

CONTRACT

PART 1: AGREEMENT AND CONTRACT DATA

C1.1 FORM OF OFFER AND ACCEPTANCE
(Agreement)

A: OFFER

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract in respect of the following works;

BID No: ALMT10/2023

EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

The Tenderer, identified in the Offer signature block below, has examined the documents listed in the Tender Data and addenda thereto as listed in the Tender Schedules, and by submitting this Offer has accepted the Conditions of Tender.

By the representative of the Tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance, the Tenderer offers to perform all of the obligations and liabilities of the Contractor under the Contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the Conditions of Contract identified in the Contract Data.

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VALUE ADDED TAX IS

AMOUNT	AMOUNT IN WORDS
R.....	

This offer may be accepted by the Employer by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document to the Tenderer before the end of the period of validity stated in the Tender Data, whereupon the Tenderer becomes the party named as the Contractor in the Conditions of Contract identified in the Contract Data.

Signature: (of person authorized to sign the tender):

Name: (of signatory in capitals):

Capacity: (of Signatory):

Name of Tenderer: (organisation):

Address:
.....

Telephone number: Fax number:

Witness:

Signature: Name:

Date:

PART C1: THE CONTRACT

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B: ACCEPTANCE

By signing this part of this form of offer and acceptance, the Employer identified below accepts the Tenderer's offer. In consideration thereof, the Employer shall pay the Contractor the amount due in accordance with the conditions of contract identified in the contract data. Acceptance of the Tenderer's offer shall form an agreement between the Employer and the Tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract are contained in:

Part C1 Agreements and contract data, (which include this agreement)

Part C2 Pricing data

Part C3 Scope of work

Part C4 Site information

and drawings and documents or parts thereof, which may be incorporated by reference into the above listed parts.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as listed in the returnable schedules as well as any changes to the terms of the offer agreed by the Tenderer and the Employer during this process of offer and acceptance, are contained in the schedule of deviations attached to and forming part of this form of offer and acceptance. No amendments to or deviations from said documents are valid unless contained in this schedule.

The Tenderer shall within two weeks after receiving a completed copy of this agreement, including the schedule of deviations (if any), contact the Employer's agent (whose details are given in the contract data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the conditions of contract identified in the contract data. Failure to fulfill any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the Tenderer receives one fully completed original copy of this document, including the schedule of deviations (if any). Unless the Tenderer (now Contractor) within five working days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the parties.

For the Employer:

Signature:

Name: (*in capitals*)

Capacity:

Name of Employer :

Address:

Witness:

Signature: Name:

Date:

C: DEVIATIONS

Notes:

- 1. The extent of deviations from the tender documents issued by the Employer before the tender closing date is limited to those permitted in terms of the conditions of tender.
- 2. A Tenderer's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid becomes the subject of agreements reached during the process of offer and acceptance, the outcome of such agreement shall be recorded here.
- 3. Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the parties becomes an obligation of the contract shall also be recorded here.
- 4. Any change or addition to the tender documents arising from the above agreements and recorded here shall also be incorporated into the final draft of the contract.

1.

Subject:

Details:

2.

Subject:

Details:

3.

Details:

Details:

4.

Subject:

Details:

5.

Subject:

Details:

PART C1: THE CONTRACT

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By the duly authorised representatives signing this agreement, the Employer and the Tenderer agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to the documents listed in the tender data and addenda thereto as listed in the returnable schedules, as well as any confirmation, clarification or changes to the terms of the offer agreed by the Tenderer and the Employer during this process of offer and acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this agreement shall have any meaning or effect in the contract between the parties arising from this agreement.

