 100% vertical in both planes.
- Notwithstanding the above, the contents of Clause 5.5.7.3 as amended in PSG-5.5.7.3 shall apply to all works in connection with items built into water-retaining structures
- In the case where pockets were left for the later casting in of items as in (b) above, the following procedures is specified:

Building in of items will not be measured separately as it is included in the supply and installation of the pipes and specials measured in Section 1200 L.

PSG-5.8 Items built into existing structures (*Additional Clause*)

Where pipes or other items have to be built into existing water-retaining structures, the existing concrete shall be cut out carefully to obtain sufficient space to install the items. The building in of the items shall then proceed as described in PSG-5.7(b). Building in of the items will not be measured separately as it is included in the supply and installation of the pipes and pipe specials as measured in Section 1200 L. The cost of breaking into existing concrete and making good after installation will however be measured separately.

PSG 7 Tests

PSG 7.1 *Facilities and Frequency of Sampling*

PSG-7.2.1 General

Of each sample of four cubes, one cube shall be tested at 7 days and the remaining three cubes at 28 days.

PSG-7.2.5 Test for watertightness (*Additional clause*)

Water-retaining structures (including reservoirs) shall be subjected to two stages of testing, and water towers to the second stage of testing only. Where a water-retaining structure consists of different compartments, these shall each be tested separately. Floor slabs with an under floor drainage systems cast on ground shall be subjected to the first stage of the water test.

First stage:

The watertightness of the floor shall be tested by flooding the floor with water to a minimum depth of 50 mm after all inlet and outlet pipes have been closed, sealing the outlets from the underfloor drainage system and pressurizing the underfloor drainage system (as shown on the drawings) with compressed air to a pressure equivalent to 400 mm head of water.

The floor shall then be inspected for leakages (with special attention being given to construction joints), and all visible leakages shall be repaired to the satisfaction of the Engineer where after the floor shall again be subjected to the same test. Only after the floor has passed this test, may column footings be cast.

After all concrete elements have reached their 28-day strengths, any post-tensioning has been completed, and all pipe work has been connected to the network, but before backfilling has been done, the second stage of the watertightness test shall be conducted.

Second stage:

A thorough inspection shall be done to ensure that all joints are properly sealed and that all inlet and outlet pipes are closed. The structure shall be filled with water to its maximum operating level at a rate that shall ensure a maximum rise in water level of 2,0 m in 24 hours. In structures where the water surface is exposed to the atmosphere a small cylindrical watertight container floating in the water should be filled with water to approximately 80% of its capacity.

The water level in the structure and the container (where applicable) shall be carefully noted and recorded by the Engineer. Where applicable, the water level in the container shall be used to correct the water level in the structure for precipitation. If there are no visible leakages the structure shall be allowed to remain filled for a saturation period of at least one week, or such longer time as may be required, to permit complete saturation of the concrete.

If any leakages are visible, the water test shall be aborted, depending on the seriousness of the leakages, and the leakages repaired before another water test shall be done. During the above-mentioned period readings of the water levels shall be taken by the Engineer at regular intervals.

At the end of the saturation period more water shall be added, if necessary, to bring the water level back to the maximum operating level and the level in the container to the original level. All water levels shall be carefully noted and recorded in the presence of the Engineer. The water levels in the structure and the underfloor drainage pipes shall then be monitored daily for a period of seven days.

The structure shall be deemed watertight if:

- (a) no visible leakage or obvious damp spots are apparent on the outside of the structure; and
- (b) the drop in water level after being corrected for evaporation and precipitation where applicable during the 7-day test period does not exceed 1/500 of the water height or 6 mm whichever is the smaller.

If the structure fails the watertightness test the Contractor shall determine the cause of the leakage. The leakage shall be repaired on the inside of the structure after the water has been drained. Thereafter the structure shall again be subjected to a complete water test as described above. Full payment under item 8.4.3 will only be made once the watertightness test has been passed (refer to PSG-8.1.3 hereafter).

The roof slabs that are required to be water retaining shall be ponded with water to a maximum depth of 80 mm and a minimum depth of 20 mm for a period of at least three days. The ponding shall be carried out in an approved systematic manner over the entire top surface area of the slab. The roof slab shall be deemed watertight if there are no visible leakage or damp spots on the soffit of the slab.

PSG 8 Measurement and Payment

PSG 8.4 *Scheduled Concrete Items*

"PSG 8.4.7 Pipes and Conduits Embedded in ConcreteUnit : Number (No.)

Measurement will be the number of pipes or conduits embedded in the concrete in accordance with the dimensions and details given on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required to carry out the work as specified.

PSG 8.4.8 Grouting of Pipes/Specials through wallsUnit : Number (No.)

Measurement will be the number of pipes/specials Grouted into preformed entry holes in the concrete in accordance with the dimensions and details given on the drawings. Various pipe sizes and/or specials will be scheduled separately.

The rate tendered shall include full compensation for all materials, equipment and work required to complete the work as specified."

PSG 8.9 Testing for watertightness Unit: Lump Sum

PSG 8.10 Cleansing and disinfection Unit: Lump Sum

The payment for testing for watertightness and the cleansing and disinfection will be made once the Engineer is satisfied that the work is complete in terms of the specification."

PSHA: STRUCTURAL STEELWORK (Small Works)
(Applicable to SANS 1200HA)

PSHA 3 MATERIALS

PSHA 3.1 STRUCTURAL STEEL (Sub-clause 3.1)

PSHA 3.1.1 New structural steel

Use grade 300W steel for all steel structures. The Contractor must allow in his price to provide shop details.

Manual flame-cutting is allowed only where authorized. Edges shall be grinded to be free of unevenness, defects and distortions.

Welding shall comply to SANS 044 Part 111, SANS 044 Part iv and SANS 0162.

PSHA 5.2 GENERAL METALWORKS

PSHA 5.2.4 Ladders

Ladders shall be manufactured in accordance with the details and general arrangements shown in the drawings in lengths suitable for hot-dip galvanizing. All ladders and their fixings shall be hot-dip galvanized.

PSHA 5.2.5 Prefabricated and chequer plate covers

Open grid steel covers and floor panels shall be pressure locked and welded as "Maclock" type "Eggcrate" or similar approved, and together with frames shall be hot-dipped galvanized after manufactured. All span bars shall have a depth of 40mm and be of such a width and at such a spacing that the maximum deflection of any bar under a 10kN/m² uniformly distributed load shall not exceed 1/360 of the clear span.

Under no circumstances will cutting and welding be permitted on site.

Framing to open grid "Maclock" or "Eggcrate" covers or panels shall be assembled and welded to the detail as shown on the drawings.

The galvanized steel flooring shall be fully washed and cleaned as specified, and when dry shall receive one coat of epoxy tar compound to a dry fill thickness of 100 microns.

Chequer-plate flooring shall be of 6mm minimum thickness "treadplate" flooring or similar approved with raise 5-bar pattern and lifting key holes at each end of each plate.

Frames shall be of 3CR12 angle and bar welded together and as detailed on the drawings.

All ferrous metal covers, flooring and frames shall be hot-dipped galvanized to SANS 763, except for 3CR12.

PSHA 5.2.6 Handrails

Handrails shall be of the two rail type, ball and stanchion top mounted, type Mentis MT 90 or similar. Corrosion protection shall be hot-dipped galvanized in accordance with Sub-clause 5.2.14.3.

PSHA 5.2.8 Open grid flooring

Corrosion protection for the open grid steel flooring, including frames, shall be in accordance with Sub-clause 5.2.14.3.

PSHA 5.3 ERECTION AND INSTALLATION

PSHA 5.3.7 Repair to paint and site painting

All mild steel items not suited for hot dip galvanized shall receive the following treatment at the shop of an approved painting sub-Contractor.

All internal and external surfaces shall be blast cleaned to Swedish Standards SIS 05/09/00 SA 3 to s surface profile not exceeding 75 micro-meters. The surface shall be moisture-free and free of soluble salts and airborne contaminants and shall be painted with a twin pack polyamide cured high build epoxy coating to a minimum dry film thickness of 200 micro-meter and the maximum 300 micro-meters.

Where a decorative or colour-coated finish is required (e.g crane rails and roof trusses) a vinyl copolymer paint shall be used.

Undercoats shall be applied in accordance with the manufacture's recommendations and all coats shall have a total dry film thickness of 200 micro-meters. The first coat of paint shall be applied within two hours of blast cleaning. The time period between subsequent coats shall be in accordance with the paint manufacture's requirements.

PSHA 5.3.8 Painting of galvanized mild steel items

Galvanized items to be painted and not in contact with Wastewater, shall be unpassivated and degreased after erection, painted with a vinyl copolymer system applied in accordance with the paint manufacture's specifications.

The minimum dry film thickness of the paint system, shall be 100 micro-meters.

All galvanized items which are intermittently or permanently in contact with wastewater shall be feather blasted after galvanizing. The surface shall be moisture-free and free of soluble salts and airborne contaminants and shall be painted with a twin pack polyamide-cured high build epoxy coating.

PSHA 5.3.9 Cast-iron items (Including valves)

All cast iron items to be installed underground or not exposed to view, shall be twice hot bitumen dipped, using different shading bitumen inside and outside. Casting iron items to be cast into concrete shall be degreased and nylon brushed.

Cast iron items which are specifically scheduled as "twin pack epoxy painted", shall be blast cleaned and painted with a twin pack polyamide cured high-build epoxy coating.

Cast iron items where painting is specified and which are exposed to view but not in contact with Wastewater, shall be nylon brushed and degreased, then painted with a vinyl copolymer paint system in accordance with the manufacturer's recommendations. Cast iron valves not generally exposed to view (i.e. manholes), must be painted.

PSHA 5.3.10 Galvanising

Steelwork scheduled or shown on drawings to be galvanized, shall be galvanized in accordance with the requirements of ISO 1461 and the thickness of the coat shall be as specified in Sub-clause 4.3.1 Table 1 (profile sections 65 micro-meters: tubular sections 45 micro-meters).

Where hot-dipping is specified for tubes and fittings 200mm diameter and larger, they shall be cleaned to SA 22 and grit blasted prior to galvanizing.

Members and assembled units which are too large to be dipped in the galvanizing bath, may be zinc sprayed provided that they are cleaned as required by Appendix C-7 of SANS 763 and provided the coating gives protection to the steelwork equal to that specified for galvanizing above.

The repair to galvanizing damage by welding, shall be achieved by the application of two coats of single pack zinc-rich epoxy primer.

PSHA 7 TESTING

PSHA 7.4 Testing and inspection of corrosion protection

The paintwork shall be tested and inspected by an approved inspection service at the relevant stages of the Contract. The Contractor shall make the necessary arrangements for testing with the inspection service at the various stages as approved by the Engineer and shall submit all these reports to the Engineer for approval. All damaged areas shall be repaired in accordance with the paint manufacturer's requirements.

Final approval of the paintwork shall be given by the Engineer when the works are commissioned.

PSHA 7.5 Repairs to paint

On arrival on Site and both before and after erection, all items of steelwork shall be examined for damage to the paintwork, and damaged areas degreased, derusted and repaired. The damaged area shall be ground down to at least SA 22. The surrounding paintwork, which is still intact, shall be feathered for a distance of 20mm beyond the damaged area. The whole shall then be repainted as specified herein. Under no circumstances will the use of wire brushes be permitted for the removal of rust or other contaminants. If more than 10% damaged, removed from site, strip and repaint.

PSHA 8 MEASUREMENT AND PAYMENT

PSHA 8.1 Basic principles

Unless stated otherwise, scheduled metalwork will be measured by number or square of linear meters, including wastage and fastenings.

The rate will be held to include for the supply, testing, fabrication, delivery and erection of the metalwork, corrosion protection, delivery and erection of the metalwork, corrosion protection, together with all operations specified in all Sub-clauses of Clause 3 hereof and also for the supply and fixing of all anchor/holding down bolts, bolts, nuts, washers and plates.

PSHA 8.2.5 Handrailings

Hand railings will be measured by the length of the complete balustrade, including top rail, middle rail and stanchions as well as end pieces and corners. The unit rate will be held to include for all materials and fastenings supplied, for welding, erection and protective coatings and for providing and grouting in holding down bolts.

PSHA 8.2.6 Ladders

Ladders will be measured by number or specified length. The unit rate will be held to include for all materials and fastenings supplied, for welding, erection and protective coatings.

PSHA 8.2.7 Prefabricated open and chequer plate covers and flooring

The open grid or chequer plate flooring covers or panels will be measured by area, and the unit rates will be held to include for all cutting and welding, etc. At the factory, prior to galvanizing, for the frame, installation, galvanizing and paint and the rate will be held to include for the supply and fixing complete, including all cement mortar and bolts which may be required to secure the frame.

PSHA 8.2.8 Testing and inspection of corrosion protection

The rate bided for steelwork items, shall include for testing and inspection of corrosion protection.

PSL MEDIUM PRESSURE PIPELINES (SANS 1200 L)

PSL 1 Scope

This specification covers the supply and installation of pipelines, for raw water, pipework for pumping installations reservoirs and treatment works.

PSL 2 Interpretations

PSL 2.4 Abbreviations

Add the following:

HDPE : High Density Polyethelene
uPVC : Unplasticised Poly Vinyl Chloride"

PSL 3 Materials

PSL 3.4 Steel Pipes, Fittings and Specials

Add the following new sub-clauses:

"PSL 3.4.5 Stainless Steel Pipework

Pipework fittings and specials shall comply with the dimensional requirements specified for mild steel pipe work, fittings and specials. The wall thickness shall be not less than 4,0 mm for pipes of diameter up to 150 mm and not less and 5,0 mm for pipes exceeding 150 mm in diameter, or as called for on the pipe schedules.

Stainless Steel pipework, fittings and specials shall be Grade 304L and shall not be supplied coated.

Plain ends of pipes and fittings shall be covered and protected against damage whilst being transported and stored.

PSL 3.4.6 Steel Pipes

All steel pipes and fittings, irrespective of their diameter, shall be fabricated from plain-ended pipes and shall be coupled by means of welded flanges as detailed. Screwed flanges and fittings shall not be permitted. The lengths of the pipes shall be as dimensioned on the drawings but shall be verified on site prior to galvanising. No cutting or welding of pipes shall be permitted on site."

PSL 3.7 Other Types of Pipes

PSL 3.7.2 Polyethylene Pipes

HDPE Pipes shall be of Type V and shall comply with SANS 533 Part III.

PSL 3.7.3 mPVC Pipes

mPVC Pipes shall not be permitted unless otherwise shown or agreed with the Engineer.

PSL 3.7.4 uPVC Pipes

uPVC Pipes shall comply with SANS 966; 1998 Part 1 and all seal rings with SANS 974.

PSL 3.7.4.1 u PVC Fittings and Accessories

All bends shall comply with SANS 966 Part I; 1998 and the factory of manufacture shall comply to ISO 9002.

PSL 3.8 *Jointing Materials*

PSL 3.8.3 Flanges and Accessories

"All flanges shall be drilled in accordance with SANS 1123. Flanges shall be drilled to Table 16 as a minimum and shall be drilled to match the pressure rating of the adjacent fitting or pipe for pipes and fittings rated Greater than 16 bar."

PSL 3.8.4 Loose Flanges

"Nuts and Bolts and other fasteners shall be hexagon head type and comply with the requirements of SANS 135 - 1971 with threads of the coarse pitch series. "

PSL 3.8.8 Compression Type Fittings

"Fittings for HDPE pipes shall be of the compression type complying with the requirements of ISO 3458, ISO 3459 and ISO 3503 respectively. Fittings shall be rated to 16 bar as a minimum and shall be supplied to match the pressure rating of the adjacent fitting or pipe for pipes and fittings rated Greater than 16 bar."

PSL 3.9 *Corrosion Protection*

PSL 3.9.2 Steel Pipes

"Steel pipes, fittings, flanges and specials shall have their surfaces thoroughly cleaned by Grit blasting to a finish complying with the requirements of SIS 05 59 00 for an Sa 2½ finish. Grit for blast cleaning shall be in accordance with SANS 064. Surfaces shall within 4 hours after cleaning be primed with the specified primer or if no primer is specified with the first coat of the specified system.

All materials used shall be of the highest quality and in accordance with the manufacturer's requirements. Particular care shall be taken to ensure compatibility of all materials used with others forming part of the corrosion protected system. Manufacturer's application and

overcoating times and specific instructions relating to curing periods and humidity limitations shall be strictly adhered to.

Corrosion protection systems shall not be applied over any surface containing traces of Grit, Grease, oil, loose rust, millscale or any contaminants or corrosion products. All surfaces shall be absolutely dry.

Welds and adjacent parent metal shall be Ground smooth and all weld spatter removed. Sharp edges shall be avoided and where they are evident the removal shall be effected by Grinding to a radius of not less than 3 mm.

The Contractor shall arrange for the Engineer or his representative to be present during surface preparation and coating application to ensure compliance with the specification.

3.9.2.1 Fusion Bonded Epoxy (FBE)

- (1) All internal and external surfaces of steel pipes, as well as associated flanges, couplings etc. Apply Powder-Lak Fusion Bonded Powder Coating E 2000. Minimum dry film thickness of 300 microns. All coatings to be applied strictly in accordance with manufacturers specifications.
- (2) External surfaces of FBE coated steel pipes, which will be buried or cast into concrete shall be wrapped with a bitumen fiberglass wrap, which shall extend at least 500 mm beyond the soil/concrete/air interface and shall have a minimum thickness of 5 mm as follows:
 - a) Materials
 - Primer
 - Tape (5 mm thick x 300 mm wide)

All materials shall be used strictly in accordance with the manufacturer's instructions and as specified below.

- b) Surface Preparation and Priming
 - (i) Remove all Grit and/or dust before priming at the average spread rate as specified by the manufacturer.
 - (ii) The adjacent coating shall be cleaned to a minimum of 300 mm beyond the section to be wrapped.
 - (iii) Grease and oil shall be removed with a non-volatile solvent. The surface shall then be cleaned with potable water and allowed to dry completely.
 - (iv) Cleaned pipe shall be primed, extending 300 mm on either side of the area to be wrapped, the same day and prior to any recontamination to the pipe. Any surface oxidation, or other foreign agents shall be removed by reprocessing through the necessary cleaning steps.

- (v) The primer shall be applied in a uniformly thin film, free of runs and sags covering the entire surface of the pipe. The flow of primer shall be regulated so that the pipe surface is entirely covered. Solvents shall be allowed to flash off for a minimum of 30 minutes before application of tape or mastic. Uncoated, flooded, or areas primed over improperly cleaned pipe, shall be cleaned to the satisfaction of the Engineer and re-coated.

c) Profiling Tape

Apply 5 mm thick x 300 mm wide tape to the full circumference of the pipe, strictly in accordance with manufacturers specifications. Care shall be taken to ensure a smooth profile and to avoid air bubbles being trapped beneath the tape. The tape shall not be stretched.

3.9.2.2 Hot Dip Galvanising

Where ordered or specified, galvanised steel pipework shall comply with SANS 934 and 763 and be entirely coated with zinc after fabrication by complete immersion in a zinc bath. The finished surface shall be clean and uniform and any excess being removed. The zinc deposit shall exceed the following: -

Coastal areas	0.735 kg / m ²
Inland areas	0.400 kg / m ²

‘Coastal areas’ shall apply to this contract.”

PSL 3.9.5 Joints, Bolts, Nuts and Washers

All joints, bolts, nuts and washers shall be hot-dip galvanised in accordance with SANS 763 unless stated otherwise. Electroplating shall not be permitted.

PSL 3.9.5 Galvanising

“Galvanised steel fittings, specials, etc, shall comply with SANS 934 and 763 and be entirely coated with zinc after fabrication by complete immersion in a zinc bath. The finished surface shall be clean and uniform and any excess being removed. The zinc deposit shall exceed the following: -

Coastal areas	0.735 kg / m ²
Inland areas	0.400 kg / m ²

‘Coastal areas’ shall apply to this contract.”

PSL 3.10 Valves

PSL 3.10.1 Isolation Valves (General)

Unless otherwise stated, all isolation and scour valves shall be of the Waterworks Pattern Sluice Valve type.

The following general requirements shall be met:

- a) The valve class shall be at least equal to that of the pipework in which is to be installed. All valves shall be rated for a working pressure of at least 1,0 MPa (Class 10).
- b) The valves shall be doubled flanged.
- c) The valves shall be supplied with non-rising type spindle. Spindles shall be threaded such that two turns of the hand wheel shall effect a movement of 25 mm on the valve gate. This allows for easy identification of the valve diameter.
- d) The valves shall be fitted with a cast iron cap attached to the spindle by means of a Stout brass screw with hexagonal head or with a handwheel as indicated on the drawings or specified in the Schedule of Quantities. The handwheel shall indicate the direction of closing.
- e) The valves shall be **CLOCKWISE CLOSING**.
- f) The design of the valve guides shall be such that all valves supplied can be mounted in any position.
- g) The stuffing box may either be of the conventional type with gland packing with a gland secured with 2 No. bolts and nuts. The nuts shall be of the Tee pattern and the gland stuffing box shall be capable of holding four rings of a standard size of gland packing. The gland stuffing box shall be capable of being repacked under working pressure, preferably with the gate in the open position. The gland shall fit neatly and snugly into the stuffing box. The base of the gland and the stuffing box shall be chamfered to force the packing against the spindle.

Alternatively the sealing of the spindle in the body may be by means of O-rings which are retained in position by means of machined Grooves in the valve body and which seal against the spindle. If this type of valve is offered, tenderers should indicate with their tender the cost of a service head for each size of valve offered. Such service head shall be supplied complete with seals, gate, spindle and cap.
- h) The valves shall be double flanged and drilled in accordance with SANS 1123/1977 appropriate to the Class of valve required/specified.
- i) Each valve shall be supplied with 2 No. full face rubber gaskets and the requisite number of bolts, nuts and washers to suit the valves. Sufficient bolts, nuts and washers shall be supplied for both faces of the valves. The cost of these items shall be included in rates tendered.
- k) The valves shall be drop tight at the specified working pressure applied to one side of the gate and the other side subject to open end conditions.
- l) In addition to the above conditions (k) when called for in Schedule of Quantities, valves for installation on fire hydrants shall be drop tight when subjected to working pressures within in range 345 kPa to 1380 kPa under unbalanced open end conditions, and chattering of the gate in its guides during operation of the valves shall be reduced to a minimum to prevent damage to the valve

seats.

- m) Every valve shall be internally and externally fusion bonded epoxy powder coated to 250 micron DFT, as standard.

PSL 3.10.1.1 Resilient Seal Valves

- a) General

Gate valves shall be double flanged and be resilient seated and unless otherwise specified, the valves shall be of the non rising spindle type.

The valves shall be capable of withstanding the nominal pressure and specified test pressure and shall have the capability to seal drip tight bi-directionally. The valves shall generally be manufactured in accordance to SANS 664.

- b) Gate Design

The gate shall be fully rubber encapsulated inside and outside therefore to ensure drip tight sealing and avoid corrosion. The gate shall further have a drain hole, preventing stagnant water or impurities from collecting.

Rubber utilised in the coating of the wedge shall be inert and shall not impart odour, taste and colour and shall be suitable for drinking water applications. The gate nut shall not be fixed to the wedge, thereby reducing opening torques.

- c) Gate and Body Design

The gate shall have optimally placed guides of wear resistant plastic so as to reduce the torques as well as reduce wear between the rubber and the coating on the body. The bore of the body shall be straight through design in order to allow cleaning with a badger.

- d) Valve Bonnet

The valve shall utilise 3 independent bonnet seals which shall include a set of stem steels embedded in non corrosive material, a back seal to prevent leakage when changing seals, and wiper ring to protect against debris entering the valve.

Two friction washers (sizes 50mm – 200mm) and thrust ball bearings (250mm – 600mm) shall be incorporated to ensure smooth spindle operation as well as to reduce opening and closing torques.

A full circle thrust collar shall be utilised to ensure low torque operation. O-ring stem seals shall be replaceable under pressure for sizes 50mm – 200mm.

- e) Spindle

Spindles shall be made of stainless steel. The stem threads shall be rolled to maintain steel structure and increase strength and, to ensure smooth thread edges and consequently a low operating torque.

f) Body and Bonnet Assembly

The rubber bonnet gasket shall fit in a recess in the valve bonnet preventing blow out of the seal under surge conditions. The bonnet bolts shall pass through the gasket and sunk into the bonnet and sealed for corrosion protection.

An edge protecting ring shall permanently be fitted around the body and bonnet joint in order to protect the coating during transportation and installation.

PSL 3.10.1.2 Wedge Gate Valves

Wedge Gate Valves shall be of the Waterworks Pattern Sluice Valve type and be manufactured to a standard of not less than that specified in SANS 664.

The following special requirements shall be met:

- a) The lugs on the gate and the spindle are to conform to 3.2.3 of SANS 664 and are to be machined to a good fit and finish.
- b) Valve trim shall be either Type B (Gun metal trim) or Type C (Stainless Steel trim) as specified in SANS 664 Clause 3.5.5. Tenderers must indicate in their tender what type of trim is offered.
- c) Seat rings shall comply with Clause 3.5.6 of SANS 664 and shall be pinned into position.
- d) The stuffing box may either be of the conventional type with gland packing with a gland secured with 2 No. bolts and nuts. The nuts shall be of the Tee pattern and the gland stuffing box shall be capable of holding four rings of a standard size of gland packing. The gland stuffing box shall be capable of being repacked under working pressure, preferably with the gate in the open position. The gland shall fit neatly and snugly into the stuffing box. The base of the gland and the stuffing box shall be chamfered to force the packing against the spindle.
- e) Valves which incorporate a thrust plate of the horseshoe type will NOT be considered.
- f) Every sluice valve shall be provided with substantial guides cast on each side of the gate, preferably extending to the top of the nut box and operating along corresponding guides cast in the sides of the valve body. (Brass trim only).
- g) When called for in the Schedule of Quantities, valves shall, in place of the guides described in (f) above, be fitted with machined bronze guide shoes on either side of the gate operating in accurately matching machined bronze guide channels fixed on the sides of the valve body. The bronze guides shall be of phosphor bronze to B.S. 1400 PB 2-0.
- h) The gate valves shall be supplied with the gland packing installed and shall be either "Maxmech Style M57, Chesterton 1724" or similar approved.