For the Tenderer:

For the Employer:

Signature

Name

Capacity

Name and address of organisation:

Name and address of organisation:

Witness Signatures

Witness Names

Date

PART C1: THE CONTRACT

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D: CONFIRMATION OF RECEIPT

The Tenderer, (now Contractor), identified in the Offer part of this Agreement hereby confirms receipt from the Employer, identified in the Acceptance part of this Agreement, of one fully completed original copy of this Agreement, including the Schedule of Deviations (if any) today:

the _____ (day)

of _____ (month)

20 _____ (year)

at _____ (place)

For the Contractor:

.....
Signature

.....
Name

.....
Capacity

**Signature and Name
of Witness:**

.....
Signature

.....
Name

C1.2 CONTRACT DATA

PART 1: DATA PROVIDED BY THE EMPLOYER CONDITIONS OF CONTRACT

The General Conditions of Contract for Construction Works Third Edition 2015 published by the South African Institution of Civil Engineering are applicable to this contract. Copies of these conditions of contract may be obtained from the South African Institution of Civil Engineering (Tel: 011-805 5947, Fax: 011-805 5971 and www.saice.org.za).

It is agreed that the only variations from the General Conditions of Contract 2015 are those set out hereafter under "Special Conditions of Contract".

SPECIAL CONDITIONS OF CONTRACT

1. GENERAL

These Special Conditions of Contract (SCC) form an integral part of the Contract. The Special Conditions shall amplify, modify or supersede, as the case may be, the General Conditions of Contract 2015 to the extent specified below, and shall take precedence and shall govern.

The clauses of the Special Conditions hereafter are numbered "SCC" followed in each case by the number of the applicable clause or sub clause in the General Conditions of Contract 2015, and the applicable heading, or (where a new special condition that has no relation to the existing clauses is introduced) by a number that follows after the last clause number in the General Conditions, and an appropriate heading.

2. AMENDMENTS TO THE GENERAL CONDITIONS OF CONTRACT

The variations to the General Conditions of Contract are:

SCC 4.4.3 For conditions regarding selection of **LOCAL EMERGING SUB-CONTRACTORS** (LES Work), see additional clauses below.

The additional clauses to the General Conditions of Contract are:

LOCAL EMERGING SUBCONTRACTORS (LES)

The Contractor shall promptly, and in any event within a reasonable time after the Commencement Date, sub-contract a portion of the Works to the value of **thirty (30) percent** of the work specified in the Schedule of Works (excluding preliminary and general costs) ("the LES Work") to one or more of the local emerging sub-contractors notified by the Employer to the Contract ("the Local Emerging Sub-Contractors"), in strict accordance with, and subject to, the requirements set out in Paragraphs (i) to (x) of this Clause, as follows:

- (i) The Contractor shall select the Local Emerging Sub-Contractor(s) to whom he is to sub-contract the LES Work by means of a competitive bidding process conducted strictly in accordance with the CIDB Standard for Uniformity in Construction Procurement and Best Practice Guidelines January 2009, and in doing so shall exercise all reasonable endeavors to ensure as inclusive and equal a distribution of the LES Work as shall be practicable amongst all the Local Emerging Sub-Contractors, taking into account price, competency and capacity only.
- (ii) The Contractor shall, without reference to the Employer, consider only the competencies and capacity of each Local Emerging Sub-Contractor, be free to identify those components of the LES Work that he shall allocate to each Local Emerging Sub-Contractor.
- (iii) Subject to paragraphs (iv) and (vii) of this clause, in the event that the Contractor fails to sub-contract and/or allocate the required quantum of LES Work or any portion thereof in accordance with this clause, the Engineer may either a) apply a penalty equal to 10% of the value of the shortfall, or b) make a determination regarding the setting aside of the LES Work so as to prevent the shortfall.
- (iv) Subject to paragraph (vii) of this clause, and notwithstanding paragraph (iii) of this clause, in the event that the Contractor fails to sub-contract and/or allocate the required quantum of LES Work or any portion thereof in accordance with this clause by reason of his inability to reach agreement on price with one or more of the Local Emerging SubContractor(s), the Engineer may, in his absolute discretion, advise the Employer to allow an increase in the Contractor's rates to so as to facilitate successful price negotiation. In the event that the Employer refuses to authorise an increase to the Contractor's rates or, in the event that the authorised increase in rates fails to facilitate successful negotiation between the Contractor and the relevant Local Emerging Sub- Contractor(s), the Contractor shall be relieved of his obligation to sub-contract the relevant portion of LES Work, always subject to paragraph (vii) of this clause.
- (v) The rates to be applied by the Contractor in the sub-contracts with the Local Emerging Sub-Contractors for the LES Work shall at all times be based strictly on the rates applicable to the Contractor under the Contract, save for any adjustments allowed in terms of paragraph (iv) above.

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- (vi) The Contractor shall apply the same rates to each Local Emerging Sub-Contractor in respect of each component of the LES Work, such that, in the event that more than one Local Emerging Sub-Contractor is successfully selected for a single component of the LES Work, the same rates shall apply to each of the selected Local Emerging Sub-Contractors in respect of the said single component.
- (vii) The Contractor shall not be under any obligation to employ a Local Emerging Sub-Contractor against whom the Contractor raises reasonable objection by written notice to the Engineer as soon as practicable, with supporting particulars in writing. In the event of failure on the part of the Contractor to prove reasonable objection to the satisfaction of the Engineer, the Engineer's determination shall be final and binding.
- (viii) The Contractor shall be entitled to include within the Contract Price a maximum management fee of 10% in excess of the rates paid to the Local Emerging Sub-Contractors.
- (ix) When tendering the Contractor shall have exercised all reasonable care not to distort any rates in such a way as to hinder or preclude his obligations under this clause, and, in the event that the Engineer determines the setting aside of the LES Work in terms of paragraph (iii) above, the Contractor shall be prevented from arguing that such LES Work is reserved not to be subcontracted.
- (x) The Contractor shall submit a priced copy of the final agreed version of each proposed sub-contract with a Local Emerging Sub-Contractor ("the Final Draft LES Sub- Contract") to the Employer prior to the execution of such sub-contract. In the event that the Employer, in consultation with the Engineer, deems the price or any other term of any Final Draft LES Sub-Contract to be unduly onerous or unfair to the Local Emerging SubContractor concerned, the Contractor shall modify the price and/or terms in accordance with the Engineer's reasonable instructions.

In sub-contracting the LES Work, the Contractor shall be responsible for performing the LES Work as if he had not sub-contracted. The Contractor shall be liable for the acts and omissions of the employees, sub-contractors and agents of the Local Emerging Sub-Contractors as if they were his own employees, sub-contractors and agents.

CONDITIONS OF CONTRACT FOR LABOUR-INTENSIVE CONSTRUCTION

Payment for the labour-intensive component of the works

Payment for works identified in the Scope of Work as being labour-intensive shall only be made in accordance with the provisions of the Contract if the works are constructed strictly in accordance with the provisions of the scope of work.

Any non-payment for such works shall not relieve the Contractor in any way from his obligations either in contract or in delict.

Applicable labour laws

The Ministerial Determination, Special Public Works Programmes, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of Labour in Government Notice N° R63 of 25 January 2002 shall apply to works described in the scope of work as being labour intensive and which are undertaken by unskilled or semi-skilled workers, as reproduced below.

1 Introduction

1.1 This document contains the standard terms and conditions for workers employed in elementary occupations on a Special Public Works Programme (SPWP). These terms and conditions do NOT apply to persons employed in the supervision and management of a SPWP.

In this document –

“department” means any department of the State, implementing agent or contractor;

“employer” means any department, implementing agency or contractor that hires workers to work in elementary occupations on a SPWP;

“worker” means any person working in an elementary occupation on a SPWP; “elementary occupation” means any occupation involving unskilled or semi-skilled work; “management” means any person employed by a department or implementing agency to administer or execute an SPWP;

“task” means a fixed quantity of work;

“task-based work” means work in which a worker is paid a fixed rate for performing a task;

“task-rated worker” means a worker paid on the basis of the number of tasks completed;

“time -rated worker” means a worker paid on the basis of the length of time worked.