PSL 3.10.2 Air release valves

a) Function

The required valves shall provide any of the functions, or combination of functions, described below as specified in the schedule of quantities:

- Pipeline filling

Uninterrupted high volume air discharge through the large orifice.

- Pipeline draining or Column Separation

Uninterrupted high volume air intake through the large orifice.

- Pipeline full and operating

Discharge of dis-entrained pressurized air through the small orifice.

- Rapid Filling / Column Separation

The valve must incorporate an integral surge alleviation mechanism which will automatically dampen surge pressures due to rapid air discharge or the subsequent re-joining of separated water columns.

b) Construction and design

The air release and vacuum break valve shall be of a compact single chamber design with solid cylindrical High-Density Polyethylene control floats housed in a tubular stainless steel or corrosion protected body with epoxy powder coated cast iron, or stainless steel ends secured by means of stainless steel tie rods.

The valve shall have an integral surge alleviation mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure due to high velocity air discharge or the subsequent re-joining of separated water columns. The limitation of pressure rise must be achieved by deceleration of approaching water prior to valve closure. Relief mechanisms that act subsequent to valve closure cannot react in the low millisecond time span required and are therefore unacceptable.

Large orifice sealing shall be effected by the flat face of the control float seating against a nitrile/EPDM rubber 'O' Ring housed in a dovetail Groove circumferentially surrounding the large orifice. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice on a nitrile/EPDM rubber seal affixed to the control float.

The intake/discharge orifice area shall be equal to the nominal size of the valve i.e. a 150mm (6") valve shall have a 150mm (6") intake/discharge orifice. The valve construction shall be proportioned with regard to material strength characteristics, so that the deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

The valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. This feature shall consist of easily replaceable components such as gaskets, seals or the like. The air valve class shall be at least equal to that of the pipework in which is to be installed, with a minimum working pressure of at least 1,6 MPa (Class 16).

PSL 3.10.3 Float Valves

Float Valves shall be hydraulically controlled dual diaphragm end line type control valves with either a direct or remote pilot to facilitate automatic control of levels in tanks and reservoirs with an inherent slow closing characteristic to automatically reduce induced pressure when closing. Float valves shall be dual diaphragm end of line type with concentric cast iron body and bonnet, which shall be coated and lined with fusion bonded epoxy powder coated to 250 microns.

The spacer piece and plug assembly shall be manufactured from solid HDPE and the diaphragms shall be manufactured from proprietary elastomer as specified by the manufacturer. The internal filter mechanism shall be manufactured from LG2 brass and 304 stainless steel. The control orifice, trim and fasteners shall all be manufactured from Grade 304 stainless steel.

Valve construction shall be such that deformation, leaking or damage of any kind does not occur when the valve is subjected to testing pressures of 1.5 x the designed working pressure.

The valve shall be supplied with a direct or remote (as specified), magnetic two level latch type pilot with a fixed deadband. The pilot shall be constructed of brass with stainless steel trim and shall be fitted with an "Eclipse shallow pot" type magnet. The pilot float arm shall be constructed from stainless steel and the ball from polypropylene.

The pilot shall be able to remain "closed" or "open" when the water surface is turbulent and shall only change state at either end of the deadband. Where a filter is specified to prevent debris from entering the valve, it shall be a cone filter manufactured from powder coated mild steel.

Float valves shall be supplied with stud connections suitable for alignment to flanges conforming to PN16 ratings of BS 4504 standards. Float valves shall be suitable for operating under a static pressure of 16 bar and shall be able to operate at a residual pressure of at least 0.1 bar.

PSL 3.11 Manholes and Surface Boxes

PSL 3.11.1 Pipeline Markers

Where so instructed by the Engineer or as shown on the drawings, the Contractor shall erect pipeline markers. These markers will be precast concrete units manufactured out of 25 Mpa concrete to the dimensions shown on the drawings and shall comply with SANS 1200 GA Concrete (Small Works)."

PSL 3.12 Padlocks for Manholes, Air Valve Chambers, Reservoirs etc.

All padlocks for use in locking manholes, air valves chambers, valve chambers, reservoirs etc shall be “key-a-like” 50 mm “VIRO” or similar approved with all working mechanisms treated with copper slip.”

PSL 4 Plant

PSL 4.1 *Handling and Rigging*

PSL 4.1.1 Stacking of Ductile Iron Pipes

The pipes shall be stacked in uniform stacks, sockets at the same end, as described below:

Bottom Layer: The bottom layer shall be laid on 2 timbers, arranged in parallel; one timber being 1m from the socket end and the other 1m from the spigot end. The pipes shall be laid parallel with one another. The sockets touch and shall not be in contact with the ground. The pipes at the two ends shall be secured at the socket and spigot with large wooden wedges nailed to the timbers. The intermediate pipes shall be secured at the spigot end only, using smaller wedges.

Upper Layers: Each tier consists of parallel pipes laid in line vertically. Each tier is separated by timbers slightly thicker than the difference in diameter (socket – barrel).

Fittings and accessories shall be packed in robust timber crates and secured in position to prevent chaffing in transit.

The contractor shall supply all necessary timber dunnage/crating necessary to stack the pipes in accordance with the above specification. Timber dunnage shall be sufficiently robust to prevent crushing or breaking and shall be of sufficient size to prevent contact with the ground.

PSL 5 Construction

PSL 5.1 *Laying*

PSL 5.1.1 General

“The pipelines shall be laid to straight grades to the levels and to the routes indicated on the drawings. Pipes shall be laid free from cold stresses. No deflections shall be taken in curvature of pipes, but shall be taken with approved bends with exceptions as hereinafter specified. All deflections in pipes with flexible couplings shall not exceed those recommended by the manufacturer of the couplings after making allowance for ground movements, etc. All deflections in the axis of butt-welded steel pipelines of 10° or less shall be made by mitring equally the ends of the two pipes to be joined so that the maximum mitre in any one pipe shall be 5°.

Where the total deflection is 3° or less, the mitring may be made in one pipe end only. Ends to be mitred shall be carefully and accurately marked and then either machine cut or machine planed. Hand planning will not be permitted. After mitring, the pipe ends shall be re-chamfered as described in Clause 4.1.5 of SANS 719.

The minimum gap between pipe end root faces before welding shall be 1,5 mm and the maximum gap shall be 3,0 mm. After mitring all pipe ends shall be thoroughly cleaned before the field weld is carried out. Where the Engineer gives written approval for cold bends, they shall be made by the cold stretch method in such a manner as to preserve the cross-sectional shape of the pipe. The minimum radius of any such bend shall be twenty-five times the outside diameter of the pipe. Approved bending shoes shall be used for bending of the pipes.

Snaking into the trench of butt-welded sections of steel pipeline which has been factory lined and/or coated will not be permitted without the written approval of the Engineer.

The Contractor may butt-weld factory coated and/or lined steel pipes together alongside the edge of the trench to form continuous welded pipeline sections up to a maximum length of 45 m and to lower each section into the trench, provided the pipe, coating and/or lining are in no way damaged during these operations and provided furthermore that the deflection of the pipe barrel at any point during any stage of the operation does not exceed 2% of pipe outside diameter.

During the welding of circumferential joints, the Contractor shall ensure that either rubber mats or other suitable material is laid in the pipe invert of epoxy lined steel pipes to protect the lining against damage by traffic or fall-out from arc welding at the joint. Care shall be taken not to stroke arcs on the epoxy lined areas adjacent to the weld joint. Immediately before welding of joints, the protective tape between the ends of concrete or epoxy linings and coatings and pipe ends shall be removed.

The Contractor shall ensure that pipes are strung in accordance with the Engineer's drawings for proper placement by diameter, wall thickness and specifications. Any movement of pipes resulting from failure to comply with these requirements shall be rectified at the Contractor's expense.

Skids of sufficient number shall be supplied to support the pipe to proper height. If pipe is supported over the trench, skids shall be of sufficient length to prevent collapsing of the trench and of sufficient strength to carry the pipe. For coated pipe a sufficient number of skids shall be used to prevent damage to the coating."

PSL 5.1.4 Depths and Cover

"Water mains shall be so laid in road verges that the minimum cover from the finished surface level to the top of the pipe barrel is 800 mm. Under carriageways, water mains shall be laid horizontally and so that the minimum cover is 1000 mm, the change to the cover under the carriageway from the verge being effected as specified in Subclause 5.1.4.2 of SANS 1200 L. Bulk supply mains shall be laid so that the minimum cover, in all situations, is 1000mm."

PSL 5.11 Pipeline Markers

Markers are to be erected 300 mm off the edge of the pipe trench to the left of the trench and at right angles to the trench centre line at all horizontal changes of direction and on both sides of all road and river crossings, at valve chambers and at intermediate intervals as agreed with the Engineer. At bends the marker will be erected at the P.I. point of these 300 mm offset lines.”

PSL 6 Tolerances

PSL 6.3 Control Points

“On completion of the contract, the Contractor shall provide the Engineer with a list of as built coordinates (Accurate to 1.0 m) for all air valves, scour valves, isolation valves and standpipes. The cost of providing this information shall be deemed to be included in the rates tendered for the individual items.”

PSL 7 Testing

PSL 7.1.1 Inspection (Additional Clause 7.1.1 under 7.1)

“The Contractor shall be responsible for supplying pipes and specials which comply with the specification in every way and he shall arrange for such inspection of his own work as well as work done by others as may be necessary to ensure this.

All welded steel items shall receive a 100% visual inspection of all welds after they have been cleaned and all visible defects shall be rectified.

The Employer reserves the right to appoint suitable qualified inspectors to inspect all stages of the manufacturing process in the Contractor's workshop and in those of his suppliers, on either a part time or a full time basis. The Contractor shall have no claim for moderate inconvenience due to the inspection procedure.”

PSL 7.1.2 Standard of Acceptance (Additional Clause 7.1.2 under 7.1)

“The Standard of acceptance of welding shall be laid down in API 1104: Standard for welding pipe lines and related facilities, for API 5L line pipe.”

PSL 7.1.3 Marking (Additional Clause 7.1.3 under 7.1)

“All individual pipe fillings and pipe specials shall be clearly marked with the appropriate reference numbers for identifying purposes. Reference numbers shall be legibly painted and also stamped on the one end of each pipework item.

The position of a weld test shall be clearly recorded and related to a pipe number.”

PSL 7.2 INITIAL TESTS ON WELDING STEEL PIPES

PSL 7.2.1 Dye-Penetrant Test

"The Contractor shall perform non-destructive testing on complete welds being not less than 10% of the total welding performed, in addition to every weld for steel specials."

PSL 7.2.2 Radiographic Examination

"Testing for X-ray examination shall be carried out as specified in BS 2600: Methods of Radiographic Examination of Fusion Welded Butt Welds in Steel.

The Contractor shall allow for X-ray tests on 1% of all welds performed by an automatic process and on 2½% of all welds performed manually or by a semi-automatic process. The cost of this work shall be deemed to have been included in the rates for steel pipes and specials.

Testing for ultrasonic examination shall be carried out as specified in BS 3923, 1968, Part 1: Manual Examination of Fusion Welded Butt Joints in Ferritic Steel."

PSL 7.2.3 Magnetic Particle Examination (Additional Clause after 7.2.2)

"Testing shall be carried out to BS EN 1291:1998, Methods of Magnetic Particle Testing of Welds."

PSL 7.2.4 Paraffin Test (Additional Clause after 7.2.2)

"All fabricated steel bends, fittings and specials which cannot readily be pressured tested in the works shall receive a paraffin test on all welds to ensure that they are completely watertight. Alternatively, other liquid penetrants may be used."

PSL 7.2.5 Destructive Tests (Additional Clause after 7.2.2)

"The Engineer receives the right to call on the Contractor to perform destructive tests such as transverse tensile, root bend and flatter tests on test specimens cut from the pipes. Separate payment will be made for such tests if they are called for, but the Contractor shall accept that the cutting out of a specimen and its testing may cause a moderate disruption of his work."

PSL 7.3 *Standard Hydraulic Pipe Test*

PSL 7.3.1 Test Pressure and Time of Test

"The test pressure for field testing of the section of pipeline under test, shall be 1,50 times the maximum working pressure.

The maximum working pressure, for testing purposes, shall be deemed to be the pressure rating of the pipe being tested."

Add the following new sub-clauses:

PSL 7.4 *Testing of Valves*

All valves shall be pressure tested according to SANS 664 or other applicable code at the appropriate test pressure. Test certificates shall be issued to the Engineer upon delivery to site.

No separate payment shall be made for testing of valves and hydrants and the scheduled rates for the supply and installation of valves shall include for all costs in respect of testing.”

PSL 8 *Measurement and Payment*

PSL 8.2 *Scheduled Items*

PSL 8.2.1 Supply, Lay and Bed Pipes Complete with Couplings

Until all the specified work has been completed and all requirements complied with, pipes will be regarded as “materials on site”.

PSL 8.2.2 Extra-over 8.2.1 for the Supplying, Laying and Bedding of Specials Complete with Couplings.

Until all the specified work has been completed and all requirements complied with, specials and couplings will be regarded as “materials on site”.

PSL 8.2.3 Extra-over 8.2.1 for the Supply, Fixing and Bedding of Valves

Until all the specified work has been completed and all requirements complied with valves will be regarded as “materials on site”.

Add the following new payment items:

PSL 8.2.16 : Pipeline Markers..... Unit : No.

The unit of measurement will be the number of markers erected and accepted by the Engineer and the rate will include for all materials, manufacturing, delivery, painting and erection of each unit.

PSL 8.2.17 : Valve Markers..... Unit : No.

The unit of measurement will be the number of markers erected and accepted by the Engineer and the rate will include for all materials, manufacturing, delivery, painting and erection of each unit.”

PSLB BEDDING (PIPES) (SANS 1200 LB)

PSLB 3 Materials

PSLB 3.1 *Selected Granular Material*

“Selected granular material shall be regarded as a clean river sand or any other granular, non-cohesive, vegetation free material subject to the approval of the Engineer. The maximum particle size shall be 19 mm. This material may occur in-situ, be imported or selected from trench excavations.

PSLB 3.2 *Selected Fill Material*

“Selected fill material shall be material that has a PI less than 12 and does not contain vegetation or stones exceeding 20 mm. Selected fill material may occur in-situ, be imported or selected from trench excavations.

PSLB 3.3 *Bedding*

All medium pressure pipes shall be classed as flexible pipes and shall be bedded in accordance with Drawing LB 2 of SANS 1200 LB.

All concrete pipes shall be classed as rigid and shall be bedded in accordance with Drawing LB 3 of SANS 1200 LB.

PSLB 8 Measurements and Payment

PSLB 8.1.3 *Volume of Bedding Materials*

“The volume of bedding materials will be computed from dimensions shown on the drawings. The volume occupied by the pipe (measured to the outer diameter) shall be excluded from the bedding volume not be measured.”

PSM: ROADS (GENERAL)
(Applicable to SANS 1200 M)

PSM 3 MATERIALS

PSM 3.2 SOURCE OF MATERIALS (Sub-clause 3.2)

The Contractor shall be responsible to locate suitable sources for materials for the purpose of the Contract.

PSME : SUB-BASE
(Applicable to SANS 1200 ME)

PSME 3 MATERIALS

PSME 3.2.1 Sub-base materials

The requirements for sub-base materials shall be as set out in Section 3 SANS 1200 ME except as revised by the following:

- (a) Maximum PI after stabilization – 6
- (b) Minimum CBR:

	AS SUB-BASE MATERIAL	IN LIEU OF BASE COURSE
Before stabilization	30	45
After stabilization	45	70
Stabilizing agent : Roadlime to SANS 824 (expected application rate -2%)		

PSME 3.3.2 Gravel shoulder and gravel wearing course material

The PI shall not be left unfixed.

PSME 3.5 Selection (Sub-clause 3.5)

The natural gravel shall be obtained from either excavation in the road prism or from borrow pits in the vicinity of the Site. This material shall also be used where indicated in lieu of the base course. The material obtained in the road prism shall be excavated either by cut the windrow or by cut and transport to temporary stockpile within the freehaul distance. Material obtained from borrow pits shall be stockpiled at the borrow pit ready for loading and transport.

PSME 5.4 PLACING AND COMPACTION

PSME 5.4.4.2 Compaction

The material shall be compacted to 93% or 95% Mod. AASHTO maximum density as indicated on drawings.

PSME 6 TOLERANCES

PSME 6.1.2 Grade

When the sub-base material is used in lieu of base course, particular care shall be taken in compacting and finishing the surface and preparing it for priming. The requirements of the SANS 1200 MF are required before construction of the sub-base can start.

PSMF: BASE
(Applicable to SANS 1200 MF)

PSMF 3 MATERIALS

PSMF 3.1 Natural gravel

Natural gravel shall be used for base materials obtained from borrow pits located by the Contractor and approved by the Engineer. The minimum CBR requirements will be as per PSME 1.1 for base materials.

The grading Reactors shall not be less than 1,75. All other requirements shall be as per Clause 3.3.1.

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C 3.4 CONSTRUCTION SPECIFICATIONS

PART C: PARTICULAR SPECIFICATIONS

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PROJECT SPECIFICATION

C3.4: CONSTRUCTION SPECIFICATION

PART C: PARTICULAR SPECIFICATIONS

PA FENCING

CONTENTS

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PA 05	INSTALLING POSTS AND STANDARDS
PA 06	INSTALLING WIRE
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PA 09	CLOSING OPENINGS UNDER FENCES
PA 10	INSTALLING GATES
PA 11	GENERAL REQUIREMENTS AND TOLERANCES
PA 12	MEASUREMENT AND PAYMENT

PA 01 SCOPE

This is a Particular Specification and covers the erection of new fences.

PA 02 TYPE OF FENCE

The fence shall be a security fence and shall be erected in accordance with the dimensions shown on the Drawings.

PA 03 MATERIALS

PA 03.1 POSTS, STAYS AND STANDARDS

Posts, stays and standards shall be of the type and size indicated on the Drawings. Posts shall include gate posts, straining posts and corner posts.

Metal posts, stays and standards shall comply with the requirements of CKS 82 and SANS 280. "Acceptable" in CKS 82 means "acceptable to the Engineer".

Tubular posts, standards and stays shall be galvanized in accordance with SANS 763 Table 1 for type B articles. All rail and Y-sections shall be provided with a protective coating of tar or other approved material.

Corner, gate and straining posts shall be suitably drilled for stay bolts or gate fittings as indicated on the Drawings.

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PA 03.2 BOLTS FOR STAYS

Bolts shall be of mild steel and galvanized in accordance with SANS 763 Table 1 for type C articles. The length and diameter of the bolts shall be as shown on the Drawings. All the necessary bolts, together with nuts and washers, shall be supplied with each post.

PA 03.3 WIRE

All wire shall conform to the requirements of SANS 675 and shall be class B galvanized, except where otherwise specified below.

(a) Barbed wire

Barbed wire shall be one or both of the following types:

- (i) High-tensile grade, oval shaped, single-strand wire, 2,60 mm x 2,00 mm
- (ii) Mild-steel grade, double-strand, uni-directional twist wire, each strand 2,50 mm in diameter

Barbs shall be spaced at not more than 150 mm intervals.

(b) Smooth wire

Smooth wire shall be of the types specified below:

- (i) Straining wire shall be mild-steel wire, 4,00 mm in diameter.
- (ii) Fencing wire shall be high-tensile grade 2,24 mm diameter wire.
- (iii) Tying wire or binding wire shall be 2,50 mm diameter, mild-steel, class C galvanized wire for tying fencing wire to standards and 1,60 mm diameter, mild-steel, class C galvanized wire for tying wire mesh to fencing wire.

(c) Barbed-tape concertinas

Barbed-tape concertinas shall comply with the requirements for type A in CKS Specification 592 and shall consist of close-coiled high-tensile wire with a continuous strip of flat steel barbs (barbed tape) crimped to the wire along the entire length of the wire. The coils shall further be attached to each other by clips to give a concertina configuration when pulled apart. The coils shall be of the diameter as shown on the Drawings. Each concertina shall have a minimum of 55 coils, and the maximum effective length of open concertina, when pulled apart, shall depend on the diameter of the roll, but shall be at least 12 m.

The high-tensile wire shall be class B galvanized and the barbed tape shall be made of cold-rolled carbon steel galvanized to class Z450. The concertina clips shall be manufactured from steel strip galvanized to class Z450.

PA 03.4 DIAMOND MESH

Diamond mesh (chain-link fencing) shall comply with the requirements of SANS 1373. The width shall be as shown on the Drawings, and both edges shall be clinched.

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The diameter of the wire shall be 2,5 mm and the mesh size shall be as shown on the Drawings and the wire shall be class B galvanized.

PA 03.5 GATES

Gates shall comply with the requirements of CKS 146 and shall be manufactured to the dimensions shown on the Drawings.

Gates shall be complete in every respect, and shall include hinges, washers, bolts and the locking mechanism shown on the Drawings.

PA 03.6 CONCRETE

Concrete used for fencing shall comply with the requirements of SANS 1200 G.

PA 04 CLEARING FENCE LINE

Strip clearing for the fence shall be carried out in accordance with SANS 1200 C and will be measured and paid for under Section 1200 C of the Schedule of Quantities.

PA 05 INSTALLING POSTS AND STANDARDS

Straining posts shall be erected at all ends, corners and bends in the line of fencing and at all junctions with other fences. Straining posts shall not be spaced further apart than shown on the Drawings. The height of the posts above the ground shall be such that the correct clearance between the lowest wire and the ground can be obtained.

Posts shall be accurately set in holes and, where indicated, shall be provided with concrete bases to the dimensions shown on the Drawings.

Holes shall be dug to the full specified depth. Where, due to the presence of rock, the holes cannot be excavated by hand or by pneumatic tools and the Contractor has to resort to the use of explosives, he will be paid separately for the drilling and blasting operations required.

Corner, gate, end and straining posts shall be braced by means of stays or anchors, as shown on the Drawings. Pipe stays shall be bolted to the posts. Gate posts shall not be used as straining posts, but at each gate post a straining post shall be placed as shown on the Drawings and stayed by means of an anchor consisting of six strands of wire.

Standards shall be firmly planted in the ground at the spacing shown on the Drawings or as directed by the Engineer. The spacing of standards between any two straining posts shall be uniform. In rock or hard material standards shall either be driven or set in holes drilled into the rock. The size of drilled holes shall be such that a tight fit is obtained. Care shall be taken not to buckle or damage the standards when driven. Where indicated, standards shall be provided with concrete bases to the dimensions shown on the Drawings.

All posts and standards shall be accurately aligned and set plumb and shall be planted with the overhang as shown on the Drawings and at right angles to the direction of the fence. After posts and standards have been firmly set in accordance with the foregoing requirements, the fencing wire shall be attached thereto as described below.

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PA 06 INSTALLING WIRE

All fencing wire shall be carefully stretched and hung without sag and with true alignment, and care shall be taken not to stretch the wire so tightly as to cause breaking, pulling up straining posts, or being easily damaged during veld fires.

Each strand of fencing wire shall be securely fastened in the correct position to each standard with galvanized binding wire. The binding wire for each horizontal fence wire shall pass through a hole or notch in the standard, and the ends of the wire shall be wound at least four times around the fencing wire.

At the end, corner, straining and gate posts the fencing wire shall be securely wrapped twice around the post and secured against slipping by tying the end tightly around the wire by means of at least six snug, tight twists. In the case of high-tensile wire, two long windings must first be made before the six tight twists to prevent the wire from breaking at the first twist. Where smooth wire is used, the loose end shall be bent back and hooked into the opening between the fencing wire and the first winding.

Splices in the fencing wire will be permitted if made in the following manner with the use of a splice tool: The end of each wire at the splice shall be carried at least 75 mm past the splice tool and wrapped snugly around the other wire for not less than six complete turns, after which the two separate wire ends shall be wound in opposite directions. After the splice tool has been removed, the space left by it in the splice wire shall be closed by pulling together the wire ends. The unused ends of wire shall be cut close to leave a neat splice.

The gaps between gate posts and the adjacent straining posts shall be fenced off with short fencing wires.

PA 07 INSTALLING DIAMOND MESH

Where indicated on the Drawings, diamond mesh shall be stretched against the fence and properly tied to the fencing wire. The diamond mesh shall be secured by means of binding wire at 1,2 m centres along the top and bottom wires and at 3 m centres along each of the other fencing wires, unless shown otherwise on the Drawings.

PA 08 INSTALLING BARBED-TAPE CONCERTINAS

Barbed-tape concertinas shall be positioned on the fence as shown on the Drawings. The concertinas shall be fastened to the appropriate fencing wires at each standard as well as at 1,0 m maximum intervals between standards.

Rolls of barbed-tape concertinas shall be joined with binding wire at four points, spaced at equidistant intervals around the circumference of the loop. Joints shall be made to coincide with the positions of standards.

PA 09 CLOSING OPENINGS UNDER FENCES

At ditches, streams, drainage channels or other hollows where the fence cannot follow the general ground contour, the Contractor shall close the opening under the fence by means of horizontal barbed wires 150 mm apart and stretched between additional

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straining posts as shown on the Drawings. The opening shall be covered with strips of diamond mesh, 1 000 mm wide, fixed to the barbed wires.