2 Terms of Work

2.1 Workers on a SPWP are employed on a temporary basis.

2.2 A worker may NOT be employed for longer than 24 months in any five-year cycle on a SPWP.

2.3 Employment on a SPWP does not qualify as employment as a contributor for the purposes of the Unemployment Insurance Act 30 of 1966.

3 Normal Hours of Work

3.1 An employer may not set tasks or hours of work that require a worker to work–

(a) more than forty hours in any week (b)
on more than five days in any week; and (c)
for more than eight hours on any day.

3.2 An employer and worker may agree that a worker will work four days per week.

The worker may then work up to ten hours per day.

3.3 A task-rated worker may not work more than a total of 55 hours in any week to complete the tasks allocated (based on a 40-hour week) to that worker.

4 Meal Breaks

4.1 A worker may not work for more than five hours without taking a meal break of at least thirty minutes duration.

4.2 An employer and worker may agree on longer meal breaks.

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4.3 A worker may not work during a meal break. However, an employer may require a worker to perform duties during a meal break if those duties cannot be left unattended and cannot be performed by another worker. An employer must take reasonable steps to ensure that a worker is relieved of his or her duties during the meal break.

4.4 A worker is not entitled to payment for the period of a meal break. However, a worker who is paid on the basis of time worked must be paid if the worker is required to work or to be available for work during the meal break.

5 Special Conditions for Security Guards

5.1 A security guard may work up to 55 hours per week and up to eleven hours per day.

5.2 A security guard who works more than ten hours per day must have a meal break of at least one hour or two breaks of at least 30 minutes each.

6 Daily Rest Period

Every worker is entitled to a daily rest period of at least eight consecutive hours. The daily rest period is measured from the time the worker ends work on one day until the time the worker starts work on the next day.

7 Weekly Rest Period

Every worker must have two days off every week. A worker may only work on their day off to perform work which must be done without delay and cannot be performed by workers during their ordinary hours of work ("emergency work").

8 Work on Sundays and Public Holidays

8.1 A worker may only work on a Sunday or public holiday to perform emergency or security work.

8.2 Work on Sundays is paid at the ordinary rate of pay.

8.3 A task-rated worker who works on a public holiday must be paid –

(a) the worker's daily task rate, if the worker works for less than four hours; (b) double the worker's daily task rate, if the worker works for more than four hours.

8.4 A time-rated worker who works on a public holiday must be paid –

(a) the worker's daily rate of pay, if the worker works for less than four hours on the public holiday; (b) double the worker's daily rate of pay, if the worker works for more than four hours on the public holiday.

9 Sick Leave

9.1 Only workers who work four or more days per week have the right to claim sickpay in terms of this clause.

9.2 A worker who is unable to work on account of illness or injury is entitled to claim one day's paid sick leave for every full month that the worker has worked in terms of a contract.

9.3 A worker may accumulate a maximum of twelve days' sick leave in a year.

9.4 Accumulated sick-leave may not be transferred from one contract to another contract.

9.5 An employer must pay a task-rated worker the worker's daily task rate for a day's sick leave.

9.6 An employer must pay a time-rated worker the worker's daily rate of pay for a day's sick leave.

9.7 An employer must pay a worker sick pay on the worker's usual payday.

9.8 Before paying sick-pay, an employer may require a worker to produce a certificate stating that the worker was unable to work on account of sickness or injury if the worker is –

· absent from work for more than two consecutive days; or · absent from work on more than two occasions in any eight-week period.

9.9 A medical certificate must be issued and signed by a medical practitioner, a qualified nurse or a clinic staff member authorised to issue medical certificates indicating the duration and reason for incapacity.

9.10 A worker is not entitled to paid sick-leave for a work-related injury or occupational disease for which the worker can claim compensation under the Compensation for Occupational Injuries and Diseases Act.