In the case of larger streams, the opening below the lower fencing wire shall be closed by means of loose-hanging wire nets as shown on the Drawings. These nets shall be erected at streams only on the instructions of the Engineer.

PA 10 INSTALLING GATES

Gates shall be installed at the positions indicated on the Drawings or pointed out on Site. The gates shall be hung on gate fittings in accordance with the details shown on the Drawings. Gates shall be so erected that they swing in a horizontal plane at right angles to the gate posts and clear of the ground in all positions. Double swing gates shall close to have a gap of not more than 25 mm between them, and other gates shall close to be no further than 25 mm from the gate post.

PA 11 GENERAL REQUIREMENTS AND TOLERANCES

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

The height of the lower fencing wire above the ground at posts and standards shall not vary by more than 25 mm from that shown on the Drawings. Other fencing wires shall not vary by more than 10 mm from their prescribed relative vertical positions.

Anchoring of a fence to structures shall be done as shown on the Drawings.

The Contractor shall, on completion of each section of fence, remove all cut-offs and other loose wire or mesh so as to leave the fence with a neat and finished appearance.

PA 12 MEASUREMENT AND PAYMENT

PA.01 Supply and erection of new fence as per drawingUnit: m

The unit of measurement shall be the metre of the completed fence constructed as per the drawing detail.

PA.02 New gates

(a) Single leaf Unit: number

(b) Double leaf Unit: number

The unit of measurement shall be the number of new gates erected. A pair of gates shall be measured as one.

The tendered rate shall include full compensation for gate posts, hinges, bolts, concrete, locking mechanism and straining wire, and for the erection of the gates complete as specified and as shown on the Drawings. It shall not include compensation for any fencing wire or mesh used on the gate.

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PB : BUILDING WORK AND SERVICES

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PB 1.0 SCOPE

This section covers different aspects of construction work associated with the erection of buildings, which makes up a portion of the contract.

Building work must be carried out in accordance with the National Building Regulations and the directives contained in this section.

Work associated with the erection of buildings, such as earthworks, concrete work, structural steelwork, etc, must be measured as specified in the applicable sections of these specifications.

PB 2.0 GENERAL

All references to the Employer shall be deemed to mean the Engineer.

PB 2.0 EARTHWORKS

All earthworks shall be carried out in accordance with SANS Specification 1200D - Earthworks, with the following amplifications and amendments: -

Filling, etc.:

All backfilling and filling under floors and pavings must be of selected material from the excavations, unless otherwise stated, returned and compacted in layers to 93% Mod AASHTO and with the top surface dressed to the correct levels and Grades, all to the approval of the Employer. Under no circumstances will the Contractor be allowed to use clay, peat or other unsuitable material for filling.

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Rates for all items of filling with material from the excavations are to include for haulage.

Any filling supplied by the Contractor is to be of suitable material approved by the Employer.

Compaction of Filling, etc. :

All filling and backfilling is to be done in layers not exceeding 200mm thick before compaction, with the layers level to ensure uniform compaction. Each layer is to be thoroughly compacted over the whole of the area to a dry density not less than 93% of Mod. AASHTO density. The surface of each compacted layer shall be uniform and tightly bonded. Care is to be taken that no damage is done to foundation walls, drains and other services.

Protection against Subterranean Wood-destroying Termites :

In order to protect against termites the following shall apply :-

- a) Remove vegetable matter : All dead roots and other vegetable matter likely to encourage termites must be removed from the Ground under and against the building and from all filling material.
- b) Treating the Ground : The Ground under surface beds, and below suspended floors, shall be treated by the application of Soil Insecticides of Chlordane or Aldrin types complying with SANS Specifications 1165 and 1164 respectively, mixed with water and applied at the rate of not less than 5 litres of solution per square metre uniformly over the whole surface. The concentration of the solution must be strictly in accordance with the manufacturer's instructions and to the approval of the Employer.

Where the Ground to be treated is of earth filling, the upper 50mm layer of fillings must be levelled by raking, but must not be rammed until after the solution has been applied, and where of natural Ground, it must be loosened to a depth of not less than 50mm and similarly levelled, in order to enable the solution to penetrate into the soil. After the solution has been applied and allowed to penetrate the surface, the soil must be well rammed and consolidated.

Before applying the solution to the Ground under the floors, splay back earth for a depth and width of 75mm from the internal surfaces of walls enclosing the floors, against internal walls, sleeper piers, etc. and thoroughly saturate with the solution. After the solution has soaked into the earth the splayed Grooves must be filled with earth and consolidated.

The treated layer of soil under suspended wood floors must be protected with a 75mm thick layer of approved clean Gravel, finished to an even surface.

The treated layer of soil under concrete surface beds must be protected with a 25mm thick layer of well consolidated approved Grit prior to laying the waterproofing membrane.

Great care must be taken when laying concrete surface beds, protective layers, etc., in order to avoid rupturing the treated layer of soil. Should the treated layer be ruptured at any point it must be made good and the area affected re-treated with the soil insecticide.

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Contractors are advised that :-

- a) Special precautions must be taken to protect the workmen whilst using the insecticide.
- b) The treatment of filling or Ground under floors shall be done as soon as practicable, so that treatment may dry out before the floors are laid.
- c) The treatment of the Ground must be carried out under the supervision of the Employer.
- d) The soil insecticide is to be delivered to the site in sealed drums clearly labelled or stamped with the name of the product.
- e) In addition to the foregoing the application of the insecticide is to be carried out in accordance with SANS Code of Practice 0124 - The application of Certain Soil Insecticides for the Protection of Buildings.
- f) The protective layers of Gravel or Grit shall be measured separately.

PB 4.0 CONCRETE, FORMWORK AND REINFORCEMENT

All concrete and formwork shall be carried out in accordance with SANS Specification 1200G - Concrete (Structural), with the following amplifications and amendments :-

Construction Details :

Building on Concrete Footings : No structural load shall be imposed on concrete footings until at least three days after depositing the concrete in the case of mass concrete footings, and after seven days in the case of reinforced concrete footings, or as may be directed by the Employer.

"No-Fines" Concrete : shall consist of one part of cement to eight parts of 19 mm aggregates (1 : 8 - 19mm stone) with a water/cement ratio of approximately 0,46. This water/cement ratio may be varied slightly to suit conditions on approval by the Employer.

The quantity of water used shall be just sufficient to form a smooth Grout, which shall completely coat every particle of aggregates and also to ensure that the Grout is just wet enough to form a small fillet at each point of contact between the stones. "No-fines" concrete mixed with excessive water, which results in a thin Grout, which drops off the aggregates, will be rejected.

"No-fines" concrete shall be placed in its final position within 20 minutes of mixing and shall be placed in continuous horizontal layers. "No-fines" concrete shall be spade worked sufficiently to ensure that it fills the norms but vibrating, tampering or ramming will not be permitted.

Finishes to in-situ concrete:

Unformed finishes: are those concrete surface finishes developed without the use of formwork.

Class U1 Ordinary Finish: Immediately after placing, the concrete shall be finished by screeding with the edge of a wooden board of straight and true line and working between

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guides set accurately to level. No mortar shall be added and noticeable surface irregularities caused by the displacement of coarse aggregates shall be made good by rescreeding after removing or tamping down the offending aggregates.

Class U2 Wood Float Finish: The concrete surface shall first be brought to the standard Class U1 ordinary finish and then floated with a wood float. Floating shall be started as soon as the screeded finish is stiffened sufficiently and the bleed water has evaporated or been removed and it shall be the minimum necessary to produce a surface free from screed marks and uniform in texture.

Class U3 Steel Trowel Finish: The concrete surface shall first be brought to the standard of Class U2 wood float finish with floating being continued until a small amount of mortar without excess water is brought to the surface and then when the floated surface has hardened sufficiently to prevent any more excess fine material from being drawn to the surface, trowelling with a steel trowel. Trowelling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense uniform surface free from blemishes and trowel marks. Gradual surface irregularities shall not exceed 5mm over any 3m. The sprinkling of sand and/or neat cement on the surface to absorb excess moisture shall not be permitted.

Class U4 Power Float Finish: The concrete surface shall first be brought to the standard of Class U1 ordinary finish using wooden screeding boards or steel rollers. After evaporation or removal of all bleed water and immediately the concrete is stiff enough to support the machine the surface shall be closed with a mechanical power float and then finished with a mechanical power trowel. The texture of the finished surface shall be either non-slip or polished as shown on the drawings. Irregularities shall be of long wavelength not exceeding a curvature of 2mm in 600mm. Under no circumstances shall sand and/or neat cement be sprinkled over the surface either to absorb excess moisture or to fill surface blemishes or irregularities. Power floats and trowels shall be operated by skilled operators.

Tolerances: Unless otherwise agreed by the Employer Degree of Accuracy I shall apply to all concrete work and steel reinforcing.

PB 5.0 BRICKWORK

Sand: shall comply with the requirements of SANS Specification 1090, washed where necessary and screened through a 2 360-micrometre mesh sieve.

Cement: shall be in accordance with SANS ENV 197-1 : Cement-composition, specifications and conformity criteria. Part 1: Common Cements. Cement containing more than 15% blast furnace slag will not be permitted to be used.

Lime: shall be hydrated lime complying with SANS Specification 523.

Water: shall be clean and free from injurious amounts of acids, alkalis, and other organic substances. If so required by the Employer, the suitability of the water shall be proved by tests carried out by an approved laboratory.

Cement Mortar: unless otherwise described, shall be composed of one part by volume of cement to five parts by volume of sand.

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Compo Mortar: unless otherwise described, shall be composed of one part by volume of cement, one part by volume of lime to ten parts by volume of sand.

Strength Mortar: where required, shall be of the class specified and as defined in Table C-1 of SANS Code of Practice 0164 - Part 1.

Mixing of Mortar: the materials are to be mixed dry on a non-absorbent and close jointed timber or iron platform until the mixture is of a uniform colour, with water added and the mixture turned over until the ingredients are thoroughly incorporated.

No cement mortar that has commenced to set will be allowed to be used. Mixing platforms are to be cleaned and old mortar removed before any new batch of mortar is prepared for mixing.

Testing of Strength Mortar: During the time brickwork is being laid samples shall be taken of the mortar being used as shall be directed by the Employer. A Group of three 70 x 70 x 70mm test cubes shall be made from each sample for testing at 28 days age. Each Group of test cubes shall be deemed to represent the whole of the batch from which the sample was taken and shall be identifiable with the batch.

The testing shall be undertaken by an independent firm or institution nominated by the Contractor to the approval of the Employer.

Burnt Clay Common Bricks: shall comply with SANS Specification 227 and are to be good quality, sound, hard, well burnt bricks, uniform in size and shape.

A sample load of bricks is to be approved by the Employer and all subsequent loads are to be equal thereto.

Bricks for Foundations: are to be as above but extra hard burnt bricks.

Reject facing bricks may be used in lieu of extra hard burnt foundation bricks provided they are equal to a sample to be submitted to and approved by the Employer.

Facing Bricks, Paving Bricks, Quarry Tiles, etc.: Facing bricks shall comply with SANS Specification 227. Facing bricks, paving bricks, quarry tiles, terra cotta Grille blocks, etc., are to be of the types to match existing colours and texture, specially selected, free from blemishes, square on all faces, uniform in size, shape and colour and equal to a sample to be deposited with and approved by the Employer.

Special care must be taken to preserve the arises and faces of facing bricks, paving bricks, quarry tiles, etc., during transit and handling.

Brickwork: unless otherwise described, is to be burnt clay common bricks and wherever practicable is to be in stretcher bond with the skins tied together with and including galvanised crimp wire wall ties in accordance with SANS Specification 28. The wire ties are to be of sufficient length to allow not less than 75mm of each end to be built into brickwork, built into every fourth course and spaced at 450mm staggered centres (seven ties per square metre). The bricks are to be well wetted before being laid and the course of bricks laid last is to be well wetted before bedding the next course of bricks upon it. The brickwork is to have the perpends flushed up solid and each course is to be laid on a solid

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bed of mortar. No false headers are to be used. Whole bricks are to be used except where bats or closers are legitimately required to form bond.

Unless otherwise described one brick walls are taken at a nominal thickness of 230mm. The joints of walls to be plastered are to be raked out as the work proceeds to form key for plaster. All walls are to be carried up regularly so that no part be built more than 1,2m higher than the adjoining walls.

Mortar joints generally are not to exceed 10mm thickness unless otherwise indicated on the drawings. If a specific brick scale is indicated on the drawings, either drawn or written, it must be adhered to.

Hollow Walls: are to be formed of two thicknesses of brickwork as specified with cavity between, tied together, unless otherwise specified, with and including A.I.S.I. Type 304 stainless steel wire butterfly type wall ties in accordance with SANS Specification 28, of sufficient length to allow not less than 75mm of each end to be built into brickwork, built into every fourth course and spaced at 450mm staggered centres (seven ties per square metre). Cavities are to be kept clear of all rubbish, mortar droppings and projecting mortar.

Brick Linings to concrete : unless otherwise described are to be tied to concrete with and including A.I.S.I. Type 304 stainless steel wire wall ties complying with SANS Specification 28 with one end embedded 75mm deep into concrete and other end built into the brick joints and spaced not less than seven ties per square metre.

Reinforced brick lintels: unless otherwise detailed are to be constructed in accordance with N.P.A. Type Drawing.

Precast Pre-stressed Concrete Lintels : where specified, are to be of approved manufacture and the Contractor is to provide the Employer with a certificate issued by the manufacturer certifying that the lintels are adequate for the purpose in terms of span, loading and number of courses and construction of brickwork above the lintel. The manufacturer is also to specify the minimum bearing required at each bearing end and the nature and period of temporary propping required. Rates for precast pre-stressed concrete lintels are to include for any cement mortar filling required and for temporary propping in accordance with the manufacturer's instructions.

Bagging down brickwork: shall be carried out when the mortar in joints is still soft by rubbing over with wet rough sacking until all joints and crevices are evenly filled, including additional mortar if necessary to obtain an even surface or, when the mortar in joints is set, by rubbing over as described but including cement Grout as necessary to fill up the joints and crevices.

Cramps : for timber door frames shall be 1,6mm thick galvanised hoop iron 32mm wide with one end turned up 50mm and twice screwed to stile of frame and built 450mm deep into wall with other end turned up into brick joint and cranked as necessary where built into cavity wall. Cramps shall be built in approximately 330mm from top and bottom of stile and intermediately at not exceeding 825mm.

Tiles to wall plates, rafters, etc.: shall be 1,6mm thick galvanised hoop iron 32mm wide and at least 1 500mm long with one end turned up and built in not less than ten courses deep into brickwork or imbedded in concrete beam or slab and with other end left

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projecting and wrapped around timber rafter and spiked to timber wall plate. Where ties are imbedded in concrete beam or slab they must be wrapped around the bottom steel bar reinforcement of the beam or slab.

Welded mesh brick reinforcement : shall be galvanized and be 55, 80, 155 or 235mm wide consisting of two 3,55mm main high tensile steel wires at 50, 75, 150 or 230mm centres respectively with 2,80mm high tensile steel cross wires electrically welded at 300mm centres, lapped 150mm at end joints, 75mm at angles and built 110mm into connecting walls. No allowance has been made for laps.

Bitumen emulsion waterproofing to brickwork; The inner thickness of external superstructure walls whether hollow or solid, behind facing bricks, is to be bagged and painted with two coats of approved bitumen emulsion waterproofing compound.

Faced brickwork: Facing bricks shall match existing brickwork and shall be sorted to ensure proper mixing of the bricks within the colour range of each type of facing bricks. Sudden changes in the general colour of face brickwork in any one type of facing brick will not be acceptable. Sand used in mortar for faced brickwork is to be clean washed sand and match the existing sand. Faced brickwork is to be pointed to match existing work.

Keyed-in joints are to be formed with a round jointing tool and square recessed joints are to be approximately 6mm deep formed with a square jointing tool. All perpendes are to be accurately kept. The bond is to be broken, if necessary, in the centre of the panels above and below windows, above doors, between openings and in the centre of sides to piers. No broken bond will be allowed at reveals or quoins. All cutting to face bricks is to be done with a carborundum or other approved high speed brick saw. Faced brickwork is to be protected from injury, mortar splashes, etc., and cleaned down with spirits of salts and scrubbed down with water at completion to the approval of the Employer.

Paving bricks and quarry tiles : unless otherwise described are to be pointed as the work proceeds with 6mm wide keyed-in joints. Paving bricks and quarry tile pavings, sills, etc., are to be protected from injury, mortar splashes, etc., and cleaned down with spirits of salts and scrubbed down with water at completion to the approval of the Employer.

Asbestos cement sills: are to be of approved manufacture without fixing lugs, even in shape, uniform in colour, free from cracks, twists and other defects, in single length between reveals and of the thickness and colour specified and equal to approved sample.

Tendered Rates:

Brickwork generally : rates for brickwork are to include for hacking the face, or raking out the joints, of brickwork where necessary to form key for plaster, etc. and for plumbing angles and surfaces, all square cutting, wedging and pinning against columns, beams, slabs, etc., for all waste in cutting and wire ties required in tying skins together as described.

Rates for hollow walls are to include in addition to the above for keeping the cavities clean and free of mortar droppings and for butterfly type wall ties, all as described.

Where items are described as cut and pinned, built in, bedded, wedged and pinned, etc., rates are to include for Grouting in or bedding solid with 1 : 3 cement mortar, unless otherwise stated.

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Where window units, etc., are described for building in as composite, rates are to include for assembling of units as required and, unless otherwise described, for tap screwing to coupling mullions or transoms, including holes.

Faced brickwork, etc. : Rates for all fair and faced brickwork, brick pavings, Grille block walls and the like are to include in addition to the foregoing for building or laying to true surfaces and angles, all fair square cutting and fitting and cleaning down to approval at completion.

Rates for brick sills, copings, steps, margins, thresholds and the like shall include for fair ends and angles unless different bricks or tiles are used or special cutting is required.

Rates for items described as "Extra over ordinary brickwork" are to be for the extra cost of the facing bricks specified over common brickwork built in stretcher bond, and are to include for building in cement mortar consisting of one part cement to five parts clean washed sand and for pointing as described.

Rates for items described as "Labour and Material" are to be for the full cost of the facing bricks specified, and otherwise as above described.

Rates for all cut face brick linings are to include for cutting and bonding at ends.

Quarry tiles : Rates are to include for all square cutting and fitting, bedding and jointing in cement mortar consisting of one part cement to three parts clean washed sand, for pointing as described as the work proceeds and cleaning down to approval at completion.

Rates for treads, sills, copings, cappings, skirtings, etc., are to include for pointing to exposed edges, ends and projecting soffits.

Air bricks : Rates for air bricks and air vent Gratings are to include for forming openings through the walls, for all necessary jack arches and turning pieces, for plastering all round the openings in cement mortar, and where in hollow walls, for building cavity solid all round in addition.

Asbestos Cement Sills: Rates are to include for all square cutting and waste and fitting and for bedding in an approved epoxy adhesive.

Terra Cotta Grille Blocks: Rates are to include for all square cutting and waste fitting, bedding and jointing in cement mortar consisting of one part cement to three parts clean washed sand and for pointing with keyed joints on both faces and into reveals of openings as the work proceeds.

PB 6.0 WATERPROOFING

General : all measurements are net - no allowance being made for laps in sheet materials or for waste in cutting.

Workmanship: All work is to be carried out to the approval of the Employer by skilled and qualified workmen and in accordance with the methods prescribed in SANS Code of Practice 021 for waterproofing of buildings.

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All work is to be executed in accordance with the instructions issued by the manufacturer of the material being used. Roof coverings and linings are to be laid to the falls, cross falls, etc., provided in the screeds or other surfaces to which they are to be applied.

Surfaces to be waterproofed are to be dry and cleaned of all dust, chips, etc., immediately prior to the commencement of this work and are to be free of any contaminating substances or projections, which may damage the waterproofing materials being used.

Polyethylene sheeting: is to comply with SANS Specification 952 and bear the SANS mark. The sheeting is to be laid with a minimum lap of 150mm, unless otherwise specified, at angles and junctions with laps sealed in accordance with the manufacturer's instructions.

Mastic asphalt roofing: is to conform to SANS Specification 297 and is to be laid hot in two or three layers, as stated, with each layer of minimum 10mm thickness and laid to break joint with the underlying layer by not less than 150mm.

Prior to the commencement of any work the specialists who lay the mastic asphalt roofings are to satisfy themselves as to the acceptability of the surface upon which the mastic asphalt is to be laid, as the said specialists will be held fully responsible therefore.

Mastic asphalt to surfaces not exceeding 10° slope is to be laid in two layers on and including one layer of approved reinforced waterproof building paper lapped 75mm at all edges. Rates are to include for all cutting and waste on building paper.

Mastic asphalt to surfaces exceeding 10° and not exceeding 20° slope is to be laid in two layers on surfaces which have been hacked, Grooved or scoured to provide an adequate key. Rates are to include for the necessary preparation of the surfaces.

Mastic asphalt to vertical surfaces and surfaces exceeding 20° slope is to be laid in three layers on and including any necessary expanded metal lathing securely fixed to the surfaces to prevent creeping. Where vertical surfaces do not exceed 300mm in height the surfaces to receive mastic asphalt may alternatively be prime coated with a latex based bitumen emulsion primer prior to the application of the mastic asphalt.

Angle fillets to all internal angles are to be run in one operation.

Finished coats of bituminous based aluminium paint on mastic asphalt roofing have been measured separately.

Flexible Glass-fibre reinforced Polyester Waterproofing : shall be of the type specified, or other approved, supplied and laid in-situ by a specialist sub-contractor, all to the approval of the Employer and shall carry a written 10 (ten) year guarantee.

The waterproofing applied in-situ shall consist of one layer of three-ply bituminous felt underlay bonded to the substrate and covered with flexible glass-fibre reinforced polyester waterproofing comprising a chopped strand glass-fibre mat having a minimum mass of 450g/m², impregnated with flexible unsaturated polyester resin and finished with two coats of abrasion-resistant flexible unsaturated polyester surface coating which shall not show any sign of the glass-fibre reinforcement. The total mass of the waterproofing (excluding the bituminous felt underlay) shall not be less than 1,8kg/m².

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Chopped strand glass-fibre mat reinforcement is to comply with the requirements of SANS Specification 419.

All unsaturated polyester resins are to be suitable for their intended use and comply with SANS Specification 713 and are to be ultra-violet ray stabilised.

All flexible glass-fibre reinforced polyester waterproofing is to be finished to approved opaque colours (excluding red or orange tints), is to be properly cured, and is to be free from porosity, blisters, cracks, surface crazing or other defects which may affect its appearance or its performance, with the surface colours consistent throughout.

Samples of the flexible glass-fibre reinforced polyester waterproofing are to be submitted to and approved by the Employer and all work executed is to be equal to the approved samples.

Expansion Joint Sealants : Polysulphide sealants, where specified, are to be approved polysulphide sealants complying with SANS Specification 110 Type 2, well compacted into joint and neatly pointed.

Rates are to include for priming joints where recommended by the manufacturer of the sealant being used with a suitable and approved primer. All work is to be executed by the manufacturer of the material, or other specialist firm, all in accordance with the manufacturer's instructions.

Rates : for all roofing and linings are to include for cleaning and preparing the surfaces to be waterproofed as before described, for protecting from damage and cleaning down, flood-testing if required and handing over in an acceptable and guaranteed watertight condition at completion.

Rates for sheet waterproofing materials are to include for all dressing, bending, narrow widths, angles, intersections, cutting and waste and where applicable for the extra material required for lapping and for sealing laps as described. Rates for roofing described as laid on "flat" roofs are to include for laying to slopes not exceeding 10° from the horizontal.

PB 7.0 ROOF COVERINGS

Concrete Roofing tiles : shall conform to SANS Specification 542. The tiles are to be of pattern and colour specified and are to be even in thickness, uniform in shape and colour and free from cracks and blemishes. The tiles are to be laid to "straight bond" in accordance with SANS Code of Practice 062 with vertical joints and bottom edges of each course ranging perfectly straight.

Unless otherwise specified each tile in every third course, all tiles in eaves and ridge courses and tiles in every course on each side of hips and valleys shall be secured with copper clout headed nails driven into the battens or with approved non-corrodible tile clips and nails in accordance with the manufacturer's instructions. Where nail holes in tiles have been cut off at hips, valleys, top edges, etc., new holes are to be drilled.

All ridge and hip cappings are to be of the types specified and of colour to match the roofing tiles. The cappings are to be bedded, jointed, pointed and torched up over roofing tiles in 1:3 cement mortar tinted to match the tiles. Where cappings having butt jointed

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ends are specified, an approved damp proof course conforming to Type C of SANS Specification 952 is to be fixed under, laid over the roofing tiles in accordance with the manufacturer's instructions.

Barge cappings are to be of the types specified and of colour to match the roofing tiles. The barge capping tiles are, unless otherwise specified, to be bedded, jointed, pointed and torched up over roofing tiles in 1:3 cement mortar tinted to match the tiles with every tile drilled and secured with copper clout headed nails to timber bargeboards or bearers (elsewhere measured).

Rates : for roof tiling are to include for all necessary half tiles at verges and for all square cutting and waste at verges, abutments, top and bottom edges and to both sides of ridges.

Rates for cappings, etc., are to include for all short lengths, cutting and waste and fitting at intersections.

All measurements are net. No allowance has been made for laps.

Corrugated Asbestos Cement Roofing, Cladding and Fittings : are to be of an approved brand conforming to SANS Specification 685.