10 Maternity Leave

10.1 A worker may take up to four consecutive months' unpaid maternity leave.

10.2 A worker is not entitled to any payment or employment-related benefits during maternity leave.

10.3 A worker must give her employer reasonable notice of when she will start maternity leave and when she will return to work.

10.4 A worker is not required to take the full period of maternity leave. However, a worker may not work for four weeks before the expected date of birth of her child or for six weeks after the birth of her child, unless a medical practitioner, midwife or qualified nurse certifies that she is fit to do so.

10.5 A worker may begin maternity leave –

(a) four weeks before the expected date of birth; or

(b) on an earlier date –

(i) if a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or

(ii) if agreed to between employer and worker; or

(c) on a later date, if a medical practitioner, midwife or certified nurse has certified that the worker is able to continue to work without endangering her health.

10.6 A worker who has a miscarriage during the third trimester of pregnancy or bears a stillborn child may take maternity leave for up to six weeks after the miscarriage or stillbirth.

10.7 A worker who returns to work after maternity leave, has the right to start a new cycle of twenty-four months' employment, unless the SPWP on which she was employed has ended.

11 Family responsibility leave

11.1 Workers, who work for at least four days per week, are entitled to three days paid family responsibility leave each year in the following circumstances -

(a) when the employee's child is born; (b)

when the employee's child is sick;

(c) in the event of a death of – the employee's spouse or life partner; the employee's parent, adoptive parent, grandparent, child, adopted child, grandchild or sibling.

12 Statement of Conditions

12.1 An employer must give a worker a statement containing the following details at the start of employment –

(a) the employer's name and address and the name of the SPWP;

(b) the tasks or job that the worker is to perform; and the period for which the worker is hired or, if this is not certain, the expected duration of the contract; the worker's rate of pay and how this is to be calculated; the training that the worker will receive during the SPWP.

12.2 An employer must ensure that these terms are explained in a suitable language to any employee who is unable to read the statement.

12.3 An employer must supply each worker with a copy of these conditions of employment.

13 Keeping Records

13.1 Every employer must keep a written record of at least the following –

(a) the worker's name and position;

(b) in the case of a task-rated worker, the number of tasks completed by the worker; (c) in the case of a time-rated worker, the time worked by the worker; (d) payments made to each worker.

13.2 The employer must keep this record for a period of at least three years after the completion of the SPWP.

14 Payment

14.1 An employer must pay all wages at least monthly in cash or by cheque or into a bank account.

14.2 A task-rated worker will only be paid for tasks that have been completed.

14.3 An employer must pay a task-rated worker within five weeks of the work being completed and the work having been approved by the manager or the contractor having submitted an invoice to the employer.

14.4 A time-rated worker will be paid at the end of each month.

14.5 Payment must be made in cash, by cheque or by direct deposit into a bank account designated by the worker.

14.6 Payment in cash or by cheque must take place –

- (a) at the workplace or at a place agreed to by the worker;
- (b) during the worker's working hours or within fifteen minutes of the start or finish of work; (c) in a sealed envelope which becomes the property of the worker.

14.7 An employer must give a worker the following information in writing –

- (a) the period for which payment is made;
- (b) the numbers of tasks completed or hours worked;
- (c) the worker's earnings;
- (d) any money deducted from the payment; (e) the actual amount paid to the worker.

14.8 If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it.

14.9 If a worker's employment is terminated, the employer must pay all monies owing to that worker within one month of the termination of employment.

15 Deductions

15.1 An employer may not deduct money from a worker's payment unless the deduction is required in terms of a law.

15.2 An employer must deduct and pay to the SA Revenue Services any income tax that the worker is required to pay.

15.3 An employer who deducts money from a worker's pay for payment to another person must pay the money to that person within the time period and other requirements specified in the agreement law, court order or arbitration award concerned.