Roofing, etc., shall be lapped half a corrugation at sides and 300mm at ends, unless otherwise specified. Roofing, etc., shall be fixed to timber purlins, rails, etc., with 8mm galvanised hook bolts of the lengths stated. Each fixing screw or bolt shall be fitted with washers as recommended by the roofing manufacturer and shall be spaced not less than two screws or bolts to the width of each sheet to each purlin or rail.

Rates for roofing, cladding and fittings are to include for :-

- a) Fixing as described and in accordance with the manufacturer's instructions.
- b) Bedding washers in an approved mastic sealing compound.
- c) Coating projecting ends of hook bolts and nuts with bitumen after fixing.
- d) All square notches, square cutting and waste, laps, fitting, mitring and drilling. No punched holes will be permitted.

All measurements are net. No allowance has been made for laps.

Corrugated Iron Roofing, Cladding and Fittings : are to be of an approved cromodeck brand and are to be manufactured from steel sheets of the thickness specified.

Roofing, etc., shall be lapped one and a half corrugations at sides and 300mm at ends, unless otherwise specified. Roofing, etc., shall be fixed to timber purlins, rails, etc. with standard galvanised drive screws 65mm long and to steel purlins, etc., with 8mm galvanised hook bolts of the lengths stated.

Each screw bolt shall be fitted with one lead washer and one bituminous felt washer and shall be spaced not less than one screw or bolt to every alternate corrugation across the width at end laps and ends of sheets and at each intermediate purlin or rail.

Rates for roofing, cladding and fittings are to include for :-

- a) Fixing as described.

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- b) Bedding washers in an approved mastic sealing compound.
- c) Coating projecting ends of hook bolts and nuts with bitumen after fixing.
- d) All square notches, square cutting and waste, laps, fitting and drilling.

All measurements are net. No allowance has been made for laps.

PB 8.0 CARPENTRY AND JOINERY

Nomenclature of timbers : Timber described as "softwood" is to South African softwood of the relevant type, Grade, etc., specified.

The names used for imported timbers are those given in Supplement No. 1 to SANS Code of Practice 02 under "Nomenclature of Standard Trade Names of Imported Commercial Timbers used in South Africa" and the Contractor is referred thereto.

Timber sizes : Sawn and wrot timbers are to be of the full sizes stated.

Where "out of" sizes have been shown for wrot timbers on the drawings, an allowance of 4mm for each wrot face off the sizes shown has been made. Doors, fanlights, sashes, manufactured boarding, plywood, veneers, etc., must be of the full thickness specified. Where doors, door frames, fanlights and frames, sashes, windows and frames are measured as numbered items, the overall sizes are given to the nearest 10mm.

Tolerances in nominal dimensions for imported timber shall not exceed the following :-

- a) for nominal dimensions up to 76mm the actual dimension may be 2,5mm under for each 25mm
- b) for nominal dimensions 76mm and over the actual dimension may be 1,6mm under for each 25mm.

Storage of timbers : Timber delivered to the site is to be properly stacked above Ground, either on bearers or platforms under cover and protected from inclement weather.

Orders : for timber are to be placed immediately after the Contract is signed, as the Contractor will be held responsible for any delay in delivery.

Pretreatment of Timbers : All permanent timbers installed in the building are to be treated against borer, cryptotermes, termites, and all wood-destroying agencies with an approved preventative, all in accordance with SANS Code of Practice 05.

Any surface subsequently exposed by cutting or planing must be touched up with the same preservative solution and rates are to include for all preservative required. The Contractor is to obtain a certificate from the merchants supplying the treated timber, to the effect that the timber has been treated against wood-destroying agencies. The Employer has the right to remove samples of the treated timber to have tests carried out by the Division of Entomology or any other Authority.

Temporary timber on the site, e.g. shuttering props, etc. must be free from wood-destroying agencies. Any timber so affected is to be immediately removed from the site. Materials which do not comply with the above requirements or are in any way damaged or discoloured by the pre-treatment must be replaced by the Contractor at his own expense, if so directed by the Employer.

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Stress Grading of Softwood Timber: The Mechanical Stress Grading of Softwood Timber (Flexural Method) shall be in accordance with SANS Code of Practice 0149.

Structural Timber : for carpentry is to be South African softwood in accordance with SANS Specification 563 and, unless otherwise specified, of Stress Grade V4, and branded accordingly. If it is necessary to use sizes that have to be re-sawn, these shall be re-graded and stamped with the respective SANS stress Grade mark. Unless this is done, timber which is resawn is no longer considered as complying with the specification and shall on no account be used.

Branding and Battens: of cross-sectional size 50 x 50mm and under shall be South African softwood in accordance with SANS Specification 653 and branded accordingly.

Joinery and Shelving: Softwood for joinery and shelving shall be South African softwood in accordance with SANS Specification 1359 and branded accordingly. All timber for joinery is to be air or kiln-dried to a moisture content of approximately 12%.

Structural Laminated Timbers: are to be of the sizes detailed, wrot on all faces and are to be manufactured by an experienced fabricator to the approval of the Employer.

Adhesives used must meet the requirements of the current BS 1204 for external use.

The surface appearance of members shall be Class C (Constructional) or Class S (Selected) as defined in SANS Specification 876 and as stated in the items.

Finger-jointed Timbers: are to be manufactured in accordance with SANS Code of Practice 096 -"The manufacture of finger-jointed structural timber".

Contractors wishing to use finger-jointed timber must supply a guarantee that the finger-jointing complies with the above Code of Practice and that the glue is suitable for the particular member.

Jointing of the Purlins, Fascias, Rails, Beams, etc. : shall, unless otherwise detailed, be as follows :-

Purlins, slating battens, etc., of cross-sectional size 50 x 76mm and under shall be jointed over the rafter. Larger sized purlins may be dealt with in the same way or by using some other suitable, recognised method. All purlins and battens shall be fixed to the supporting rafter by at least one nail skew driven from the direction of the ridge. Where the purlin or batten is fixed at more than 900mm centres, at least two nails shall be used at every fixing point.

Fascias shall be jointed over rafters.

Beams, rails, etc., shall be jointed over a support or at 1/5th span with a recognised joint using bolts, etc.

Roof and floor plates are to be halved at joints, angles and intersections and nailed together.

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Floor joists and bearers are to have splayed heading joints nailed together and staggered to occur over bearers and sleeper piers respectively.

Sawn brandering is to be butt-jointed at heading joints and angles and where wrot, is to have splayed heading joints and mitred angles over all points of support.

Hardwoods : (Red Meranti and Sapele) are to be best quality, specially selected and well seasoned, free from all sapwood to the approval of the Employer and are to be well kiln-dried. Red Meranti is to be even in Grain and colour, selected from "Standard and Better" Grade from Malaysia. Sapele to be *Entaindrophragma cylindrium* of F.A.S. Grade.

Prefabricated Timber Roof Trusses :

Design : The design of prefabricated roof trusses, bracing and secondary members forming part of the total timber roof construction shall be prepared by a professional structural engineer (Truss System Engineer) strictly in accordance with SANS Code of Practice 0163 for the Design of Timber Structures.

Wind and superimposed loadings are to comply with SANS Code of Practice 0160 and the superimposed loading, unless otherwise specified, is to be taken as that for inaccessible roofs.

Analysis : From the configuration and mechanism shown on the tender drawings the Truss System Engineer shall submit, through the Contractor, to the Employer detailed calculations and working drawings showing timber sizes, connections, truss dimensions, etc.

This submission must include details of both trusses and bracing as specified below :-

- a) **Trusses :** The analysis of the truss system is to include diagrams of the trusses with marked up members and nodes showing dimensions, positions of supports and positions and values of applied loads, which, if not specified in the tender documents, must be derived from an approved source of reference which shall be indicated in the analysis. Due account must be taken of any eccentricity particularly at supports.

The analysis must also indicate allowable stresses, internal axial forces, moments and resulting stresses, as well as timber sizes and Grades and detailed plate sizes and positions.

- b) **Bracing :** Bracing must be designed to withstand the forces specified in SANS Code of Practice 0163 clauses 6 and 7.

If the bracing system incorporates trusses, the additional forces must be shown in the analysis of the trusses.

The drawings must give all the information necessary for the construction of the bracing.

An outline of the bracing system, including temporary bracing must be shown on a working drawing giving clear details of fixings and anchorages into the supporting structure at wall plate level. Interference of bracing with truss members must be taken

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into account. Moments caused by forces applied between node points of bracing trusses and the axial forces must be given in the bracing calculations, also sizes and fixings of the bracing system.

Submissions : A copy of letter reference TR1 completed and signed by the Truss System Engineer must be submitted by the Contractor at the same time as the list of Sub-Contractors. Two sets of calculations and drawings with pertinent erection instructions for the whole roof construction as presented by the Truss System Engineer must be submitted to the Employer for consideration and permission to proceed.

This in no way absolves the Contractor of his responsibilities.

Any modifications to design or drawings are to be arranged directly between the Truss System Engineer and the Employer. It will be the Contractor's responsibility to ensure that information is presented to the Employer in good time and no claims will be entertained in respect of any delays resulting from the late approval of drawings, etc.

Any difference in cost between the roof system initially submitted by the Contractor and the finally accepted system to meet the original design requirements will be for the account of the Contractor.

The Truss System Engineer will be required to inspect the roof structure and certify on letter reference TR2 that the construction is in conformity with his design, and any costs in this respect must be included in rates for the truss system.

If, in the opinion of the Employer, further visits are necessary due to errors or omissions on the part of the Contractor or the Truss System Engineer the costs of these inspections will be for the account of the Contractor.

Fabrication and Storage : Fabrication shall not commence until written permission has been given by the Employer. The prefabricated roof trusses shall be manufactured, supplied and delivered to site by an approved manufacturer with all members accurately mitre cut, close butted and rigidly fixed together by approved galvanised metal spike connectors applied simultaneously to both sides of every joint by use of a mechanical press in accordance with SANS Code of Practice 0163.

Permissible deviations in fabrication of trusses are to be as specified in SANS Code of Practice 0155.

The following will not be permitted at joints :-

- a) knots, splits or finger joints,
- b) varying member thicknesses,
- c) plates not fully pressed into timber,
- d) gaps between members exceeding 1,5mm average over the width of the mitres members.

Stress Grade marks must be clearly visible on all members.

Relevant dimensions must be checked on site before fabrication. Trusses must be stored off the Ground and under cover both in the factory and on site.

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Erection and Bracing : Unless otherwise instructed, erection must be carried out as described in "The Erection and Bracing of Timber Roof Trusses" published by the Truss Plate Association of South Africa Limited and the National Timber Research Institute - CSIR.

Where the overall length of trusses exceeds 13 m, complete braced bays are to be assembled on level Ground and lifted into position suspended at maximum 3m intervals from a spreader bar. Alternatively, braced bays may be assembled in position on a minimum of two lines of temporary intermediate supports below node joints. Temporary supports must be removed before roof covering is placed.

The erector must be suitably qualified and must satisfy the Employer that he can meet the specification.

Where the roof incorporates a hipped end, the construction is to commence with the hip, otherwise erection is to be commenced with a fully braced bay.

Temporary bracing must be installed as erection proceeds in accordance with the accepted design.

The Contractor must notify the Employer in sufficient time in order that an inspection may be made before the roof covering is placed.

The trusses will be subject to the following tolerances :-

- a) maximum out of straight - length/400.
- b) maximum out of vertical at any point - height/200.

Rates : The Contractor is to allow in his rates for the roof trusses for the design, manufacture, supply, hoisting and fixing of the roof trusses and permanent bracing, any necessary temporary bracing, and for the costs of all inspections by the Truss System Engineer.

Rates for roof trusses are to include for the exposed rafters at eaves overhangs to be wrot all round and trimmed and splay cut as required.

Ceilings:

Insulation Material for Ceilings : shall be resin bonded glass wool or mineral wool thermal insulation blanket complying with SANS Specification 1381 of the thickness specified, delivered to the site in unopened rolls in its original factory wrappings.

Insulation, Waterproofing and Dustproofing Material for Roofs : shall be an approved aluminium foil faced both sides laminated kraft paper and synthetic reinforced material fixed in accordance with the manufacturer's instructions, lapped 150mm at all edges unless otherwise specified.

Gypsum Plasterboard : is to be in accordance with SANS Specification 266.

Gypsum coved Cornices : are to be in accordance with SANS Specification 622.

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Asbestos Cement Sheets : are to be in accordance with SANS Specification 685.

Asbestos Cement Cellulose sheets : are to be in accordance with SANS Specification 803.

Nails and Screws : Mild steel nails are to be in accordance with SANS Specification 820. Mild steel and brass screws are to be round headed, countersunk, etc., as appropriate and are to be in accordance with SANS Specification 1171. Nails and screws shall be of the size, length and type appropriate to their respective uses.

Plugs, etc. : Where items of woodwork are described as "plugged", these may be nailed to timber plugs or slips built into the structure, and where described as "plugged and screwed" these may be screwed to timber or approved patent fixing plugs.

Shot Fixing : Where items of woodwork are described as "shot fixed" these are to be fixed with an approved cartridge-assisted tool and rates are to include for all nails, spikes, blanks, washers, cartridges, etc.,

Carpentry : Timbers are to be the best of their respective kinds, free from sap, shakes, large, loose or dead knots, wany edges and other defects and thoroughly seasoned. Wrot surfaces are to be finished clean, smooth and free from tool marks.

Timbers shall be in as long lengths as possible.

Rates for sawn and wrot structural timbers are to include for notching, splay and birdsmouth cutting, housing, halving, scarfing, cutting timbers to the required lengths, spiking and clinching and for hoisting and fixing timber in position.

Ceilings : are to be of the types described, fixed to timber branderling, bearers, etc., as described and with panels set out so as to give even width panels not less than half a sheet wide at edges.

Doors:

Flush Doors : Hollow core, semi-solid and solid laminated flush doors are to be of approved manufacture complying with SANS Specification 545.

The doors are to be finished on both sides with the facing veneers specified and concealed on both stiles, unless otherwise specified, with hardwood edge strips and where doors are required to receive a transparent finish, the edge strips are to match the facing veneers.

Doors with rebated meeting stiles are to have edge strips to the meeting stiles not less than 19mm thick.

Each door or leaf of double door, described as hung to swing, is to be fitted with necessary hardwood reinforcing blocks for bottom shoe and top centre of spring hinge.

Unless otherwise specified, all flush doors are to be interior quality, but, where exterior doors are specified, the glue used must comply with Type WBP of BS 2304.

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Framed, Lugged and braced batten doors, etc. : Doors described as filled in with V-jointed boarding are to be filled in flush on one side with tongued and Grooved vertical boarding, V-jointed on one or both sides and of the thickness stated. The boarding is to be in narrow widths, closely cramped up, rebated on outer edge and housed to Grooves in stiles and rails and twice brass countersunk screwed at each intersection.

Ledges and braces and inner edges of the abutting stiles and rails are to chamfered to form a V-joint at junction with the boarding.

Joinery : All timbers shall be in as long lengths as possible. Lengths for joinery shall be single where possible and where joints are unavoidable, they shall be made as inconspicuous as possible.

Timber for Grounds, firings, blocks, plugs, etc., shall be sound and free from defects.

All joinery work is to include for work in connecting by mortice and tenon, dovetailing, housing, flush pinning, etc., as may be by required and for all screws, nails and glueing together and for sinking flush all exposed screws unless otherwise specified.

Wrot surfaces and edges are to be steel scraped and sandpapered before and if necessary, after fixing.

Edges are to be arris rounded unless specified to be angle rounded.

"Arris rounded" denotes that the sharp edges are slightly rounded off and that no mitring is required.

"Angle rounded" denotes rounded from 3mm to 10mm radius and is to include for housed and mitred joints.

Hardwood doors, frames, jamb and soffit linings, etc., are to be treated on all surfaces with one coat of approved sealer before building in, etc., and rates for these items must include for this. Batten doors with tongued and Grooved battens are to have the tongues and Grooves well sealed before assembling. The sealer used shall be compatible with the finishing coats to be applied.

Horns of door frames are to be checked and splayed back where frames are fixed projecting or flush with surface and built in.

Where doors, fanlights or sashes are described as hung to butts on steel or aluminium frames, rates are to include for supplying necessary steel, brass or stainless steel screws.

Panel work is to be secured to the Grounds, etc., with screws concealed behind the mouldings or by sinking the screws and pelleting as directed.

Joinery is be framed up, but not glued or wedged, immediately the order is given to commence work. Wherever possible, joinery shall not be placed or fabricated in position until the plaster has dried out. Reasonable tolerance shall be provided at all connections between the joinery and building carcass so that any irregularities, settlements or other movements shall be adequately compensated. All joinery shall be accurately scribed to fit the contour of any irregular surface. Should the joints of any joinery open or give, such

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defective work is to be taken down, refitted and redecorated or replaced by new joinery at the Contractor's expense.

Only brass screws may be used for hardwood joinery.

The Contractor is to allow for cross-tongueing all solid wood sections unobtainable in single widths.

No joinery is to be primed until it has been inspected and approved by the Employer.

All joinery liable to injury must be protected to the satisfaction of the Employer. Rates must include for this temporary protection.

Rates for timber frames, mullions, transoms, linings, standards, rails fascias, cornices, skirtings, beads, picture rails, etc., are to include for mitres, etc.

Rates for all items of timber are to include for fixing and planting on as may be required with necessary panel pins or nails.

PB 9.0 FLOOR COVERINGS, PLASTIC LININGS, ETC

Floor tiles and Sheeting : are to be of the composition, type, size and thickness specified with colour, pattern Graining, etc., consistent throughout, all to the approval of the Employer.

Thermoplastic floor tiles : with a bituminous or resinous binder are to comply with SANS Specification 586.

Semi-flexible vinyl asbestos floor tiles or sheeting : are to comply with SANS Specification 581.

Fully-flexible vinyl floor tiles or sheeting : are to comply with SANS Specification 786.

Where the specified sizes and/or thicknesses of floor tiles and sheeting differ from those in the SANS Specifications, such items of floor tiles and sheeting shall comply in all other respects with the relevant SANS Specifications.

Skirting, Stair nosings, Edging Strips, etc.: are to be of the types and sizes specified and are to be of approved manufacture.

Carpet Tiles and Sheeting : are to be of the types specified and of approved colours and patterns all to the approval of the Employer.

Laying : All floor coverings, wall linings, etc., are to be laid by workmen experienced in laying the particular type of floor covering, wall lining, etc., in strict accordance with the instructions issued by the manufacturer of the materials being used and to the approval of the Employer.

All adhesives used must be the correct adhesives as supplied or recommended by the manufacturer of the material being used.

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The floor coverings, wall linings, etc., are, except where otherwise specified, to be laid on cement screeds or plaster backings. All cement screeds and plaster or other backings have been measured elsewhere.

Tiles are to be laid with close butt joints and to approved patterns with no cut tiles less than half a tile wide and tiles are to be fully bonded to the backing surfaces.

Sheeting is to be cut to fit the areas accurately and neatly and is to be so disposed as to have a minimum number of seams set out to the approval of the Employer and all seams are to be perfectly tight and practically invisible. No piecing of short ends will be allowed. The sheeting is to be fully bonded to the backing surfaces and is to be rolled as necessary to remove all air bubbles and to ensure complete adhesion.

Welded sheet flooring or wall linings are to have the seams welded together by approved process to form a seamless floor or lining.

Patterned sheet flooring or wall linings are to be matched at joints.

Vinyl skirtings, stair nosings, edging strips, etc., are to be fully bonded to the backing surfaces.

Wood block and wood mosaic flooring is to be laid in accordance with SANS Code of Practice 043.

Cleaning, etc.: All floor coverings are to be cleaned down to the approval of the Employer. Cleaning of thermoplastic, vinyl and similar floor coverings shall, unless otherwise stated, be done with an approved waterbound floor stripper in order to achieve a standard of cleanliness acceptable to the Administration. Any foreign matter such as paint, stain, tar, etc. which may not respond satisfactorily to the cleaning process shall be removed by means of a scraper, steel wool, etc.

Metallised Floor Dressing : where specified, vinyl sheet flooring and floor tiles shall be cleaned down with an approved water-based floor stripper, and finished with two coats of an approved sealer and two coats of an approved metallised floor dressing applied in accordance with the manufacturer's instructions.

Rates : for all floor covering are to include for laying as described, for cleaning down backing surfaces before laying and for all square and raking cutting and waste and fitting, fair cutting at edges where no skirtings occur, protecting from injury, and for cleaning down, etc., as described, at completion.

Rates for all wall linings are to include for laying as described, cleaning down backing surfaces before laying, sizing backing surfaces if necessary to ensure proper adhesion, all square and raking cutting and waste and fitting, fair cutting at exposed edges, bending at angles and for all narrow widths and protecting from injury and cleaning down, etc., as described, at completion. Wall linings in widths not exceeding 300mm to returns, reveals and the like have not been measured separately, but have been included in the area of the general items of wall linings and rates must include for this.

Rates for skirtings, stair nosings, edging strips, etc., are to include for fixing as described, cutting to lengths, fitting at intersections, mitres, ends, etc. and for cleaning down at completion.

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PB 10.0 IRONMONGERY

Ironmongery is to be to the approval of the Employer and rates are to include for fixing with screws of corresponding metal and finish and for oiling and easing as required at completion.

Where catalogue references are given, the articles are to be of the brand specified or other approved.

No two-lever mortice locks are to be used.

Mortice locks, cylinder locks, cupboard locks, etc., are specified to be "en-suite" in the specified number of "suites". The "suites" are to be controlled by differing sub-master keys with a Grand master key controlling all "suites", and no sub-master key is to pass any lock of another "suite".

All locks are to be fitted with two keys and the locks are to be stamped with consecutive numbers and the keys to each are to be stamped to correspond with the lock.

Items of ironmongery specified as chromium plated or satin chrome finish are, unless otherwise specified, to be chromium plated or satin chrome finish on solid brass.

Items of ironmongery specified as aluminium are to be natural anodised.

Where items of ironmongery are specified as fixed to pressed steel door frames, the Contractor is to ensure that the suppliers of the steel frames prepare the frames for all keeps and to all morticing and drilling required and receive all information necessary regarding ironmongery. Preparation of steel door frames for ironmongery has been measured elsewhere.

Where items of ironmongery are described as "plugged and screwed" these are to be screwed to patent fixing plugs of approved manufacture, and this shall include for plugging and screwing to brickwork or concrete.

Key tags are to be 40mm diameter x 3mm thick plaster of approved colour, engraved on face with the required number of letters and numerals finished in an approved colour, and the tag is to be holed for and fitted with a steel split ring and fixed to key.

PB 11.0 STRUCTURAL STEELWORK

The fabrication, assembly and erection of structural steelwork is to be executed in accordance with SANS Specification 1200H - Structural Steelwork.

PB 12.0 METAL WORK

Proprietary Materials : Where proprietary materials are specified, the materials used are to be of the type specified or other approved by the Employer.

Rates : for all metalwork, unless otherwise stated, are to include for cutting to lengths, shaping, turning, threading, forging, fitting, assembling, riveting, welding, welded running

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joints, filing smooth, also for all screws and holes and hoisting and fixing in position. All screwed work is to have full threads.

Welding and Brazing : Where items are described as welded or brazed, rates must include for neatly welded or brazing by experienced workmen using a recognised process and for cleaning and filing or Grinding off smooth, all to approval. All welding is to be continuous unless otherwise described.

Screw Fixings : Where items are described as tap screwed, Grub screwed, set screwed, etc, rates must include for the necessary screws, for drilling all components and for tapping the components where necessary to receive such screws.

Pipe Members : All galvanised mild steel pipe members are to be "medium" pipes complying with BS 1387. Diameters of pipes, unless otherwise stated, are normal internal diameters.

Priming of Steelwork : All items of fabricated mild steel except where described to be galvanised, are to be cleaned in accordance with SANS Code of Practice 064 to remove all scale, rust, Grease, oil, etc, endeavouring to bring the surface to a bright metallic conditions, and painted, unless otherwise specified, with one coat of red oxide zinc chromate primer in accordance with SANS Specification 909 prior to despatch from the works.

Galvanising of Steelwork : All steel surfaces described to be galvanised are to be thoroughly sand, Grit or steel shot blasted to white metal in accordance with SANS Code of Practice 064 and fluxed ready for galvanising and the completed unit is to be hot dip galvanised after fabrication in accordance with SANS Specification 763 for general applications on the relative thicknesses of metal.

The zinc coating shall be continuous and of even thickness over all surfaces entirely free of bare spots, dull, rough patches, blisters and other imperfections and shall show no signs of peeling. Where site welding has to be done, the welds are to be properly cleaned down and cold galvanised to the approval of the Employer.

If requested by the Employer, the manufacturer shall carry out tests to prove that the requisite mass/thickness of zinc coating is applied and that it is of uniform thickness. The tests shall be made by attaching a test piece of mild steel, approximately 250 x 25 x 6 mm, by means of wire, to an article being galvanised and subjecting the test piece to the same cleaning, fluxing and galvanising treatment as the article being galvanised, and at completion, the test piece tested by a method approved by the South African Bureau of Standards, the cost of which will be borne by the Contractor.

Burglar Bars :- are to be standard type burglar bars formed of 20 x 5 mm mild steel bars riveted at intersections and riveted at ends to the window frames. The burglar bars to the small-pane type windows are to line through with the glazing bars, and windows of the horizontal-pane type or of the no-glazing bar type are to be fitted with burglar bars which are divided as for the small-pane type window.

Burglar-Resisting Safes :- must comply in all respects with SANS Specification 751. The safes shall be "Office Safe, Category 1" as laid down in SANS Specification 751. Each safe is to be provided internally with one shelf and two lockable drawers.