15.4 An employer may not require or allow a worker to –

- (a) repay any payment except an overpayment previously made by the employer by mistake; (b) state that the worker received a greater amount of money than the employer actually paid to the worker; or pay the employer or any other person for having been employed.

16 Health and Safety

16.1 *Employers must take all reasonable steps to ensure that the working environment is healthy and safe.*

16.2 *A worker must –*

- (a) work in a way that does not endanger his/her health and safety or that of any other person;*
- (b) obey any health and safety instruction;*
- (c) obey all health and safety rules of the SPWP;*
- (d) use any personal protective equipment or clothing issued by the employer;*
- (e) report any accident, near-miss incident or dangerous behaviour by another person to their employer or manager.*

17 Compensation for Injuries and Diseases

17.1 *It is the responsibility of the employers (other than a contractor) to arrange for all persons employed on a SPWP to be covered in terms of the Compensation for Occupational Injuries and Diseases Act, 130 of 1993.*

17.2 *A worker must report any work-related injury or occupational disease to their employer or manager.*

17.3 *The employer must report the accident or disease to the Compensation Commissioner.*

17.4 *An employer must pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months.*

The employer will be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

18 Termination

18.1 *The employer may terminate the employment of a worker for good cause after following a fair procedure.*

18.2 *A worker will not receive severance pay on termination.*

18.3 *A worker is not required to give notice to terminate employment. However, a worker who wishes to resign should advise the employer in advance to allow the employer to find a replacement.*

18.4 *A worker who is absent for more than three consecutive days without informing the employer of an intention to return to work will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.*

18.5 *A worker who does not attend required training events, without good reason, will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.*

19 Certificate of Service

19.1 On termination of employment, a worker is entitled to a certificate stating –

- (a) *the worker's full name;*
- (b) *the name and address of the employer;*
- (c) *the SPWP on which the worker worked;*
- (d) *the work performed by the worker;*
- (e) *any training received by the worker as part of the SPWP;*
- (f) *the period for which the worker worked on the SPWP;*
- (g) *any other information agreed on by the employer and worker*

CONTRACT SPECIFIC DATA

The following contract specific data are applicable to this contract.

Clause	Description
1.1.1.13	The "Defects Liability Period" is 12 months
1.1.1.14	The "Due Completion Date", or time for achieving Practical Completion is 12 months .
1.1.1.15	The "Employer" is the Chief Albert Luthuli Municipality.
1.1.1.16	The "Employer's Agent" is Mr. K. Keta of Appollo Engineering (Pty) Ltd.
1.1.1.26	The "Pricing Strategy" is re-measurement Contract.
1.2.1.2	The Employer's Agent address for receipt of communications and notices is: Telephone: (013) 752 6187 Facsimile: 013 752 4199 Address (physical): 15 Russel Street, MBOMBELA, 11200 Address (postal): P.O Box 1108, WHITE RIVER 1240
3.2.3	The Employer's Agent is required to obtain the specific approval of the Employer for the following functions or duties: a) Approve extension of time for practical completion in terms of Clause 5.12.1; b) Approve imposition of penalty for delay in terms of Clause 5.13.1; c) Issue of a Variation Order in terms of Clause 6.3.2; and d) Approve the use of contingency funds.
5.1.1 and 5.8.1	The special non-working days are public holidays, Sundays and the year-end break which commences on the first working day after 15 December and ends on the first Tuesday after 5 January of the next year.
5.3.1	The Contractor shall submit within 14 days from the Commencement Date the following documentation for approval by the Employer's Agent: a) Health and Safety Plan (Refer to Clause 4.3); b) Initial programme (Refer to Clause 5.6) and estimated cash flow; c) Security (Refer to Clause 6.2); d) Insurances (Refer to Clause 8.6); e) Proof of registration with the Workman's Compensation Commissioner; f) Valid original copy of Tax Clearance Certificate; and g) Written acceptance of appointment.
5.3.2	The time to submit the documentation required before commencement of the Works is 14 days.
5.4.1	The Site is located within inhabited areas, is generally accessible to the public and is not exclusive to the Contractor. The Contractor shall safeguard the public as statutorily required and shall coordinate assistance from the Community Liaison Officer (CLO) as nominated by the Employer.
5.8.1	The non-working days are Sundays. The special non-working days are indicated under Clause 5.1 above.

5.12	<p>FORMULA FOR EXTENSION OF TIME IN RESPECT OF ABNORMAL RAINFALL</p> <p>Extension of time in terms of Clause 5.12 of the general conditions of contract in respect of abnormal rainfall shall be determined in terms of the method below for each calendar month or part thereof, unless the project specifications determine otherwise:</p> $V = (N_w - N_n) + (R_w - R_n)/20$ <p>Where:</p> <p>V: Extension of time in calendar days for the calendar month under consideration.</p> <p>N_w: Actual number of days during the calendar month under consideration on which a rainfall of 10mm and more is recorded.</p> <p>R_w: Actual total rainfall in mm recorded during the calendar month under consideration.</p> <p>N_n: Average number of days, derived from rainfall records, on which a rainfall of 10mm and more was recorded during the relevant calendar month as per the data tabulated hereinafter.</p> <p>R_n: Average total rainfall in mm for the relevant calendar month, derived from rainfall records, as tabulated hereinafter.</p> <p>Where the extension of time due to abnormal rainfall has to be calculated for portion of a calendar month, pro rata values shall be used. Should V be negative for any particular month, and should its absolute value exceed the corresponding value of N_n, then V shall be taken as being equal to minus N_n. The total extension of time to be granted shall be the algebraic sum of all the monthly extensions, provided that if this total is negative then the time for completion shall not be reduced due to subnormal rainfall.</p> <p>The Contractor shall, at its own cost, provide and erect on the Site at a location approved of by the Employer's Agent, an approved rain gauge, which shall be fenced off in a manner which will prevent any undue interference by workmen and others. The Contractor shall, at its own cost, arrange for the reading of the rain gauge on a daily basis for the duration of the Contract. The gauge readings, as well as the date and time at which the reading was taken shall be recorded in a separate record book provided by the Contractor for this purpose. All entries in the rainfall record books shall be signed by the person taking the reading and the gauge shall be properly emptied immediately after each reading has been taken. If required, the Employer's Agent shall be entitled to witness the reading of the gauge.</p> <p>The rainfall records applicable to this Contract are those recorded at Carolina. The following values of N_n and R_n shall apply:</p>
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Clause	Description		
	MONTH	N_n (Days)	R_n (mm)
	January	14.2	125.6
	February	11.0	79.8
	March	13.0	77.2
	April	7.6	43.7
	May	2.8	14.2
	June	0.6	1.0
	July	1.7	3.3
	August	3.8	5.1
	September	5.3	32.8
	October	14.2	96.2
	November	16	106.2
	December	16.5	159.8
	Total	106.7	744.9
5.13.1	The penalty for failing to complete the Works is 0.08% of the contract amount per day, to a maximum of 5% of the contract amount.		
5.14.1	The requirements for achieving Practical Completion are set out in the Scope of Works Part C3.1.2.1.		
5.14.7	This contract does not contain multiple "Due Completion Dates".		
5.16.3	The latent defects liability period for the works is 10 years.		
6.2.1	The type of security for the due performance of the Contract shall be a Fixed Performance Guarantee of 10% of the value of the Works (Excl. Contingencies and VAT). The Performance Guarantee shall follow the suggested wording according to the pro-forma included in Section C1.3 – Performance Guarantee.		
6.5.1.2.3	The percentage allowance on the net cost of workmen and materials actually used in the completed work is 15%.		
6.8.2	<p>The Contract Price Adjustment Factor shall not be applied to this Contract.</p> <ul style="list-style-type: none"> ○ The value of the certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule with the following values: ○ The value of x = 0.10 ○ The values of the coefficients are (and the sum thereof is unity): <ul style="list-style-type: none"> ▪ a = 0.15 Labour ▪ b = 0.20 Contractor's equipment ▪ c = 0.55 Material ▪ d = 0.10 Fuel 		