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Where the mass of each safe is 680 kg or less, provision must be made for securing it rigidly to prevent unauthorised removal, the means of securing shall be at least equal in effectiveness to that which would be provided by four 12 mm bolts. Locks shall be lever locks with a minimum of six levers. Each safe is to be provided with two keys to each lock and the keys for any safe must be forwarded by the supplier under registered cover direct to the Employer, and the supplier must clearly indicate the institution in which the safe (or safes) is being installed.

PB 13.0 PLASTERING

Materials

Stone Chippings :- are to be approved clean stone chippings of the sizes stated complying with SANS Specification 1083.

River Sand :- for floor finishes and screeds is to be clean, sharp, coarse sand free from all impurities, washed if so directed and complying with SANS Specification 1090.

Plaster Sand :- is to be clean, sharp, free from all impurities, washed if so directed and is to comply with SANS Specification 1090.

Cement :- unless otherwise specified is to be Portland cement of normal setting quality, is to comply with SANS Specification 471, and must be used fresh. Cement containing more than 15% blast furnace slag will not be permitted to be used.

Lime :- is to comply with SANS Specification 523.

Water :- is to be clean, fresh and free from injurious amounts of acids, alkalis and other organic substances.

Measurement of Constituent Parts of Floor Finishes, Toppings, Screeds and Plaster Finishes :- cements, sand and stone chippings are to be measured exactly by means of gauge boxes or purpose made wheelbarrows. Part fillings or heaping of normal wheelbarrows will not be permitted.

Water is to be accurately measured for each batch, to approval.

Waterproofing compounds, where specified, are to be added to the mixture in the proportions recommended by and in strict accordance with the manufacturer's instructions.

Preparation of Surfaces :- prior to the application of floor finishes, toppings, screeds, plaster finishes, etc, the surfaces of the new or existing concrete, brickwork, etc, are to be thoroughly cleaned, chipped, hacked, sloshed, etc, as necessary to ensure a satisfactory bond. The Contractor will be held entirely responsible for the proper and adequate preparation of the surfaces and any work which results in failure in this regard must be made good at the Contractor's expense to the satisfaction of the Employer.

Floor Screeds, etc :- cement screeds are to consist of one part cement and three parts sand, unless otherwise described, and are to be steel trowelled, unless otherwise stated,

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to true smooth and even surfaces, free from tool marks to the satisfaction of the Employer to receive the finishes stated in the items.

Granolithic Finish to Concrete Floors, etc :- float up to within 6mm of finished surface with layers of concrete approximately 10mm thick, composed of one part cement, two and a half parts concrete sand and three and a half parts granite or other approved hard stone chippings. Form finished surface with one part cement and one part fine Granite chippings for other approved hard stone Graded up to particles which will pass a 6 mm mesh brought to a smooth surface with a steel trowel. The floating and finishing coats are to be performed in one operation.

The Granolithic work is to be carried out by experienced workmen and is to be laid in panels V-jointed and not exceeding 6 m² in area or as shown on drawings or described in the Bills of Quantities.

Thin strips of wood or other suitable materials are to be laid between panels to break contact.

Where Granolithic is described to be tinted, the requisite quantity of oxide of iron or other colouring materials is to be mixed with the finishing thickness.

Where Granolithic is described to be Green tinted, the requisite quantity of Green magnesite and cement black is to be mixed with the finishing thickness.

All Granolithic floors, etc, are to be covered up and protected from injury and discoloration during the progress of the work.

Rates for Granolithic work are to include for cleaning down and for a coat of approved was polish or stoep reviver well rubbed in at completion.

Plaster :

General :- except where otherwise described, all external plaster is to be finished with a wood float and internal plaster is to be finished with a steel trowel, unless otherwise described, all to true and even surfaces, free from tool marks and other defects to the satisfaction of the Employer.

No distinction has been made for brick or concrete surfaces.

Cement Plaster :- External cement plaster to walls is to consist of one part cement and four parts sand. External cement plaster to ceilings is to consist of one part cement and three parts sand. Internal cement plaster to walls is to consist of one part cement and five parts sand. Internal cement plaster to ceilings is to consist of one part cement and three parts sand. One coat cement plaster to walls shall not be less than 13 mm or more than 16 mm in thickness, and one coat cement plaster to ceilings shall not be less than 10 mm or more than 13 mm in thickness, unless otherwise described.

Where plaster is described as undercoated, the same type of approved sand and the same brand of cement is to be used throughout to maintain a uniform colour and texture.

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Barium Plaster :- Barium plaster shall consist of two coats plaster, the first coat 13 mm thick consisting of one part cement and five parts sand, and the second coat 6 mm thick consisting of one part cement and five parts Barium Sulphate.

All surfaces are to be plastered in one operation from ceiling to floor and corner to corner; breaks are to be made only in corners or at junctions of walls and ceilings.

Curing, Protection, etc :- all floor finishes, pavings, plaster finishes and screeds are to be properly cured to approval and all cracks, blisters and other defects which may occur are to be made good and the whole left in a satisfactory condition at completion.

The finished surfaces are to be properly protected from damage and cleaned down at completion.

Rates :- rates for floor finishes and screeds are to include for preparation of new or existing surfaces, dressing to falls where required, V-joints where specified, curing, protecting from damage and cleaning down at completion.

Rates for skirtings, risers, etc, are to include for internal angles at junction with floor, treads, etc, to be square or coved to not more than 50 mm girth and in addition are to include for mitres, stops, etc, except where given separately in terms of the Standard System of Measuring Builders' Work.

Rates for plaster finishes are to include for preparation of new or existing surfaces, curing, protecting from damage and cleaning down at completion.

Rates for plastering are to include for internal angles to be square or coved to not exceeding 50 mm girth.

Rates for rounded angles, fair edges and arisses and the like are to include for mitres, stops, etc, except where given separately in terms of the Standard System of Measuring Builders' Work.

Rates for moulding, projecting bands, coves, weatherings and the like are to include for dubbing out.

Rates are to include for cutting back against frames and for V-joints cut where concrete abuts brickwork.

Rates generally are to include for all sundry making good and working around pipes, balusters, etc.

Generally

Narrow Widths :- Items described as "Extra over for narrow widths" include for all reveals, edges, soffits, treads, risers, etc, not exceeding 500 mm wide, narrow widths not exceeding 500 mm wide in general surfaces caused by openings or projections, all of which have been included in the areas of horizontal or vertical surfaces. No distinction has been made for finishes of differing thickness.

PB 14.0 TILING

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Materials

River Sand :- is to be clean, sharp, coarse sand, free from all impurities, washed if so directed and complying with SANS Specification 1090.

Plaster Sand :- for wall backings is to be clean, sharp, free from impurities, washed if so directed and complying with SANS Specification 1090.

Cement :- unless otherwise specified, is to be Portland cement of normal setting quality complying with SANS Specification 471 and must be used fresh. Cement containing more than 15% blast furnace slag will not be permitted to be used.

Water :- is to be clean, fresh and free from injurious amounts of acids, alkalis and other organic substances.

Measurement of Constituent Parts of Backings, etc :- cement and sand are to be measured exactly by means of gauge boxes or purpose made wheelbarrows. Part filling or heaping of normal wheelbarrows will not be permitted.

Water is to be accurately measured for each batch to approval.

Waterproofing compounds, where specified, are to be added to the mixture in the quantities recommended by and in strict accordance with the manufacturer's instructions.

Preparation of Surfaces :- prior to the application of the backing for tiles, the surfaces of the new or existing concrete, brickwork, etc, are to be thoroughly cleaned, chipped, hacked, sloshed, etc, as necessary to ensure a satisfactory bond. The Contractor will be held entirely responsible for the proper and adequate preparation of the surfaces and any work which results in failure in this regard must be made good at the Contractor's expense to the satisfaction of the Employer.

Glazed Ceramic Wall Tiles and Fittings :- shall comply with SANS Specification 22 of selected Grade, free from defects and blemishes and of uniform colour.

Rates are to include for either bedding tiles on and including a solid cement mortar backing consisting of one part cement to three parts sand on brickwork or concrete, or fixed with an approved tile adhesive on and including a coat of cement plaster consisting of one part cement to five parts sand and finished to a surface to receive tiles.

Tiles are to have vertical and horizontal joints continuous with all joints solidly flushed up in neat white cement.

Mosaics :- glass or ceramic are to be of approved South African manufacture of the sizes and colours specified, fixed to paper panels for ease of handling.

Mosaics are to be bedded to a true even surface on and including a solid cement mortar backing consisting of one part cement and three parts sand on brickwork or concrete, or fixed with an approved mosaic adhesive on and including a coat of cement plaster consisting of one part cement to three parts sand finished to a surface to receive mosaics.

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After setting, the paper panels are to be removed and all joints are to be solidly flushed up in neat white cement.

Samples of mosaics are to be submitted to the Employer for approval before any work is put in hand.

Unglazed Ceramic Floor Tiles and Fittings :- are to be unglazed acid and alkali resistant tiles and fittings of the types specified in the items, and of approved manufacture, uniform in size, shape and colour, free from cracks, twists and other defects and equal to samples to be deposited with and approved by the Employer.

Floor tiles are to be laid with maximum 10 mm wide joints continuous in both directions on and including a 15 mm thick cement mortar bed consisting of one part cement to three parts sand, unless otherwise specified, to true levels and Grades with the joints raked out and Grouted up solid and flush pointed with an approved epoxy jointing compound.

Floor tiles are to be set out so as to have no long edges of tiles cut to suit room size.

PB 15.0 DRAINAGE AND PLUMBING

Generally : The Standard Preambles for other trades, with reference to Excavations, Concrete, Brickwork and Plastering, and, in particular for the full description, intent and meaning of the classification for excavation, are to apply equally to this trade.

Licensed Drainlayers and Plumbers : Only licensed drainlayers shall be employed on any drainage work and licensed plumbers on plumbing work.

Gulley Traps : Gulley trap assemblies must be of the material specified with "P" or "S" trap, jointed to drain and with hopper head with vertical and side inlets, the head fitted with 190 mm diameter cast iron gulley Grating complying with SANS Specification 1115 laid loose in socket. The trap, hopper head and vertical pipe shall be set on and encased in concrete Class B having a minimum thickness of 150 mm at any one part, carried up 75 mm above Ground level as kerb, dished down to Grating and finished on all exposed surfaces in 1:3 cement plaster with angles rounded, including necessary excavation and formwork.

Grease Traps : Grease trap assemblies of verified clay must consist of outlet junction jointed to trap with side inlet. Access openings of trap and junction shall be fitted with vitrified clay stoppers laid loose in socket of trap and set in bitumen in socket of junction. The trap and junction and vertical pipe shall be set on and encased in concrete Class B having a minimum thickness of 150 mm at any one part, carried up 75 mm above Ground level as kerb, dished down to Grating and finished on all exposed surfaces in 1:3 cement plaster with angles rounded, including necessary excavation and formwork.

Rodding Eyes : Where pipes are carried up in ramps for rodding eyes, the head of the pipe at Ground level must be fitted with an "A.B.C." cast iron cover and frame, complying with SANS Specification 746, jointed to pipe, the frame rebated for and including cover with raised letters "CE" cast on same, secured to frame with gun-metal screws and with the whole encased in concrete Class B having a minimum thickness of 150 mm at any one part, carried up 75 mm above Ground level and finished on all exposed surfaces in 1:3 cement plaster with angles rounded, including necessary excavation and formwork.

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Inspection Eye Blocks : Where inspection eye fittings are provided in pipelines, the position of these inspection eyes must be registered and demarcated with concrete Class C block size 300 x 300 x 50 mm thick finished on all exposed surfaces with 1:3 cement plaster with angles rounded and with sunk letters "I.E." formed in top and set in Ground, including necessary excavation and formwork.

Soak Pits : shall be of the lengths and widths specified and shall be a minimum of 900 mm deep below the invert of the inlet pipe. A perforated pitch-fibre drain pipe jointed to the inlet pipe and with other end capped is to be laid level in a 19 mm stone packing of a minimum thickness of 150 mm below and at sides of pipe and a minimum thickness of 50 mm above the top of the pipe. The remainder of the soak pit is to be filled with stone Graded from 50 mm to 75 mm to a level of 50 mm above the top of the pipe. The stone is to be covered with corrugated asbestos cement sheets extending 150 mm beyond the walls of the soak pit all round. The trench shall be backfilled above the sheeting to a minimum depth of 300 mm lightly rammed with the final 100 mm of backfilling being approved top soil from the excavations.

Sheet Metalwork : generally is to be lapped 75 mm at ends and 150 mm at angles, unless otherwise specified. Rates for sheet metalwork shall include for all labour, cutting and waste, laps, seams, welts, angles, clips, tacks, soldered dots, riveting, soldering, brazing, burning, nailing, dressing and wedging as required. All measurements are net with no allowance being made for laps, seams, welts, angles, clips and tacks or waste in cutting. Where stepped flashings are described as to flat slope, the pitch of the roof to which they apply does not exceed 40°.

- a. **Galvanised sheet iron** shall be of an approved brand of the thickness specified after galvanising and having a galvanised coating of "Isacor Coating Designation Z450". Corroded or otherwise defective sheets shall not be used. All nailing or screwing shall be done with galvanised nails or screws.
- b. **Sheet lead** shall be best milled sheet lead of the full mass specified and of equal thickness throughout and must comply with BS Specification 1178.

Linings to Valleys : shall be of the material specified, lapped 200 mm at ends and dressed up on to purlins or battens at sides of valleys with edges bent back to form open beads.

Linings to Secret Gutters : at back of chimney stacks and wall abutments and at raking intersections of walls and roofs shall be of the material specified, turned 100 mm up vertical surfaces and dressed 150 mm up roof slope and on to purlin or batten at edge.

Cover Flashings : shall be either galvanised sheet iron, copper or aluminium, as specified, of 0,6 mm thickness fitted over under-flashing, stepped where required on rake and with top edge bent and wedged 25 mm deep into joint of brickwork or Groove formed in concrete face and flush pointed in 1:3 cement mortar.

Flashings Around Pipes Through Roof Coverings

- (a) Pipes through preformed sheet steel roofing shall be flashed around with 0,6 mm galvanised sheet iron apron pop-riveted to top of roofing with edges cut and dressed

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to profile roofing, soldered all round and with conical sheet iron upstand, riveted and soldered at joint and at base to apron. The top of the conical upstand is to be fixed with a galvanised steel gutter bolt.

- (b) Pipes through asbestos cement roofing shall be flashed around with 24 kg/m² lead apron dressed into corrugations, bedded in mastic and bolted to roof sheeting with galvanised steel gutter bolts and with conical lead upstand, wiped on at joint with apron, and secured around pipe with copper wire.
- (c) Pipes through slate or tile roofing shall be flashed around with 24 kg/m² lead apron dressed to profile of slates or tiles with top edge of lead apron dressed over back edge of slate or tile under overlap of slates or tiles. A conical lead upstand, wiped on at joint with apron, is to be secured around the pipe with copper wire.
- (d) Pipes through prepainted or embossed sheet steel or aluminium roofing shall be flashed around with flexible glass-fibre reinforced waterproofing dressed to profile of roofing, pop-riveted around edges to roofing and dressed up and around pipe. The waterproofing is to be finished in a colour to match that of the roofing material.

Rainwater Pipes

- (a) **Galvanised sheet iron rainwater pipes**, offsets and shoes shall be formed from 0,6 mm thickness sheet, seamed at back and jointed with soldered slip joints. Pipes must be fixed 25 mm clear of finished wall face on brackets at not exceeding 2 m centres formed of 1,6 mm x 25 mm galvanised mild steel wrapped around pipe and bolted to 3 mm x 25 mm galvanised mild steel U-shaped brackets holed for and screwed to plugs in wall. Rainwater pipes fixed in recesses must have galvanised sheet iron ears soldered on across the pipe and screwed to plugs in wall.
- (b) **Asbestos cement rainwater pipes**, offsets and shoes shall be of approved manufacture with spigot and socketed ends, jointed with tarred hemp rope gasket caulked into each joint and the joint filled with approved bitumen compound and finished off with a neat trowelled fillet of 1:3 cement mortar. The pipes must be fixed clear of the finished wall face on approved aluminium alloy brackets with tails driven in or cut and pinned in 1:3 cement mortar.
- (c) **Unplasticised polyvinyl chloride (UPVC) rainwater pipes and accessories**, shall comply with SANS Specification 967 and must be fixed clear of the finished wall face on stock pattern brackets in accordance with the manufacturer's instructions.

Eaves Gutters

- (a) **Galvanised sheet iron gutters, rainwater heads, etc.**, shall be formed from 0,6 mm sheet and must have beaded edges with all laps riveted and soldered. Corners must be reinforced with 0,6 mm x 50 mm wide galvanised sheet iron strips and must be soldered across the inside of the angles.

Gutters must be laid to even falls on approved galvanised mild steel gutter brackets screwed to roof timbers at approximately 1 m centres. Half round pattern gutters shall be bolted to each bracket with 6 mm galvanised gutter bolt fitted close to the

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beaded edge. Rectangular pattern gutters shall be fixed at each bracket with galvanised mild steel long-screw with 1 mm thick galvanised sheet iron spacer tube.

- (b) **Asbestos cement gutters and accessories** shall be of approved manufacture, not less than 6 mm thick, with spigot and socketed joints made in an approved mastic compound in accordance with the manufacturer's instructions. Gutters must be laid to even falls on approved aluminium alloy or stock asbestos cement brackets screwed to roof timbers at the manufacturer's recommended spacings.
- (c) **Unplasticised polyvinyl chloride (uPVC) gutters and accessories** shall comply with SANS Specification 11 and must be laid to falls and fixed on brackets in accordance with the manufacturer's instructions.

PB 16.0 GLAZING

Materials : Glass shall conform to the requirements of the relevant current British Standards Specification for the respective materials.

Clear glass shall be float quality glass.

Toughened safety glass is to be "Armourplate" float quality safety glass of the thickness specified and as manufactured by Armourplate Safety Glass (Pty) Ltd, or other approved, and glazed to sashes, etc, in strict accordance with the manufacturer's instructions.

All toughened safety glass is to have the manufacturer's name or motif sand-blasted in one corner of each pane.

Laminated safety glass is to be float quality normal strength glass, unless otherwise stated, and of the type specified and as manufactured by Shatterprufe Safety Glass Co. (Pty) Ltd, or other approved and glazed to sashes, etc, in strict accordance with the manufacturer's instructions.

All laminated safety glass is to have the manufacturer's name or motif sand-blasted in one corner of each pane.

All glass is to be free from imperfections and is to be left in a thoroughly clean condition on completion.

Glazing : The glazing and fixing of glass in buildings shall be in accordance with SANS Code of Practice 0137.

Glass panes shall have adequate glazing clearance between edges of glass and the rebates.

Putty for glazing shall comply with SANS Specification 680 Type I for glazing in wood and Type II for glazing in steel. Putty for glazing in natural finished wood shall be tinted to match the colour of the wood. Putty for glazing in aluminium windows shall be tinted to match the aluminium or anodised aluminium.

All rebates, other than in natural finished hardwoods, are to be primed before glazing.

Glass fixed with glazing beads shall be well bedded in back putty in the rebates.

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Putty shall be carefully trimmed and cleaned off with front putty worked in within 3 mm of the sight lines.

Rates : Rates for glass generally shall include for preparing the rebates, etc, all putty, sprigs, clips, etc, as required and all cutting.

Rates for toughened and laminated glass shall include in addition for all necessary spacing and setting blocks in accordance with the manufacturer's requirements.

PB 17.0 PAINTING

Materials : Proprietary materials where specified are to be of the brand specified or other approved by the Employer.

All primers, emulsion paints, enamels, stains, varnishes, etc, are to comply with the relevant SANS Specification.

Paints, etc, shall be suitable for application on the surfaces to which they are being applied and those used externally shall be of exterior quality or suitable for exterior use.

For any particular work the priming coat and subsequent coats of paint are to be executed with paints from the same manufacturer and in accordance with that manufacturer's instructions.

The materials are to be brought to the site in unopened containers and no adulteration will be permitted, except thinners of a quantity and quality directed by the manufacturer.

The Employer shall at all times be permitted to take samples for testing purposes for open containers of any brand of paint being used on the work.

All materials, if and when required by the Employer, will be subject to tests by South African Bureau of Standards, and the cost of such tests, should the material under test not meet the requirements of this specification, shall be borne by the Contractor.

Fillers and stoppings are to be suitable for use with the material being filled or stopped and to the approval of the Employer.

Preparatory Work : All new and existing surfaces are to be thoroughly dry and are to be cleaned of all dust, dirt, Grease, oil, rust, scale, efflorescence, fungus, loose or flaking material, etc, rubbed down, stopped, filled, knotted and sanded smooth as required in accordance with the paint manufacturer's recommendations and to the approval of the Employer prior to the application of paint, etc.

Ceilings are to have nail heads, including those to cornices and cover strips, primed and stopped up as necessary and rubbed down smooth.

Asbestos cement shall be primed with an approved alkali resistant primer before the application of subsequent coats which are not, in themselves, alkali resistant.

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Iron, steel and other ferrous metals shall be cleaned in accordance with SANS Code of Practice 064 to remove rust, scale, Grease, oil, etc, and the surface brought to a bright metallic condition.

Galvanised iron and zinc shall be cleaned in accordance with SANS Code of Practice 062 to remove the manufacturer's temporary protective coating, white rust, etc.

Other non-ferrous metals shall be thoroughly cleaned to remove all milling oils, temporary protective coating, etc, and the surface abraded with fine waterpaper and white spirit.

Woodwork to be painted shall have all knots and resinous areas treated with an approved knotting, the surface shall then be primed and all holes, etc, stopped and rubbed down smooth.

Woodwork to be oiled, stained, varnished, etc, shall be free of all stains, pencil marks and other surface discoloration and all hole, etc, stopped with tinted stopping and rubbed down smooth.

In preparing existing glazed sashes and sash doors, all loose putty is to be removed, the rebates primed and glass re-sprigged and re-puttied as necessary before the repainting is commenced.

Previously distempered or lime washed surfaces to receive any other type of paint, are to have the existing distemper or lime wash completely removed by scraping or wire brushing and the surfaces treated with an approved bonding liquid.

Where existing paint films are in good condition any flaking or bared patches are to be properly feathered into the surrounding paint and spot primed as necessary.

Where existing paint films are in poor condition and require to be removed completely, they are to be removed by means of wire brushing, paint remover, burning off, or other approved method.

Paint removers shall be free of wax and caustic substances and shall preferably be of water rinsable type. When burning off paint from wood, care must be taken to avoid charring the wood.

The final state of preparatory work to existing decorated surfaces shall in all cases produce in the finished decorated surfaces a condition similar to new work.

The Contractor will be held responsible for the proper and adequate preparation of the surfaces and any work which fails to meet the manufacturer's recommendations must be made good at the Contractor's expense to the satisfaction of the Employer.

Applications of Paints, etc : Painting may be carried out by brush, roller or spray as recommended by the manufacturer and to the approval of the Employer.

All paints, etc, are to be applied in strict accordance with the manufacturer's instructions.

Each coat of paint is to be adequately and permanently keyed onto the previous coat or surface and shall be evenly distributed and continuous and shall dry to a smooth film, free from sags, runs or other imperfections.

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Each coat of paint is to be of a colour distinctive from previous or succeeding coats.

All painting must be done in accordance with a colour scheme, which will be provided by the Employer, and rates for painting, etc, are to include for all cutting in of contrasting colours and masking as required. No distinction has been made where more than one colour of the same material is required on the walls or ceilings of the same room.

Samples of colours for the final coats are to be prepared in all cases to the approval of the Employer and all work must be finished to the approved colours.

Backs of wood door and similar frames and the surfaces of other new or refixed joinery in contract with brickwork, etc, and built in as the work proceeds, shall be primed or sealed before building in to prevent moisture seeping into the wood from the mortar bedding.

Tongued and Grooved and rebated edges of boards in batten doors and other such like inaccessible parts of new joinery shall, before assembly, be primed, or where the joinery is to receive a finish other than paint, be given one coat of such other finishing material.

All new external structural timbers shall be primed before the timbers are fixed in position and shall include all surfaces such as backs of fascias and bargeboards.

Rates : Rates for painting, etc, are to include for all preparatory work, and where spraying is employed, are to include for adequately masking all surrounding areas.

Where diameters of pipes are stated these are the nominal internal diameters, and rates for painting pipes are to include for painting the holderbats, hangers, clips, etc, supporting the pipes.

Rates are to include for providing all necessary dust sheets, covers, etc, taking all necessary precautions to prevent marking the surfaces of joinery calls, floors, glass, electrical fittings, etc. All surfaces disfigured or otherwise damaged shall be completed renovated or replaced as necessary to the approval of the Employer at the Contractor's own expense.

PB 18.0 ELECTRICAL WORK

The electrical wiring of buildings must be carried out by registered and licensed electricians in accordance with:

The requirements of SANS 0142

The Particular Specification – PC - Standard Electrical Specification for Building Works

The Occupational Health and Safety Act 85/1993

Regional By-Laws and Special Requirements of the supply Authority

Local Fire Regulations

The electrician must work in collaboration with the contractor to ensure that all ducts, panelboards, plug boxes, and switch boxes are installed in the correct position.

The work must form an extension to the existing wiring in the existing building. Light fitting are to match existing in make, size and number and existing switches may be used but

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this is not essential. No plug points will be required. All work is to be carried out to the satisfaction of the Engineer.

PB 19.0 MEASUREMENTS AND PAYMENT

The price tendered and paid for each individual item shall include full compensation for the supply of all labour, equipment and materials for supervision, plant, tools and any other operation or item necessary for the completion of the work as specified.

C3.5: MANAGEMENT

C3.5.1 MANAGEMENT OF THE WORKS

C3.5.1.1 Applicable SANS and SANS standards

The Contractor is referred to SANS 1921: 2004 parts 1, 2 and 3: Construction and Management Requirements for Works Contracts. These specifications shall be applicable to the contract under consideration and the Contractor shall comply with all requirements relevant to the project.

- a) The following SANS 1921 Construction Works standards and associated specification data are applicable:
- i) SANS 1921-1 : General
 - ii) SANS 1921-2 : Accommodation of traffic on public roads occupied by the contractor

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- iii) SANS 1921-3 : Structural steelwork
- iv) SANS 1921-4 : Third party management support
- v) SANS 1921-5 : Earthworks activities which are to be performed by hand
- vi) SANS 1921-6 : HIV/AIDS Awareness

- b) The specification data applicable to the SANS 1921 standards referred to in a) are as follows:

Standard	Clause	Specification Data
SANS 1921-1	Essential Data:	
	4.1.7	<p>The reduced drawings which form part of the tender documents shall be used for tendering purposes only.</p> <p>The contractor shall be supplied with three complete paper copies of the construction drawings free of charge. The Contractor shall at his own expense produce there from all further paper prints required for the construction of the work.</p> <p>At the completion of the Contract, the Contractor shall return to the Engineer all drawings, provided or made, during the contract period.</p> <p>Any information which the Contractor has control over and which is required by the Resident Engineer to complete the as-built drawings shall be made available to the Resident Engineer before the completion certificate is issued.</p> <p>Only written dimensions may be used. Dimensions are not to be scaled from drawings unless ordered by the Engineer. The Engineer will supply all figures / dimensions which are not shown on the drawings. The levels or dimensions given on the drawings are subject to confirmation on site. The Contractor shall submit all levels and dimensions to the Engineer for confirmation before he commences with any structural construction work. The Contractor shall also check all clearances which are given on the drawings and inform the Engineer of any conflicting dimensions.</p>
	4.14	<p>The Contractor is responsible to provide a suitable site for his camp and to provide accommodation for his personnel and labourers. If the Employer can make any specific site available to the Contractor, such site will be pointed out to the Contractor.</p> <p>The chosen site shall be subject to the approval of the Engineer, the local municipality and the client. Possible locations for a campsite shall be pointed out at the Site inspection. The Contractor shall conform to all local authority, environmental and industrial regulations.</p> <p>The Contractor shall make his own arrangements concerning the supply of electrical power and all other services. No direct payment shall be made for the provision of electrical and other services. The cost thereof shall be deemed to be included in the rates and amounts tendered for the various</p>

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		<p>items of work for which these services are required.</p> <p>The Contractor shall provide security watchmen for the contract as he deems fit at no extra cost for the Employer. The Contractor must ensure that all his employees as well as the employees of his subcontractors are able to identify themselves as members of the construction team.</p> <p>Accommodation of Employees</p> <p>No employees except for security guards will be allowed to sleep or be accommodated on the site in urban areas.</p> <p>No housing is available for the Contractor's employees and the Contractor shall make his own arrangements to house his employees and to transport them to site.</p> <p>No informal housing or squatting will be allowed.</p> <p>The Contractor shall provide the necessary ablution facilities at his camp site and the site of the works for the use of his employees. Chemical toilets only will be allowed where temporary facilities have to be provided.</p>
	Variations:	

Standard	Clause	Specification Data
SANS 1921-2	Essential Data:	
	4.6.1	<p>The travelling public shall have the right of way on public roads, and the Contractor shall make use of approved methods to control the movement of his equipment and vehicles so as not to constitute a hazard on the road.</p> <p>The Contractor shall ensure that all road signs, barricades, delineators, flagmen and speed controls are effective and that courtesy is extended to the public at all times.</p> <p>Failure to maintain road signs, warning signs or flicker lights, etc, in a good condition shall constitute ample reason for the Engineer to suspend the work until the road signs, etc, have been repaired to his satisfaction.</p> <p>The Contractor may not commence constructional activities affecting existing roads before adequate provision has been made to accommodate traffic in accordance with the requirements of this document and the South African Road Traffic Signs Manual.</p> <p>The Contractor shall construct and maintain all temporary drainage works necessary for temporary deviations.</p> <p>The Contractor shall provide and grant access to persons whose properties fall within or adjoin the area in which he is working</p>

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	Variations:	

C3.5.1.2 Planning and programming

The programme to be submitted by the Contractor in terms of the General Conditions of Contract shall be in the form of a bar chart with a horizontal time scale and shall clearly show all significant activities, the duration of all activities, the interdependencies (if any) of activities and the critical path of the overall programme, clearly related to the items or groups of items in the Schedule of Quantities and indicating the quantity of work that will be completed each month and shall ideally be drawn up using a commercially available computer programme. The programme shall take account of and include:

- All special non-working days
- Allowance for inclement weather
- Known physical conditions or artificial obstructions
- Searching for, dealing with and carrying out alterations to existing services, and
- The accommodation and safeguarding of public access and traffic

C3.5.1.3 Software application for programming

The contractor shall use Microsoft Project or any other approved software for his programming of the works. Such approval shall be unreasonably withheld.

C3.5.1.4 Methods and procedures

Method statements shall be compiled by the successful tenderer for approval by the Engineer. The Contractor shall submit written method statements to the Engineer, as requested in the Project Specification. For the purposes of the environmental specification, a method statement is defined as a written submission by the Contractor to the Engineer setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the Engineer when requesting the method statement, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and/ or will produce results in accordance with Specifications.

The method statement shall cover applicable details with regard to:

- construction procedures,
- materials and equipment to be used,
- getting the equipment to and from site,
- how the equipment/material will be moved while on site,
- how and where material will be stored,
- the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur,
- timing and location of activities,
- Compliance/ non-compliance with the Specifications, and any other information deemed necessary by the Engineer.

The Contractor shall abide by these approved method statements, and any activity covered by a method statement shall not commence until the Engineer has approved of such method. In such cases, the method statement shall be submitted to the Engineer not less than 14 days prior to the intended date of commencement of the activity. The following page provides a pro forma method statement sheet that must be completed by the Contractor for each activity requiring a method statement as specified in the Project Specification or requested by the Engineer.

C3.5.1.5 Quality plans and control

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The Contractor shall at his own expense institute a quality control system and shall employ experienced engineers, foremen, surveyors, materials technicians and other staff to ensure proper supervision and control of the work at all times and shall at his own cost carry out all necessary testing to ensure that materials and workmanship comply with specified requirements.

The Contractor shall be deemed to have allowed in his tender for the costs of all testing of materials and completed work as are required to be rendered by him in terms of the contract. It is the Contractor's sole responsibility at his own cost and by means of any necessary tests to demonstrate to the Engineer that all materials and completed work comply with all specified requirements.

C3.5.1.6 Environment

The Contractor must take note of the requirements regarding the control of access for deliveries, vehicular and pedestrian routes to site. The Contractor must comply with all safety, environmental and other relevant conditions and requirements on the Project.

C3.5.1.7 Accommodation of traffic on public roads occupied by the contractor

Safe, normal traffic movement must be accommodated on the road during construction. Access to properties must be maintained at all times

C3.5.1.8 Testing, completion, commissioning, and correction of defects

During progress of the work and upon completion thereof, the site of the works shall be kept and left in a clean and orderly condition. The contractor shall store materials and equipment for which he is responsible in an orderly manner, and shall keep the site free from debris and obstructions.

The contractor shall engage the services of an approved independent laboratory for the testing of materials and the quality testing of layer works, to ensure that his work complies with the specifications.

No separate payment will be made for such testing, the cost of which will be deemed to be included in the contractor's tendered rates for the items of work that require testing in accordance with the specifications.

Should the testing laboratory proposed by the contractor not be approved by the engineer, the contractor shall at his own cost negotiate with and propose another laboratory.

Progressive and systematic finishing and tidying will form an essential part of this contract. Under no circumstances shall spoil, rubble, materials, equipment or unfinished operations be allowed to accumulate unnecessarily and in the event of this occurring the Engineer shall have the right to withhold payment for as long as necessary in respect of the relevant works in the area(s) concerned.

C3.5.1.9 Recording of weather

Extensions of time in respect of clause 42 in respect of abnormal rainfall shall be calculated using the following formula for each calendar month or part thereof:

$$V = (Nw - Nn) + \frac{(Rw - Rn)}{X}$$

X

Where:

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V = Extension of time in calendar days in respect of the calendar month under consideration.

N_w = Actual number of days during the calendar month on which a rainfall of 10 mm or more has been recorded.

N_n = Average number of days in the relevant calendar month, as derived from existing rainfall records, as stated in the Site Information, on which a rainfall of 20 mm or more has been recorded for the calendar month.

R_w = Actual average rainfall in mm recorded for the calendar month under consideration.

R_n = Average rainfall in mm for the calendar month as derived from existing rainfall records as stated in the Site Information.

For purposes of the Contract N_n , R_n , X and Y shall have those values assigned to them in the Appendix and/or the Specification.

If V is negative and its absolute value exceeds N_n , then V shall be taken as equal to minus N_n .

The total extension of time shall be the algebraic sum of all monthly totals for the period under consideration, but if the total is negative the time for completion shall not be reduced due to subnormal rainfall.

Extensions of time for part of a month shall be calculated using pro rata values of N_n and R_n . This formula does not take account flood damage which could cause further or concurrent delays and will be treated separately as far as extension of time is concerned.

The factor $(N_w - N_n)$ shall be considered to represent a fair allowance for variations from the average in the number of days during which rainfall exceeds 10 mm. The factor $(R_w - R_n)$ shall be considered to represent a fair allowance for variations from the average in the number of days during which the rainfall did not exceed 10 mm but wet conditions prevented or disrupted work.

For the purpose of applying the formula, accurate rain gauging shall be taken at a suitable point on the Site and the Contractor shall at his own expense, take all necessary precautions to ensure that rain gauges cannot be interfered with by unauthorized persons.

C3.5.1.10 Format of communications

Instructions to the contractor will be given through site instructions recorded in the site instruction book that will be provided to the contractor. Requests for site inspections by the contractor should be made in the site inspection book to be provided to the contractor.

C3.5.1.11 Key personnel

A schedule of the contractor's key personnel shall be submitted to the engineer together with the letter of acceptance of the contract. The schedule shall include contact details of the key personnel including telephone numbers fax numbers, cell phone numbers and e-mail addresses.

C3.5.1.12 Management meeting

Site meetings to review project progress will be held on the last Friday of each month and the meetings will be held on site. The meeting will be preceded with a site inspection. The meetings will be attended by the client, the engineer, the local municipality and the contractor. It is a requirement that key personnel with the required delegated authority to make decisions in aspects such as planning change management and health and safety from the contractor should attend this meeting..

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C3.5.1.13 Forms for contract administration

Standard contract administration forms necessary for the management of the contract will be provided to the contractor at the first meeting. These will include requests for site inspection, payment certificates, requests for approvals and any other forms that the engineer deems necessary.

C3.5.1.14 Daily records

Daily records of resources (people and equipment employed) shall be kept on site for inspection by the engineer. A site diary in respect of work performed on the site shall also be kept on site for inspection by the engineer.

C3.5.1.15 Bonds and guarantees

The original and a copy of any bond and/or guarantee as stipulated in the documents shall be submitted to the EMALAHLENI LOCAL Municipality. Upon release of the bond and guarantee requirements the contractor will be required to apply for the release of the documentation after which the documentation will be collected from EMALAHLENI LOCAL Municipality offices.

C3.5.1.16 Payment certificates

The Contractor at his own expense, shall measure the work executed during each month and the materials on site and shall deliver to the Engineer a supporting statement with his monthly statement in terms of clause 52(1) of the General Condition of Contract, showing the said measurements and the relevant amounts paid or payable by him for such materials and all other particulars requires by the Engineer in a draft form as prescribed by the Engineer.

C3.5.2 HEALTH AND SAFETY

C3.5.2.1 Health and safety requirements and procedures

The Occupational Health and Safety Act 1993 (Act No. 85 of 1993) together with its applicable Regulations ("the OH&S Act) forms part of the Health and Safety Regulations. Any word or expression, to which a meaning has been assigned in the OH&S Act, shall have the meaning so assigned to it unless otherwise indicated. The Principal Contractor must comply with all the relevant requirements of the OH&S Act which aims to minimise Health and Safety hazards on projects.

In terms of the Construction Regulation 4(1) (a) of the OH&S Act, the EMALAHLENI LOCAL MUNICIPALITY, as the Client" is required to compile a Occupational Health & Safety Specification for all projects.

The purpose of this specification is to ensure that Principal Contractors entering into a Contract with the EMALAHLENI LOCAL MUNICIPALITY maintain an acceptable level of OH&S performance. The OH&S Specification forms an integral part of the Contract and Principal Contractors shall ensure that their contractors and/or suppliers comply with this Specification.

Compliance with the OH&S specification does not absolve the Principal Contractor from adhering to the legal requirements with regards to health & safety of his employees and mandataries.

The Principal Contractor must give the required notice to the Provincial Department of Labour before commencement of any construction work.

This notice shall include the information as set out in Annex 4 attached to the Specification and shall be signed by both Principal Contractor and Client.

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C3.5.2.2 Protection of the public

The Contractor shall at all times ensure that his operations do not endanger any member of the public.

As the area is adjacent to a residential area the Contractor shall take special precautions to prevent public access to any danger areas on the Works, e.g. by temporary barricades and/or fencing.

C3.5.2.3 Barricades and lighting

The Contractor shall employ acceptable methods of safeguarding the works both by day and night.

All road traffic signs shall comply with the requirements of the South African Road Traffic Signs Manual.

From the time any portion of the Works commences, until the completion of the Works and the issue of the Certificate of Completion of the Works, the Contractor shall be responsible for protecting the property of the Employer and all persons having business on the Site from anything dangerous or likely to cause damage or injury. The Contractor shall take all practical precautions to avoid nuisance or inconvenience to the occupiers of properties near to the Site whilst carrying out the Works and shall at all times keep the Site clean and in a safe and satisfactory condition.

C3.5.2.4 Traffic control on roads

Safe, normal traffic movement must be accommodated on the road during construction. Access to properties must be maintained at all times.

The contractor's machine operators must be made aware of the dangers the plant poses to pedestrians. Special care must be taken when reversing or manoeuvring in confined spaces. Where necessary, fragment deemed may have to be deployed with plant.

C3.5.2.5 Measures against disease and epidemics

The contractor, as part of his safety management plan shall take all measures necessary to ensure that diseases and epidemics are controlled and managed effectively. To this end it will be a requirement of the contractor to detail in his safety plan measures on how he will manage the possibility of diseases and epidemics during implementation of the project

C3.5.2.6 Aids awareness

It is the responsibility of the contractor to ensure that his personnel on the project are counselled about the effects of HIV/Aids. The contractor will be required to run such awareness programmes as may be necessary to ensure that the staffs are properly informed

C3.5.3 Environmental Management

The Contractor shall take full responsibility for protecting the natural environment and eliminating or minimising the negative impacts of construction on the environment during construction. Nothing specified herein shall relieve the Contractor of any obligations or responsibilities in this regard.

The Contractor shall implement an Environmental Policy, in line with various statutory regulations, the Environmental Management Plan (EMP) and the Works information. The Policy

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shall be submitted to the Engineer within 28 days after the Starting Date. Upon the Engineer's acceptance, the Contractor shall immediately implement the policy and any amendments, and keep it in operation for the full duration of the contract.

The Contractor shall keep the policy updated in accordance with his Quality Management Procedures and make amendments as required by the Engineer and the circumstances prevailing at the time. The Contractor shall immediately supply the Engineer with 2 copies of an updated Environmental Policy which shall clearly indicate the revisions undertaken.

The Contractor shall prepare and submit the following waste management plans to the Engineer at least three months before the scheduled start-up dates of the respective systems.

- Chemicals Management Plan.
- Effluent Management Plan.
- Solid Waste Management Plan.
- Spill Response and Contingency Plan.

C3.5.4 Access control

The Contractor in collaboration with the agent's will ensure that proper access control is in place and functional at all times onto and off the construction site. All persons entering the site shall be in possession of an identification card indicating his/her construction site safety induction attendance.

The Contractor's SH&E officer shall also in collaboration with the Contractor's safety officers or and other appropriate personnel develop a pedestrian and traffic control plan for the site to ensure the safe movement of all construction related mobile plant, equipment and employees.

All security requirements shall be highlighted at the induction given by the Contractor. All Contractors are to strictly adhere to all security requirements on the premises.

The Site area allocated to the Contractor by the agent shall be properly enclosed with a suitable security fence approved by the agent and provided with access gates which can be securely locked. The costs of enclosing the area with suitable security fence shall be for the account of the Contractor. Legally required notices and signs are to be placed at all gates to the construction site. Construction site standard identification and SH&E performance notices boards to be used.

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C3.6: ANNEXES

- A. Geotechnical Investigation Report
- B. Tender Drawings
- C. Health and Safety Specifications
- D. EPWP Labour Intensive Specification

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ANNEX A
GEOTECHNICAL INVESTIGATION REPORT

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ANNEX B
TENDER DRAWINGS

THE DRAWINGS ARE NOT INCLUDED IN THIS DOCUMENT, PLEASE SEE THE BOOK OF DRAWINGS

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ANNEX C
HEALTH AND SAFETY SPECIFICATION

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ANNEX C

HEALTH AND SAFETY SPECIFICATION

1. BACKGROUND

In terms of the Construction Regulation 4 (1) (a) of the Occupational Health and Safety Act, No. 85 of 1993, the Client is required to compile a Health & Safety Specification for the intended project and provide such specification to any prospective tenderer.

The Client's further duties are as 4(1) to 4(6) in The Construction Regulations, July 2003.

2. SCOPE

Development of a Health & Safety Specification that addresses all aspects of occupational health and safety as affected by the **Upgrading of the Ferrobank Waste Water Treatment Works**

3. OH&S MANAGEMENT

3.1 Structure and Organization of OH&S Responsibilities

3.1.1. Overall Supervision and Responsibility for OH&S

- The Client is to ensure that the Principal Contractor, appointed in terms of Construction Regulation 4(1)(c), implements and maintains the agreed and approved OH&S Plan.
- The Chief Executive Officer of the Principal Contractor in terms of Section 16 (1) of the Act is to ensure that the Employer (as defined in the Act) complies with the Act. **Annexure 2** - "Legal Compliance Audit" may be used for this purpose.
- Any OH&S Act (85 /1993), Section 16 (2) appointee/s as detailed in his/her respective appointment forms.
- The Construction Supervisor and Assistant Construction Supervisor/s appointed in terms of Construction Regulation 6.

3.1.2. Further (Specific) Supervision Responsibilities for OH&S

Appointments required by the Act and Regulations:

- OH&S Representatives (Sections 17/18 of the Act)
- OH&S Committees (Sections 19/20 of the Act)
- Risk Assessor (Construction Regulation. 7(1))
- Accident/Incident Investigations Co-ordinator (General Administrative Regulation 9 (2))
- Form/Support work Supervisor (Construction Regulation 10(a))
- *Batch Plant Supervisor (Construction Regulation 18(1))*
- *Stacking & Storage Supervisor (Construction Regulation 26(a))*
- *Fire Equipment Inspector (Construction Regulation 27(h))*
- Electrical Installations, Machinery & Appliances Inspector (Construction Regulation 22)
- Excavations Supervisor (Construction Regulation 11(1))
- Demolition Supervisor (Construction Regulation 12(1))
- OH&S Officer (where necessary) (Construction Regulation 6(6))
- Person Responsible for Machinery (General Machinery Regulation 2)
- Emergency, Security and Fire Co-ordinator (Construction Regulation 27(h) & Environmental Regulation 9)
- Fire Equipment Inspector (Construction Regulation 27(h) Environmental Regulation 9)
- First Aider (General Safety Regulation 3(2))

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- Hazardous Chemical Substances Supervisor (HCS Regulations)
- Ladders Inspector (General Safety Regulation 13A)
- Lifting Equipment Inspector (Construction Regulation 20)
- Operators & Drivers of Construction Plant & Vehicles (Construction Regulation 21 (i))
- Structures Supervisor (Construction Regulation 9)
- Users Operators of Construction Equipment (Construction Regulation 21(i))
- Welding Supervisor (General Safety Regulation 9)

3.2. Communication and Liaison

- OH&S liaison between the Client, the Principal Contractor, the other Contractors, the Consulting Engineer and other concerned parties will be through the OH&S Committee as in **3.10**.
- In addition to the above, communication may be directly to the Client or his appointed Agent, verbally or in writing, as and when the need arises.
- Consultation with the workforce on OH&S matters will be through their Supervisors, OH&S Representatives, the OH&S Committee and their elected Trade Union Representatives, if any.
 - The Principal Contractor will be responsible for the dissemination of all relevant OH&S information to the other Contractors e.g. design changes agreed with the Client and the Consulting Engineer, instructions by the Client and/or his/her agent, exchange of information between Contractors, the reporting of hazardous/dangerous conditions/ situations etc.

3.3. OH&S File

The Principal Contractor must, in terms of Construction Regulation 5 (7), keep a health and safety file on site at all times that must include all documentation required in terms of the Act and Regulations and must also include a list of all Contractors on site that are accountable to the Principal Contractor and the agreements between the parties and details of work being done. The following documents must be kept in the OH&S file:

- Notification of Construction Work (Construction Regulation 3.)
- Copy of OH&S Act (updated) (General Administrative Regulation 4.)
- Proof of Registration and good standing with a COID Insurer (Construction Regulation 4 (g))
- Copy of health and safety plan (construction regulation 5 (1))
- OH&S Programme agreed with Client including the underpinning Risk Assessment and Method Statements (Construction regulation 5 (1))

Designs/drawings (Construction Regulation 5 (8))

- A list of Contractors (Subcontractors) including copies of the agreements between the parties and the type of work being done by each contractor (Construction Regulation 9)
- Appointment / Designation forms as per 3.1.1. and 3.1.2. above.
- Registers as follows:
 - * Accident/Incident Register (Annexure 1 of the General Administrative Regulations)
 - * OH&S Representatives Inspection Register
 - * Form/Support work Inspection
 - * Excavations Inspection
 - * Lifting Equipment
 - * Demolition Inspections
 - * Designer's Inspection of Structures Record
 - 3. * Batch Plant Inspections
 - 4. * Arc & Gas Welding & Flame Cutting Equipment Inspections
 - 5. * Construction Vehicles & Mobile Plant Inspections
 - 6. * Electrical Installation and Machinery Inspections
 - 7. * Fire Equipment Inspection & Maintenance
 - 8. * First Aid

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- * Hazardous Chemical Substances
- 9. * Lifting Tackle and Equipment Inspections
- 10. * Inspection of Cranes
- 11. * Inspection of Ladders
- 12. * Inspection of Vessels under Pressure
- * Machinery Inspections
- * Drivers/Operators of Mobile Plant/Construction Vehicles Daily Inspections

The Principal Contractor will be required to submit the abovementioned registers monthly to the chairperson of the OH&S Committee for endorsement.

The Health & Safety File must be handed over to the Client on completion of the contract. It must contain all the documentation handed to the Principal Contractor by any subcontractors together with a record of all drawings, designs, materials used and other similar information concerning the completed project.

3.4. OH&S Goals and Objectives and Arrangements for Monitoring and Review of OH&S Performance

The Principal Contractor is required to maintain a Compensation Incidence Frequency Rate (**CIFR**) of at least 8 (Refer **Annexure 3** - "Measuring Injury Experience") and to report on this to the Client on a monthly basis.

3.5. Identification of Hazards and Development of Risk Assessments, Standard Working Procedures (SWP) and Method Statements

The Principal Contractor is required to develop Risk Assessments, Standard Working Procedures (SWP) and Method Statements for each activity executed in the contract or project (Refer to **Section 4.** below "Project/Site Specific Requirements")

3.6. Arrangements for Monitoring and Review

3.6.1. Monthly Audit by Client

The Client will be conducting a Monthly Audit to comply with Construction Regulation 4 (1) (d) to ensure that the Principal Contractor has implemented and is maintaining the agreed and approved OH&S Plan.

3.6.2. Other Audits and Inspections by Client

The Client reserves the right to conduct other ad hoc audits and inspections as deemed necessary.

A representative of the Principal Contractor must accompany the Client on all Audits and Inspections and may conduct his/her own audit/inspection at the same time. Each party will, however, take responsibility for the results of his/her own audit/inspection results.

3.6.3 Reports

The Principal Contractor is required to provide the Client with a monthly report in the format as per the attached **Annexure 4: "SHE Risk Management Report"**

The Principal Contractor must report all incidents where an employee is injured on duty to the extent that he/she:

- dies
- becomes unconscious
- loses a limb or part of a limb

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- is injured or becomes ill to such a degree that he/she is likely either to die, or to suffer a permanent physical defect, or likely to be unable for a period of at least 14 days either to work or continue with the activity for which he/she was usually employed

OR where:

- a major incident occurred
- the health or safety of any person was endangered
- where a dangerous substance was spilled
- the uncontrolled release of any substance under pressure took place
- machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
- machinery ran out of control

to the Provincial Director of the Department of Labour within seven days. (Section 24 of the General Administrative Regulation 8.). The Principal Contractor is required to provide the Client with copies of all statutory reports required in terms of the Act.

The Principal Contractor is required to provide the Client with copies of all internal and external accident/incident investigation reports including the reports contemplated in 3.9. below.

3.6.4 Review

The Principal Contractor is to review the Hazard Identification, Risk Assessments and SWP's at each two weekly site inspection/meeting as the construction work develops and progresses and each time that changes are made to the designs, plans and construction methods and processes.

The Principal Contractor must provide the Client, other Contractors and all other concerned parties with copies of any changes, alterations or amendments.

3.7 Site Rules and Other Restrictions

3.7.1 Site OH&S Rules

The Principal Contractor must develop a set of site-specific OH&S rules that will be applied to regulate the OH&S aspects of the construction.

3.7.2. Security and Emergency Arrangements

The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period.

Access control must include the rule that non-employees will not be allowed on site unaccompanied.

The Principal Contractor must develop a set of security rules and procedures and maintain these throughout the construction period.

The Principal Contractor must appoint a competent Emergency Controller who must develop emergency contingency plans for any emergency that may arise on site as indicated by the risk assessments. These must include a monthly practice/testing programme for the plans e.g. January: trench collapse, February: flooding etc. and practiced/tested with all persons on site at the time, participating.

3.8 Training

The contents and syllabi of all training required by the Act and Regulations must be included in the Principal Contractor's OH&S Plan.

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3.8.1 General Induction Training

All employees of the Principal and other Contractors to be in possession of proof of General Induction Training

3.8.2 Site Specific Induction Training

All employees of the Principal and other Contractors to be in possession of Site Specific OH&S Induction Training.

3.8.3 Other Training

All operators, drivers and users of construction vehicles, mobile plant and other equipment to be in possession of valid proof of training.

All employees in jobs requiring training in terms of the Act and Regulations to be in possession of valid proof of training.

OH&S Training Requirements: (as required by the Construction Regulations and as indicated by the OH&S Specification and the Risk Assessment/s):

- * General Induction (Section 8 of the Act)
- * Site/Job Specific Induction (also visitors) (Sections 8 & 9 of the Act)
- * Site/Project Manager
- * Construction Supervisor
- * OH&S Representatives (Section 18 (3) of the Act)
- * Training of the Appointees indicated in 3.1.1. & 3.1.2. above
- * Operation of Cranes (Driven Machinery Regulations 18 (11))
- * Operators and Drivers of Construction Vehicles & Mobile Plant (Construction Regulation 21)
 - * Basic Fire Prevention & Protection (Environmental Regulations 9 and Construction regulation 27)
 - * Basic First Aid (General Safety Regulations 3)
 - * Storekeeping Methods & Safe Stacking (Construction Regulation 26)
- * Emergency, Security and Fire Co-ordinator

3.9. Accident and Incident Investigation

The Principal Contractor is responsible for the investigation of all accidents/incidents where employees and non-employees were injured to the extent that he/she had to be referred for medical treatment by a doctor, hospital or clinic. (General Administrative Regulation 9).

The results of the investigation to be entered into the Accident/Incident Register. (General Administrative Regulation 9)

The Principal Contractor is responsible for the investigation of all non-injury incidents as described in Section 24 (1) (b) & (c) of the Act and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

The Principal Contractor is responsible for the investigation of all road traffic accidents and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

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OH&S Representatives and Committees

3.10.1. Designation of OH&S Representatives

Where the Principal Contractor employs more than 20 persons (including the employees of other contractors (sub-contractors) he has to appoint one OH&S Representative for every 50 employees or part thereof. General Administrative Regulation 6 requires that the appointment or election and subsequent designation of the OH&S Representative is executed in consultation with Employee Representatives or Employees. (Section 17 of the Act and General Administrative Regulation 6. & 7.)

OH&S Representatives have to be designated in writing and the designation must include the area of responsibility of the person and term of the designation.

3.10.2. Duties and Functions of the OH&S Representatives

The Principal Contractor must ensure that the designated OH&S Representatives conduct a minimum monthly inspection of their respective areas of responsibility using a checklist and report thereon to the Principal Contractor.

OH&S representatives must be included in accident/incident investigations.

OH&S representatives must attend all OH&S committee meetings.

3.10.3. Appointment of OH&S Committee

The Principal Contractor must establish an OH&S Committee consisting of all the designated OH&S Representatives together with a number of management representatives (this number is not to exceed the number of OH&S representatives on the committee) and a representative of the Client who shall act as the chairperson without a vote. The members of the OH&S committee must be appointed in writing.

The OH&S Committee must meet minimum monthly and consider, at least, the following Agenda:

- Opening and welcome
- Present/Apologies/Absent
- Minutes of previous meeting
- Matters arising from the previous minutes
- OH&S Representatives Reports
- Incident Reports & Investigations
- Incident /Injury statistics
- Other matters
- Endorsement of Registers and the statutory documents by a representative of the Principal Contractor
- Close/Next Meeting

4. PROJECT / SITE SPECIFIC REQUIREMENTS

The following is a list of specific activities and considerations that have been identified for the project and the construction site and for which Risk Assessments, Standard Working Procedures (SWP), management and control measures and Method Statements (where necessary) have to be developed by the Principal Contractor:

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- * Clearing & Grubbing of the Area/Site
- * Site Establishment including:
 - Office/s
 - Secure/safe storage for materials, plant & equipment
 - Ablutions
 - Sheltered eating area
 - Maintenance workshop
 - Vehicle access to the site
- * Dealing with existing structures (NB: the existing pipeline is also a structure.)
- * Location of existing services
- * Installation and maintenance of temporary construction electrical supply, lighting and equipment
- * Adjacent land uses/surrounding property exposures
- * Boundary and access control/Public Liability Exposures (NB: the Employer is also responsible for the OH&S of non-employees affected by his/her work activities.)
- * Health risks arising from neighbouring as well as own activities and from the environment e.g. threats by dogs, bees, snakes, lightning etc.
- * Exposure to noise
- * Exposure to vibration
- * Protection against dehydration and heat exhaustion
- * Protection from wet & cold conditions
- * Dealing with HIV/Aids and other diseases
- * Use of Portable Electrical Equipment including
 - Angle grinder
 - Electrical drilling machine
 - Skill saw
- * **Excavations including**
 - Ground/soil conditions
 - Trenching
 - Shoring
 - Drainage of trench
- * **Welding including**
 - Arc Welding
 - Gas welding
 - Flame cutting
 - Use of LP gas torches and appliances
- * Loading & offloading of trucks
- * Aggregate/sand and other materials delivery
- * Manual and mechanical handling
- * Lifting and lowering operations
- * Driving & operation of construction vehicles and mobile plant including
 - Trenching machine
 - Excavator
 - Bomag roller
 - Plate compactor
 - Front end loader
 - Mobile cranes and the ancillary lifting tackle
 - Parking of vehicles & mobile plant
 - Towing of vehicles & mobile plant
- * Use and storage of flammable liquids and other hazardous substances
- * Layering and bedding of trench floor
- * Installation of pipes in trench
- * Pressure testing of pipeline
- * Installing heat shrink joint sleeves
- * Backfilling of trench
- * Protection against flooding
- * Gabion work
- * Use of explosives
- * Protection from overhead power lines

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- * As discovered by the Principal Contractor's hazard identification exercise
- * As discovered from any inspections and audits conducted by the Client or by the Principal Contractor or any other Contractor on site
- * As discovered from any accident/incident investigation.

Annexure 1: Construction Occupational Health – Safety – Environment Audit System
Annexure 2: Guidelines for the development of a Health and Safety Plan.
Annexure 3: Guide to Risk Assessment

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ANNEXURE 1

CONSTRUCTION OCCUPATIONAL HEALTH - SAFETY - ENVIRONMENT

AUDIT SYSTEM

(Based on the New Construction Regulations)

*** Denotes items applicable to both Construction sites and Contractors Plant/Storage**

1. ADMINISTRATIVE & LEGAL REQUIREMENTS

Section/Regulation	Subject	Requirements	Yes/No
Construction. Regulation 3	Notice of carrying out Construction work	Department of Labour notified Copy of Notice available on Site	
General Admin. Regulation 3	*Copy of OH&S Act (Act 85 of 1993)	Updated copy of Act & Regulations on site Readily available for perusal by employees	
COID Act Section 80	*Registration with Compens. Insurer	Written proof of registration / Letter of good standing available on Site	
Construction. Regulation 4 & 5(1)	OH&S Specification & Plan	OH&S Specification received from Client OH&S plan developed Updated regularly	
Section 8(2)(d) and Construction. Regulation 6	*Hazard Identification & Risk Assessment	Hazard Identification carried out/Recorded Risk Assessment and Plan drawn up/Updated Risk Assessment Plan available on Site Employees/Subcontractors informed/trained	
Section 16(2)	*Assigned duties (Managers)	Responsibility of complying with the OH&S Act assigned to other person/s by CEO.	
Construction. Regulation 5(2)	Designation of Person Responsible on Site	Competent person appointed in writing as Construction Supervisor	
Construction. Regulation 5(5)(a)	Designation of Subordinate Person	Competent person appointed in writing as Sub-ordinate Construction Supervisor	
Section 17 & 18	*Designation of Occupational Health & Safety Representatives	More than 20 employees - one OH&S Representative, one additional OH&S Rep. for each 50 employees or part thereof. Designation in writing, period and area of responsibility specified. Meaningful OH&S Rep. reports. Reports actioned by Management.	
Section 19 & 20	*Occupational Health & Safety Committee/s	OH&S Committee/s established. Members appointed in writing. Meetings held monthly. Minutes kept. Actioned by Management.	
Section 37	*Agreement with Mandatories (Sub-Contractors)	Written agreement with Subcontractors. List of Subcontractors displayed. Proof of Registration with Compensation Insurer/Letter of Good Standing Construction Work Supervisor designated Written arrangements concerning OH&S Reps & OH&S Committee Written arrangements regarding First Aid	
Construction. Regulation 7	Fall Prevention & Protection	Competent person appointed to draw up and supervise the Fall Protection Plan Proof of appointees competence available on Site Risk Assessment carried out for work at heights Fall Protection Plan drawn up/updated Available on Site	
Construction. Regulation 8	Roof work	Competent person appointed to plan & supervise Roof work.	

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Section/Regulation	Subject	Requirements	Yes/No
		Proof of appointees competence available on Site Risk Assessment carried out Roof work Plan drawn up/updated Roof work inspect before each shift. Inspection register kept Employees medically examined for physical & psychological fitness. Written proof available	
Construction. Regulation 9	Structures	Information re. the structure being erected received from the Designer including: - geo-science technical report where relevant - the design loading of the structure - the methods & sequence of construction - anticipated dangers/hazards/special Measures to construct safely Risk Assessment carried out Method statement drawn up All above available on Site Structures inspected before each shift. Inspections register kept	
Construction. Regulation 10	Formwork & Support work	Competent person appointed in writing to supervise erection, maintenance, use and dismantling of Support & Formwork Design drawings available on site Risk Assessment carried out Support & Formwork inspected: - before use/inspection - before pouring of concrete - weekly whilst in place - before stripping/dismantling. Inspection register kept	
Construction. Regulation 11	Scaffolding	Competent persons appointed in writing to: - erect scaffolding (Scaffold Erector/s) - act as Scaffold Team Leaders - inspect Scaffolding weekly and after inclement weather (Scaffold Inspector/s) Written Proof of Competence of above appointees available on Site Copy of SANS 085 available on Site Risk Assessment carried out Inspected weekly/after bad weather. Inspection register/s kept	
Construction. Regulation 12	Suspended Scaffolding	Competent persons appointed in writing to: - erect Susp.Scaffolding (Scaffold Erector/s) - act as Susp.Scaffold Team Leaders - inspect Susp.Scaffolding weekly and after inclement weather (Scaffold Inspector/s) Risk Assessment conducted Certificate of Authorization issued by a registered professional engineer available on Site/copy forwarded to the Department of Labour The following inspections of the whole installation carried out by a competent person - after erection and before use - daily prior to use. Inspection register kept The following tests to be conducted by a competent person: - load test of whole installation and working parts every 12 months - hoisting ropes/hooks/load attaching devices quarterly. Tests log book kept Employees working on Susp.Scaffold medically examined for physical & psychological fitness. Written proof available	
Construction.	Excavations	Competent person/s appointed in writing to supervise and	

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Section/Regulation	Subject	Requirements	Yes/No
Regulation 13		inspect excavation work Written Proof of Competence of above appointee/s available on Site Risk Assessment carried out Inspected: - before every shift - after any blasting - after an unexpected fall of ground - after any substantial damage to the shoring - after rain. Inspections register kept Method statement developed where explosives will be/are used	
Constructions Regulation 14	Demolition Work	Competent person/s appointed in writing to supervise and control Demolition work Written Proof of Competence of above appointee/s available on Site Risk Assessment carried out Engineering survey and Method Statement available on Site Inspections to prevent premature collapse carried out by competent person before each shift. Inspection register kept	
Construction. Regulation 16	Materials Hoist	Competent person appointed in writing to inspect the Material Hoist Written Proof of Competence of above appointee available on Site. Materials Hoist to be inspected weekly by a competent person. Inspections register kept.	
Construction. Regulation 17	Caissons & Cofferdams	Competent person appointed in writing to supervise, control & inspect the construction, installation/dismantling of caissons/coffer dams Written Proof of Competence of above appointee available on Site Risk Assessment carried out To be inspected daily by a competent person. Inspections register kept	
Construction. Regulation 18	Explosive Powered Tools	Competent person appointed to control the issue of the Explosive Powered Tools & cartridges and the service, maintenance and cleaning. Register kept of above Empty cartridge cases/nails/fixing bolts returns recorded Cleaned daily after use	
Construction. Regulation 19	Batch Plants	Competent person appointed to control the operation of the Batch Plant and the service, maintenance and cleaning. Register kept of above Risk Assessment carried out Batch Plant to be inspected weekly by a competent person. Inspections register kept	
Construction. Regulation 20/ Mine Health & Safety Act (29 of 1996)	Tunneling	Complying with Mines Health & Safety Act (29 of 1996) Risk Assessment carried out	
Construction. Regulation 21/ Driven Machinery Regulations 18 & 19	Cranes & Lifting Machines Equipment	Competent person appointed in writing to inspect Cranes, Lifting Machines & Equipment Written Proof of Competence of above appointee available on Site. Cranes & Lifting tackle identified/numbered Register kept for Lifting Tackle Log Book kept for each individual Crane Inspection: - All cranes - daily by operator - Tower Crane/s – after erection/6monthly - Other cranes – annually by comp. person - Lifting tackle(slings/ropes/chain slings etc.) - 3 monthly Risk Assessment carried out	

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Section/Regulation	Subject	Requirements	Yes/No
Construction. Regulation 22/Electrical Machinery Regulations 9 & 10/Electrical Installation Regulations	*Inspection & Maintenance of Electrical Installation & Equipment (including portable electrical tools)	Competent person appointed in writing to inspect/test the installation and equipment. Written Proof of Competence of above appointee available on Site. Inspections: - Electrical Installation & equipment inspected after installation, after alterations and quarterly. Inspection Registers kept Portable electric tools and -lights and extension leads identified/numbered. Monthly visual inspection by User/Issuer/Storeman. Register kept.	
Construction. Regulation 2 Diving Regulations	Water Environments	Competent person appointed in writing to supervise diving operations and ensure maintenance, statutory inspection and testing by an Approved Inspection Authority of equipment used Written Proof of Competence of above appointee available on Site Proof of registration of all divers present on site available Risk Assessment carried out Diving Manual produced. Available on Site Record of Voice Communications kept Diving Operations record kept Each Diver keeps a personal logbook. Entries countersigned by the Diving Supervisor Decompression tables available on Site Records of any Decompression illness kept Certificate of Manufacture of any Compression Chamber or Diving Bell in use available on Site	
Construction. Regulation 30/ General Safety Regulation 8(1)(a)	*Designation of Stacking & Storage Supervisor.	Competent Person/s with specific knowledge and experience designated to supervise all Stacking & Storage Written Proof of Competence of above appointee available on Site	
Construction. Regulation 31/ Environmental Regulation 9	*Designation of a Person to Co-ordinate Emergency Planning And Fire Protection	Person/s with specific knowledge and experience designated to co-ordinate emergency contingency planning and execution and fire prevention measures Emergency Evacuation Plan developed: - Drilled/Practiced - Plan & Records of Drills/Practices available on Site Fire Risk Assessment carried out All Fire Extinguishing Equipment identified and on register. Inspected weekly. Inspection Register kept Serviced annually	
Construction. Regulation 32/ General Safety Regulation 3	*First Aid	Every workplace provided with sufficient number of First Aid boxes. (Required where 5 persons or more are employed) First Aid freely available Equipment as per the list in the OH&S Act. One qualified First Aider appointed for every 50 employees. (Required where more than 10 persons are employed) List of First Aiders and Certificates Name of person/s in charge of First Aid box/es displayed. Location of F/Aid box/es clearly indicated. Signs instructing employees to report all Injuries/illness including first aid injuries	
Construction. Regulation 33/ General Safety Regulation 2	Personal Safety Equipment (PSE)	PSE Risk Assessment carried out Items of PSE prescribed/use enforced Records of Issue kept Undertaking by Employee to use/wear PSE	
Construction.	*Inspection & Use of	Competent Person/s with specific knowledge and	

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Section/Regulation	Subject	Requirements	Yes/No
Regulation 34/ General Safety Regulation 9	Welding/Flame Cutting Equipment	experience designated to Inspect Electric Arc, Gas Welding and Flame Cutting Equipment Written Proof of Competence of above appointee available on Site Equipment identified/numbered and entered into a register Equipment inspected monthly. Inspection Register kept	
Construction. Regulation 35/ Hazardous Chemical Substances (HCS)	*Control of Storage & Usage of HCS	Competent Person/s with specific knowledge and experience designated to Control the Storage & Usage of HCS Written Proof of Competence of above appointee available on Site Risk Assessment carried out Register of HCS kept/used on Site	
Construction. Regulation 36/Vessels under Pressure Regulations	Vessels under Pressure (VUP)	Competent Person/s with specific knowledge and experience designated to supervise the use, storage, maintenance, statutory inspections & testing of VUP's Written Proof of Competence of above appointee available on Site Risk Assessment carried out Certificates of Manufacture available on Site Register of VUP's on Site Inspections & Testing by Approved Inspection Authority (AIA): <ul style="list-style-type: none"> - after installation/re-erection or repairs - every 36 months. - Register/Log kept of inspections, tests. Modifications & repair 	
Construction. Regulation 37	Construction Vehicles & Earth Moving Equipment	Operators/Drivers appointed to: <ul style="list-style-type: none"> - Carry out a daily inspection prior to use - Drive the vehicle/plant that he/she is competent to operate/drive Written Proof of Competence of above appointee available on Site Record of Daily inspections kept	
Construction. Regulation 38/ General Safety Regulation 13D	*Inspection of Ladders	Competent person appointed in writing to inspect Ladders Ladders inspected at arrival on site and monthly thereafter. Inspections register kept	
Construction. Regulation 39/ General Safety regulation 13B	Ramps	Competent person appointed in writing to Supervise the erection & inspection of Ramps. Inspection register kept.	

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ANNEXURE 2

GUIDELINES FOR THE DEVELOPMENT OF A HEALTH & SAFETY PLAN

1. Project Background

In terms of the Construction Regulations [Regulation 4 (1) (a)] of the Occupational Health and Safety Act, No 85 of 1993, the Client is required to compile an Occupational Health and Safety specification for each of its projects and the Principle Contractor, appointed by the Client in terms of Regulation 4 (1) (c), is required to prepare an Occupational Health and Safety Plan. This plan has to be prepared in terms of Regulation 5 (1) as well as the Client's Occupational Health & Safety Specification. In terms of Regulation 4 (2), the Client and the Principle Contractor are required to agree on the Occupational Health and Safety Plan before any work may commence.

2. Framework for an Occupational Health and Safety Plan

2.1 Introduction

The Principal Contractor has to demonstrate to the Client that he has a suitable and sufficiently documented Occupational Health and Safety Plan as well as the necessary competencies, experience and resources to perform the construction work safely. The Principle Contractor could be required to submit the following documentation for perusal and verification by the Client:

- Management Structure
- Quality Plan
- Human Resources Plan
- Registered Workplace Skills Plan
 - *“Letter of good standing” from the Compensation Commissioner or licensed compensation insurer.*
- Proof of induction and other training of employees
 - *Example copy minutes of previous Occupational Health and Safety Committee meetings and copies of Incident Investigation Reports*

2.2 Contents of an Occupational Health and Safety Plan

2.2.1 Occupational Health and Safety Management Programme

- Management of Occupational Health and Safety risks
- Occupational Health and Safety structures and appointments
- Programme of Occupational Health and Safety inspections
- Occupational Health and Safety Representatives
- Occupational Health and Safety committee

2.2.2 Communication and Management of the Work

- Management structure and responsibilities
- Occupational Health and Safety goals for the project and arrangements for monitoring and review of Occupational Health and Safety performance.
- Arrangements for:
 - *Regular liaison between parties on site*
 - *Consultation with the workforce*
 - *The exchange of design information between the Client, engineer, supervisors and contractors on site*
 - *Handling design changes during the project*
 - *Selection and control of contractors*
 - *The exchange of Occupational Health and Safety information between all contractors*
 - *Security*

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- *Site induction and onsite training*
- *Facilities and first-aid*
- *The reporting and investigation of accidents and incidents*
- *The production and approval of risk assessments and method statements*
- *Site OH&S rules*
- *Fire and emergency procedures*
- *Reporting to the Client i.e. results of Occupational Health and Safety inspections, incident*
- *and incident investigations and committee meetings*
- *Reporting of incidents to the Department of Labour and Compensation insurer where appropriate*

2.2.3 Arrangements for controlling significant site risks

The following are some examples of the arrangements for controlling the most significant site risks:

- **Safety risks**
 - Services, including temporary electrical installations
 - Preventing employees from falling into excavations, from trucks etc.
 - Work with, on or near fragile materials
 - Control of lifting operations
 - The maintenance of plant and equipment
 - Poor ground conditions
 - Traffic routes and segregation of vehicles and pedestrians
 - Storage of hazardous materials
 - Dealing with existing unstable structures/land
 - Accommodating adjacent land use
 - Other significant safety risks as and when identified
- **Health risks**
 - Storage and use of hazardous chemical substances
 - Dealing with contaminated land or material
 - Manual handling
 - Reducing noise and vibration
 - Provision of adequate lighting
 - Ventilation considerations
 - Extreme heat and cold temperature considerations
 - Dealing with HIV/Aids and other illnesses
 - Provision of and maintaining ablution and eating facilities
 - Other significant health risks as and when identified

2.2.4 Preparation of an Occupational Health and Safety Operational Reference File/Manual

The following are some of the requirements to be addressed:

- Layout, format and content requirements
- Arrangement for the collection and gathering of information
- Storage and archiving of all the information
- Copy to the Client at completion of project
- **Suggested Contents of an OH&S File/Manual**
 - OH&S Policy
 - Notice of new project
 - Site start-up
 - Security measures
 - Written designations & appointments
 - Arrangements with contractors/mandataries
 - OH&S rules and procedures
 - Induction
 - OH&S training

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- OH&S promotion
- OH&S representatives
- OH&S committees
- Workplace facilities e.g. ablutions, sheltered eating areas etc.
- Protective equipment
- Workplace inspections and audits
- Investigation & reporting of incidents/accidents
- Mechanical safeguarding
- Electrical safeguarding
- Safeguarding against hazardous substances
- Lifting machinery & equipment
- Construction vehicles & mobile plant
- Welding, heating & flame cutting
- Excavations
- Protection of the environment affected by construction activities
- Keeping of records in terms of the OH&S Act (85 of 1993)

ANNEXURE 3

GUIDE TO RISK ASSESSMENT

1. HOW TO DO IT?

2. Steps to Effective Risk Assessment

- Step 1 : Identifying the hazards
- Step 2 : Aim to identify major hazards, don't waste time on the minor & detail
- Step 3 : Involve as many people as possible in the process especially those at risk
- Step 4 : Gather all the information and analyse it
- Step 5 : Look at what actually occurs including non-routine operations
- Step 6 : Use a systematic approach to ensure all hazards are adequately addressed
- Step 7 : Assess the risks arising taking into account the effectiveness of controls
- Step 8 : Ensure the process is practical and realistic
- Step 9 : Always record the assessment in writing including assumptions and why

3. HOW SERIOUS IS IT?

PROBABILITY

- A Common
- B Has Happened
- C Could Happen
- D Not Likely
- E Practically impossible

CONSEQUENCES

- 1 Fatality or permanent disability
- 2 Major injury
- 3 Average Lost Time Injury
- 4 Minor Injury
- 5 Medical Treatment or less

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PROBABILITY

	A	B	C	D	E
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9

Risk Rating:

1 – 3 = Serious
 4 - 5 = High
 6 – 7 = Moderate
 8 – 9 = Acceptable

• **ACTION**
 Immediate (within 1 week)
 Within 1 month
 > 4 weeks
 No action

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LIST OF RISK ASSESSMENTS AVAILABLE (as at 2003.07.07)

Access Towers	Landscaping
Acid Washing	Lathe
Aggregate/Sand Delivery	Layering of (Road work) Materials
Angle Grinder	Layering Process
Arc Welding	Laying Kerbs
Armco Barriers - installation	Laying of stormwater drains
Assem. of elements by boilermaker	Levelling – of materials
BackFilling	Lifting Concr. Beams on to trailers
Bag Filling	Loading supervisor
BandSaw	Loading/Unloading - of Trucks
Banksman	Loffels – placing/laying
Batch Plant	Machine operator
Bench Grinder	Making of steel items
Bin Scraper	Material delivery
Block Feeder	Materials Handling
Block Machine	Mixer operator
BoomScraper	Mobile Cranes
Bricks – Laying of	Pedestal Drill
Brickwork	Pedestal Grinder
Bulk Earthworks	Placing Concrete
Cement Spray Truck	Plastering
Clearing & Grubbing of Area/Site	Portable Electric Drill
Compr. Gas Cylinders-handling	Portable Electric Tools
Compressors – Air	Portable Ladders
Concrete – placing of (1)	Post Tensioning
Concrete – placing of (2)	Radial Arm Drill
Confined Spaces – Working in	Refuelling Vehicles/Plant
Conveyors	Reinforcing Steel – placement (1)
Cutting – of Earthworks	Reinforcing Steel – placement (2)
David Arm	Road Traffic Signs – placement of
Deck Panels – placing	Roadworks - Deviations
Depalletor Operator	Roof Truss erection
Diss. Assembly Rejects	SandBlasting
Distribution Boards – Electrical	Scaffolding
Drivers – of Vehicles	Shuttering – Erection
Dry Tile Deracking	Shuttering – Stripping
Dumpers - Concrete	Site Establishment (1)
Electrical Installation – Maintenance of	Site Establishment (2)
Elevated Positions	SkillSaw
Erecting – Instal/ Shutters	Spray Painting
Excavations (1)	Stormwater pieps - laying
Excavations (2)	Structural Steel – Erection
Explosive Powered Tools	Structural Steel – Laydown
Finger Car	Surveying
Fire Fighting Prevention	Suspended Scaffolds
Fire Prevention & Protection	Termite Proofing
Formwork	Tile Machine
Friction Saw	Tile stacking
Front End Loader	Timber Feeder
Fuel Supply	Tower Cranes
Gas Cylinders – Handling of	Traffic Accommodation
Gas Welding-cutting oper.	Traffic Control/Regulation
Gas Welding-cutting operations	Trench Excavation
Guillotine	Use of angle grinder
Hand & Spray Painting	Use of Port. Elec. Tools.
Hand ToolsJacking – with Hydraulic Pump	Wet tile racking
Hanging scaffolding	Work confined spaces
Hauling	Work in Elevated Positions
High cut operations	Working Platforms
Jacking Hydraulic Pump (1)	Workshops
Jacking Hydraulic Pump (2)	
Kerb Laying	

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RISK ASSESSMENT: SITE ESTABLISHMENT

TYPE OF WORK PERFORMED:

• _____ DATE COMPLETED: _____

•

ASSESSMENT PERFORMED BY:

• _____

Step No.	Activity Rules	What can cause injury/damage ?	Result of cause (injury/damage)	Preventative Measures (tools, PPE, equipment)	Controls (test, check list)	Weights		
1.	Access to be a main consideration when positioning offices, stores and parking areas on site during planning stage. Possible one way traffic to be introduced	Restricted access to parking and delivery areas to storage areas.	Damage to transport and plant	Proper layout of site by Construction Manager and Site Agent taking into consideration all transport plant and material movements and storage on site.	Site Agent to check layout Drg. To compare with OHS Act requirements and whether they are to Concor's standards.			
2.	Oxygen and acetylene store to be a minimum distance of five metres away from other buildings. It needs to be well ventilated and have a roof to keep direct exposure to the sun.	Fire explosion leaking gas may spread if to close to other buildings.	Damage to property and plant. Health of employees.	See item 1.	See item 1.			
3.	Diesel tanks to be a distance of 10 metres away from any building and parking areas. A slab with a bund wall capable of carrying 110% of the tank capacities must be constructed for the tanks to stand in.	Fire may spread to adjacent buildings and plant if is too close.	Burns on all parts of body. Damage to plant and property.	See item 1. Persons in charge of tanks should be inducted regarding all the hazards involved and how to control them	See item 1. Supervisor to monitor on an ongoing basis if rules are complied with			

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Step No.	Activity Rules	What can cause injury/damage?	Result of cause (injury/damage)	Preventative Measures (tools, PPE, equipment)	Controls (test, check list) During erection & ongoing	Weights		
4.	All cables from distribution board to offices, store and for security to be under-ground. The distribution board is to stand on a firm level base and should be locked at all times.	Damaged cables loose wires exposed.			●	Safety	Health	R/R
5.	Security fencing minimum height of 1.8 meter around site area together with two double gates.	Theft of property. Access to unauthorised persons.	Loss of property. Injury to persons.	Security guards to be appointed to keep watch.	Supervisor to put system of control in place			
6. 6.1 6.2 6.3 6.4 6.5	Services to be available during site establishment. Fire fighting equipment. First aid boxes. First aider. Drinking water. Toilets.	Not having the essential services at hand.	Health of employees. Loss of property through fire.	6.1 to 6.5 are to be included on first order placed for contract. Dry chemical powder ABCDE fire extinguishers to be ordered 4 off for start.	Site Agent to see that these requirements are on site from start of site establishment.			
7.	Water tank tower to consist of very well cross braced pipe structure standing on concrete base.	Badly constructed water tower under designed structurally could cause tower to collapse.	Injury to persons. Damage to property.	Supervisor to erect as per design office specifications.				

Step No.	Activity Rules	What can cause injury/damage?	Result of cause (injury/damage)	Preventative Measures (tools, PPE, equipment)	Controls (test, check list) During erection & ongoing	Weights		
8.	Safety sign & notice board to be placed close to entrance of main gate	Not informing employees and public what the site rules are.	Injury to persons. Damage to property.	Concor standard notices/ Posters to be displayed. Available from Head Office.	Site manager to check that board has been erected.			
9.	Laydown areas to be sufficient in size. timber poles to be available to stack materials on.	With inadequate space various materials will be stacked on top of each other causing unstable stacks.	Injury to persons loading, unloading materials.	Allow sufficient space for laydown area during planning stage of site layout. Access to be considered important.	Site agent to discuss with Foreman regarding his requirement at planning stage.			
10.	Toilets are to be well ventilated.	No ventilation in toilets may cause germs to propagate.	Possible health problems due to germs.	Extraction fans to be fitted if required.	Supervisor to check if he is satisfied with ventilation.			

ASSESSMENT: 1 – 10 (HIGH) 11 – 16 (MEDIUM) 17 – 25 (LOW)

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RISK ASSESSMENT: EXCAVATIONS (PLANT & MANUAL)

TYPE OF WORK PERFORMED: _____

DATE COMPLETED: _____

ASSESSMENT PERFORMED BY: _____

Step No	Activity Rules	What can cause injury/damage	Result of cause (injury/damage)	Preventative measures (tools, PPE, equipment)	Controls (test, checks)			
	When using a machine to excavate, observe the following:					Safety	Health	Finan.
1	Operator must ensure there are no employees working in this area.	Employees not visible to operate or moving machine.	An injury to all parts of the body and as well as more serious fatal injuries.	Operator must work under close supervision. He must inspect the work area prior to commencing work.	Supervisor to ensure employees are informed and operator works under his supervision.			
2	Machine not to operate while employees are working in same excavations.	Danger of injury of employee by machine.	Bruises, scratches, fractures and fatal.	Supervisor must instruct operator when to commence work.	Supervisor to control and enforce procedure.			
3	All excavated materials must be discharged not closer than 2m from the edge of the excavation. When excavating manually, observe the following. See original	Materials can fall onto employees and the excavation may need extra work.	Injuries to employees and the excavation may need extra work.	Supervisor must instruct operator where to place discharged soil and gravel.	Supervisor to control.			
4	Using a pick and a shovel.	Unsafe use of a pick or a shovel.	Injury to employees.	Induct employees on safe working procedures.	Supervisor and charge hand to control.			
5	Check sides of excavations.	Unstable / loose material causes unsafe condition.	Injury to employees and damage to excavations.	Supervisor to inspect sides on a regular basis.	Supervisor / charge hand to control.			
6	Excavated material to be placed away from side of excavation.	Materials can fall onto employees when working inside the excavation.	Bruises, scratches, fractures and fatal.	Employees to be instructed not to place loose soil on edge of the excavation.	Supervisor to control.			
7	All excavations deeper than 1,5 m must have an access ladder available for employees to get into and out of the excavation safely.	Employees not able to enter or exit the excavation safely.	In case of an emergency too many employees may be buried as a result of inadequate access. Employees may also strain muscles to get into or out of an excavation without safe and convenient access.	Providing a ladder makes access into and out of the excavation area easy and safe.	Supervisors to ensure employees are given safe and convenient access to excavations.			
8	Sides of excavation to be shored (if necessary) and barricaded immediately.	Sides may collapse. Employees may NOT BE AWARE OF THE EXCAVATION AND FALL INTO IT.	Damage to the excavation. Injury to employees,	Put adequate shoring and strong physical barricades in place immediately.	Supervisor and chargehand to control.			
9	Excavations must be backfilled as soon as possible after excavation.	Excavations could collapse. Employees could trip and fall in. Vehicles and machinery could damage excavations.	Damage to excavations. Injury to employees. Damage to plant and machinery.	Keep area barricaded with a strong physical barricade and backfill as soon as possible.	Supervisor and chargehand to control.			

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<p>ANNEX D PARTICULAR SPECIFICATION</p>

PA: EPWP Labour intensive specification

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ANNEX E: PARTICULAR SPECIFICATIONS

PA: EPWP LABOUR INTENSIVE SPECIFICATION

PA1. LABOUR INTENSIVE COMPETENCIES OF SUPERVISORY AND MANAGEMENT STAFF

Contractors having a CIDB contractor grading designation of 5CE and higher shall only engage supervisory and management staff in labour intensive works who have either completed, or for the period 1 April 2004 to 30 June 2006, are registered for training towards, the skills programme outlined in Table 1.

The managing principal of the contractor, namely, a sole proprietor, the senior partner, the managing director or managing member of a close corporation, as relevant, having a contractor grading designation of 1CE, 2CE, 3CE and 4CE shall have personally completed, or for the period 1 April 2004 to 30 June 2006 be registered on a skills programme for the NQF level 2. All other site supervisory staff in the employ of such contractors must have completed, or for the period 1 April 2004 to 30 June 2006 be registered on a skills programme for, the NQF level 2 unit standards or NQF level 4 unit standards.

Table 1: Skills programme for supervisory and management staff

Personnel	NQF level	Unit standard titles	Skills programme description
Team leader / supervisor	2	Apply Labour Intensive Construction Systems and Techniques to Work Activities	This unit standard must be completed, and
		Use Labour Intensive Construction Methods to Construct and Maintain Roads and Stormwater Drainage	any one of these 3 unit standards
		Use Labour Intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour Intensive Construction Methods to Construct, Repair and Maintain Structures	
Foreman/ supervisor	4	Implement labour Intensive Construction Systems and Techniques	This unit standard must be completed, and
		Use Labour Intensive Construction Methods to Construct and Maintain Roads and Stormwater Drainage	any one of these 3 unit standards
		Use Labour Intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour Intensive Construction Methods to Construct, Repair and Maintain Structures	
Site Agent / Manager (i.e. the contractor's most senior representative that is resident on the site)	5	Manage Labour Intensive Construction Processes	Skills Programme against this single unit standard

PA2. EMPLOYMENT OF UNSKILLED AND SEMI-SKILLED WORKERS IN LABOUR-INTENSIVE WORKS

PA2.1 Requirements for the sourcing and engagement of labour

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- PA2.1.1 Unskilled and semi-skilled labour required for the execution of all labour intensive works shall be engaged strictly in accordance with prevailing legislation and SANS 1914-5, Participation of Targeted Labour.
- PA2.1.2 The rate of pay set for the SPWP is R per task or per day.
- PA2.1.3 Tasks established by the contractor must be such that:
- a) the average worker completes 5 tasks per week in 40 hours or less; and
 - b) the weakest worker completes 5 tasks per week in 55 hours or less.
- PA2.1.4 The contractor must revise the time taken to complete a task whenever it is established that the time taken to complete a weekly task is not within the requirements of (3).
- PA2.1.5 The Contractor shall, through all available community structures, inform the local community of the labour intensive works and the employment opportunities presented thereby. Preference must be given to people with previous practical experience in construction and / or who come from households:
- a) where the head of the household has less than a primary school education;
 - b) that have less than one full time person earning an income;
 - c) where subsistence agriculture is the source of income.
 - d) those who are not in receipt of any social security pension income
- PA2.1.6 The Contractor shall endeavour to ensure that the expenditure on the employment of temporary workers is in the following proportions:
- a) 60 % women;
 - b) 20% youth who are between the ages of 18 and 25; and
 - c) 2% on persons with disabilities.
- PA2.2 **Specific provisions pertaining to SANS 1914-5**
- PA2.2.1 **Definitions**
- Targeted labour:** Unemployed persons who are employed as local labour on the project.
- PA2.2.2 **Contract participation goals**
- a) There is no specified contract participation goal for the contract. The contract participation goal shall be measured in the performance of the contract to enable the employment provided to targeted labour to be quantified.
 - b) The wages and allowances used to calculate the contract participation goal shall, with respect to both time-rated and task rated workers, comprise all wages paid and any training allowance paid in respect of agreed training programmes.
- PA2.2.3 **Terms and conditions for the engagement of targeted labour**
- Further to the provisions of clause 3.3.2 of SANS 1914-5, written contracts shall be entered into with targeted labour.

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PA2.2.4 Variations to SANS 1914-5

- a) The definition for net amount shall be amended as follows:
- b) Financial value of the contract upon completion, exclusive of any value added tax or sales tax which the law requires the employer to pay the contractor.
- c) The schedule referred to in 5.2 shall in addition reflect the status of targeted labour as women, youth and persons with disabilities and the number of days of formal training provided to targeted labour.

PA2.2.5 Training of targeted labour

- a) The contractor shall provide all the necessary on-the-job training to targeted labour to enable such labour to master the basic work techniques required to undertake the work in accordance with the requirements of the contract in a manner that does not compromise worker health and safety.
- b) The cost of the formal training of targeted labour, will be funded by the provincial office of the Department of Labour. This training should take place as close to the project site as practically possible. The contractor, must access this training by informing the relevant provincial office of the Department of Labour in writing, within 14 days of being awarded the contract, of the likely number of persons that will undergo training and when such training is required. The employer must be furnished with a copy of this request.
- c) A copy of this training request made by the contractor to the DOL provincial office must also be faxed to the EPWP Training Director in the Department of Public Works– Cinderella Makunike, Fax Number 012 328 6820 or email cinderella.makunike@dpw.gov.za Tel: 083 677 4026.
- d) The contractor shall be responsible for scheduling the training of workers and shall take all reasonable steps to ensure that each beneficiary is provided with a minimum of six (6) days of formal training if he/she is employed for 3 months or less and a minimum of ten (10) days if he she is employed for 4 months or more.
- e) The contractor shall do nothing to dissuade targeted labour from participating in training programmes.
- f) An allowance equal to 100% of the task rate or daily rate shall be paid by the contractor to workers who attend formal training, in terms of (d) above.
- g) Proof of compliance with the requirements of (b) to (g) must be provided by the Contractor to the Employer prior to submission of the final payment certificate.

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C4: SITE INFORMATION

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UPGRADING OF FERROBANK WASTEWATER TREATMENT WORKS
EMPLOYER TENDER NUMBER: ELM 45/2020

APPENDIX A
STANDARD CONDITIONS OF TENDER

Standard Conditions of Tender (As contained in Annexure F of the CIDB Standard for Uniformity in Construction Procurement)

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F.1 General

F.1.1 Actions

The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in F.2 and F.3, timeously and with integrity, and behave equitably, honestly and transparently.

F.1.2 Tender Documents

The documents issued by the employer for the purpose of a tender offer are listed in the tender data.

F.1.3 Interpretation

F.1.3.1 The tender data and additional requirements contained in the tender schedules that are included in the returnable documents are deemed to be part of these conditions of tender.

F.1.3.2 These conditions of tender, the tender data and tender schedules which are only required for tender evaluation purposes, shall not form part of any contract arising from the invitation to tender.

F.1.3.3 For the purposes of these conditions for the calling for expressions of interest, the following definitions apply:

- a) **comparative offer** means the tenderer's financial offer after the factors of non-firm prices, all unconditional discounts and any other tendered parameters that will affect the value of the financial offer have been taken into consideration
- b) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process; and
- c) **fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels
- d) **quality (functionality)** means the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs

F.1.4 Communication and employer's agent

Each communication between the employer and a tenderer shall be to or from the employer's agent only, and in a form that can be read, copied and recorded. Writing shall be in the English language. The employer shall not take any responsibility for non-receipt of communications from or by a tenderer. The name and contact details of the employer's agent are stated in the tender data.

F.1.5 The employer's right to accept or reject any tender offer

F.1.5.1 The employer may accept or reject any variation, deviation, tender offer, or alternative tender offer, and may cancel the tender process and reject all tender offers at any time before the formation of a contract. The employer shall not accept or incur any liability to a tenderer for such cancellation and rejection, but will give written reasons for such action upon written request to do so.

F.1.5.2 The employer may not subsequent to the cancellation or abandonment of a tender process or the rejection of all responsive tender offers re-issue a tender covering substantially the same scope of work within a period of six months unless only one tender was received and such tender was returned unopened to the tenderer.

F.2 Tenderer's obligations

F.2.1 Eligibility

Submit a tender offer only if the tenderer complies with the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

F.2.2 Cost of tendering

Accept that the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender

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offer, including the costs of any testing necessary to demonstrate that aspects of the offer satisfy requirements.

F.2.3 Check documents

Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.

F.2.4 Confidentiality and copyright of documents

Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

F.2.5 Reference documents

Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

F.2.6 Acknowledge addenda

Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.

F.2.7 Clarification meeting

Attend, where required, a clarification meeting at which tenderers may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the tender data.

F.2.8 Seek clarification

Request clarification of the tender documents, if necessary, by notifying the employer at least five working days before the closing time stated in the tender data.

F.2.9 Insurance

Be aware that the extent of insurance to be provided by the employer (if any) may not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

F.2.10 Pricing the tender offer

F.2.10.1 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes (except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable 14 days before the closing time stated in the tender data.

F.2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.

F.2.10.3 Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.

F.2.10.4 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

F.2.11 Alterations to documents

Not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations. Erasures and the use of masking fluid are prohibited.

F.2.12 Alternative tender offers

F.2.12.1 Submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted. The alternative tender offer is to be submitted with the main tender offer together with a schedule that compares the requirements of the tender documents with the alternative requirements the tenderer proposes.

F.2.12.2 Accept that an alternative tender offer may be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.

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F.2.13 Submitting a tender offer

F.2.13.1 Submit a tender offer to provide the whole of the works, services or supply identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

F.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing in black ink.

F.2.13.3 Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.

F.2.13.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.

F.2.13.5 Seal the original and each copy of the tender offer as separate packages marking the packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

F.2.13.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked "financial proposal" and place the remaining returnable documents in an envelope marked "technical proposal". Each envelope shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

F.2.13.7 Seal the original tender offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the tender data.

F.2.13.8 Accept that the employer shall not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

F.2.14 Information and data to be completed in all respects

Accept that tender offers, which do not provide all the data or information requested completely and in the form required, may be regarded by the employer as non-responsive.

F.2.15 Closing time

F.2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Proof of posting shall not be accepted as proof of delivery. The employer shall not accept tender offers submitted by telegraph, telex, facsimile or e-mail, unless stated otherwise in the tender data.

F.2.15.2 Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of these conditions of tender apply equally to the extended deadline.

F.2.16 Tender offer validity

F.2.16.1 Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data.

F.2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period.

F.2.17 Clarification of tender offer after submission

Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the total of the prices or substance of the tender offer is sought, offered, or permitted. The total of the prices stated by the tenderer shall be binding upon the tenderer.

Note: Sub-clause F.2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.

F.2.18 Provide other material

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F.2.18.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment. Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

F.2.18.2 Dispose of samples of materials provided for evaluation by the employer, where required.

F.2.19 Inspections, tests and analysis

Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender data.

F.2.20 Submit securities, bonds, policies, etc.

If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies and certificates of insurance required in terms of the conditions of contract identified in the contract data.

F.2.21 Check final draft

Check the final draft of the contract provided by the employer within the time available for the employer to issue the contract.

F.2.22 Return of other tender documents

If so instructed by the employer, return all retained tender documents within 28 days after the expiry of the validity period stated in the tender data.

F.2.23 Certificates

Include in the tender submission or provide the employer with any certificates as stated in the tender data.

F.3 The employer's undertakings

F.3.1 Respond to clarification

Respond to a request for clarification received up to five working days prior to the tender closing time stated in the Tender Data and notify all tenderers who drew procurement documents.

F.3.2 Issue Addenda

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date of the Tender Notice until seven days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, will then notify it to all tenderers who drew documents.

F.3.3 Return late tender offers

Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

F.3.4 Opening of tender submissions

F.3.4.1 Unless the two-envelope system is to be followed, open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

F.3.4.2 Announce at the opening held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened, the total of his prices, preferences claimed and time for completion, if any, for the main tender offer only.

F.3.4.3 Make available the record outlined in F.3.4.2 to all interested persons upon request.

F.3.5 Two-envelope system

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F.3.5.1 Where stated in the tender data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

F.3.5.2 Evaluate the quality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the quality evaluation above the minimum number of points for quality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any preferences claimed. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for quality.

F.3.6 Non-disclosure

Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

F.3.7 Grounds for rejection and disqualification

Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

F.3.8 Test for responsiveness

Determine, on opening and before detailed evaluation, whether each tender offer properly received:

- a) meets the requirements of these Conditions of Tender,
- b) has been properly and fully completed and signed, and
- c) is responsive to the other requirements of the tender documents.

A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

- detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
- change the Employer's or the tenderer's risks and responsibilities under the contract, or
- affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.

F.3.9 Arithmetical errors

Check responsive tender offers for arithmetical errors, correcting them in the following manner:

- Where there is a discrepancy between the amounts in figures and in words, the amount in words shall govern.
- If a bill of quantities (or schedule of rates) apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate will be corrected.
- Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if a bills of quantities applies) to achieve the tendered total of the prices.

Consider the rejection of a tender offer if the tenderer does not correct or accept the correction of his arithmetical errors in the manner described above.

F.3.10 Clarification of a tender offer

Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

F.3.11 Evaluation of tender offers

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F3.11.1 General

Appoint an evaluation panel of not less than three persons. Reduce each responsive tender offer to a comparative offer and evaluate it using the tender evaluation method that is indicated in the Tender Data and described below:

Method 1: Financial offer	1) Rank tender offers from the most favourable to the least favourable comparative offer. 2) Recommend highest ranked tenderer for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 2: Financial offer and preferences	1) Score tender evaluation points for financial offer. 2) Confirm that tenderers are eligible for the preferences claimed and if so, score tender evaluation points for preferencing. 3) Calculate total tender evaluation points. 4) Rank tender offers from the highest number of tender evaluation points to the lowest. 5) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 3: Financial offer and quality	1) Score quality, rejecting all tender offers that fail to score the minimum number of points for quality stated in the Tender data. 2) Score tender evaluation points for financial offer. 3) Calculate total tender evaluation points. 4) Rank tender offers from the highest number of tender evaluation points to the lowest. 5) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 4: Financial offer, quality and preferences	1) Score quality, rejecting all tender offers that fail to score the minimum number of points for quality stated in the Tender data. 2) Score tender evaluation points for financial offer. 3) Confirm that tenderers are eligible for the preferences claimed, and if so, score tender evaluation points for preferencing. 4) Calculate total tender evaluation points. 5) Rank tender offers from the highest number of tender evaluation points to the lowest. 6) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.

Score financial offers, preferences and quality, as relevant, to two decimal places.

F.3.11.2 Scoring Financial Offers

Score the financial offers of remaining responsive tender offers using the following formula:

$N_{FO} = W_1 \times A$ where:

N_{FO} = the number of tender evaluation points awarded for the financial offer.

W_1 = the maximum possible number of tender evaluation points awarded for the financial offer as stated in the Tender Data.

A = a number calculated using either formulas 1 or 2 below as stated in the Tender Data.

Formula	Basis for comparison	Option 1	Option 2
1	Highest price or discount	$(1 + \frac{(P - P_m)}{P_m})$	P/P_m
2	Lowest price or percentage commission/fee	$(1 - \frac{(P - P_m)}{P_m})$	P_m/P

where:

P_m = the comparative offer of the most favourable tender offer.

P = the comparative offer of tender offer under consideration.

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F.3.11.3 Scoring quality (functionality)

Score quality in each of the categories stated in the Tender Data and calculate total score for quality.

F.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and / or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

F.3.13 Acceptance of tender offer

F.3.13.1 Accept tender offer only if the tenderer satisfies the legal requirements stated in the Tender Data.

F.3.13.2 Notify the successful tenderer of the employer's acceptance of his tender offer by completing and returning one copy of the form of offer and acceptance before the expiry of the validity period stated in the tender data, or agreed additional period. Providing the form of offer and acceptance does not contain any qualifying statements, it will constitute the formation of a contract between the employer and the successful tenderer as described in the form of offer and acceptance.

F.3.14 Notice to unsuccessful tenderers

After the successful tenderer has acknowledged the employer's notice of acceptance, notify other tenderers that their tender offers have not been accepted.

F.3.15. Prepare contract documents

If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:

- a) addenda issued during the tender period,
- b) inclusion of some of the returnable documents,
- c) other revisions agreed between the employer and the successful tenderer, and
- d) the schedule of deviations attached to the form of offer and acceptance, if any.

F.3.16 Issue final contract

Prepare and issue the final draft of contract documents to the successful tenderer for acceptance as soon as possible after the date of the employer's signing of the form of offer and acceptance (including the schedule of deviations, if any). Only those documents that the conditions of tender require the tenderer to submit, after acceptance by the employer, shall be included.

F.3.17 Complete adjudicator's contract

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

F.3.18 Provide copies of the contracts

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance.

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APPENDIX B
ELM SUPPLY CHAIN MANAGEMENT POLICY

Not attached to this document. The Emalahleni supply chain policy is available at the Municipality on request