PART C1: THE CONTRACT

BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

Clause	Description
	<ul style="list-style-type: none"> ○ The indices as follows are published by Statistics South Africa and shall be agreed on at commencement: <ul style="list-style-type: none"> ▪ “L” is the “Labour Index”; ▪ “P” is the “Contractor’s Equipment Index”; ▪ “M” is the “Materials Index”; and ▪ “F” is the “Fuel Index”. ○ The base month “0” is base month is: “the month prior to the closing of the Tender”. <p>The applicable month for the statement is denoted by “t”.</p>
6.8.3	Price adjustment in the cost of special materials shall be applied to this Contract.
6.10.1.5	The percentage advance on materials not yet built into the Permanent Works is 80%. The percentage advance on Plant not yet supplied to Site 80% (if plant is fabricated or stored on other places than the Site).
6.10.3	The limit on retention is 10% of the Contract Price
8.6.1	The following insurances shall be effected and maintained in the joint names of the Employer and Contractor:
8.6.1.1	Insurance of the Works, Plant and materials for the period of Care of the Works for a sum insured that is the aggregate of:
8.6.1.1.1	The Contract Price (Excl. Contingencies and VAT);
8.6.1.1.2	The value of Plant and materials supplied by the Employer to be included in the insurance is R 0.00 (Excl. VAT); and
8.6.1.1.3	The amount to cover professional fees payable in respect of the repair or reinstatement of damage to the works or said movables is 14% of the required amount.
8.6.1.2	The Contractor is responsible for Special Risks Insurance.
8.6.1.3	Liability insurance of at least R10 000 000.00 with the number of events being unlimited.
8.6.5	The insurances shall be effected with an insurance company registered in South Africa.

PART C1: THE CONTRACT

BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

Clause	Description
10.5.2	Dispute resolution shall be by ad-hoc adjudication.
10.5.3	The number of Adjudication Board Members to be appointed is one or three.
10.7.1	In the event of disagreement with the Adjudication Board's decision the determination of disputes shall be by arbitration.
10.8.1	In the event of disagreement with the Arbitrator the determination of disputes shall be by court proceedings.
	ADDITIONAL CLAUSES
4.4.2	Subcontracting The contractor will be required to subcontract up to a maximum of 30% of the work to local subcontractors. The work to be subcontracted will be agreed with the Employer

SIGNATURE:
 (of person authorised to sign on behalf of the Tenderer)

DATE:

PART 2 : DATA TO BE PROVIDED BY CONTRACTOR

REF. CLAUSE No	DATA BY CONTRACTOR																
1.1.1.9	Name of Contractor:																
																
1.2.1.2	Address of Contractor:																
	<u>Physical:</u> <u>Postal:</u>																
																
																
	<u>E-mail:</u>																
	<u>Telephone No:</u> <u>Fax No:</u>																
1.1.1.14	Time for achieving Practical Completion of the whole of the Works is: 12 months																
6.2.1	<p>The security to be provided by the Contractor shall be one of the following: <i>VAT is to be excluded from the Contract Sum/ value of Works for calculating the percentages</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Type of Security</th><th>Contractor's choice <i>Indicate "Yes" or No"</i></th></tr> </thead> <tbody> <tr> <td><i>Is Value Added Tax included in the Contract Sum and value of Works for calculating percentages?</i></td><td> </td></tr> <tr> <td>Cash deposit of% of the Contract Sum</td><td> </td></tr> <tr> <td>Performance Guarantee of% of the Contract Sum</td><td> </td></tr> <tr> <td>Retention of% of the value of Works</td><td> </td></tr> <tr> <td>Cash Deposit of% of the Contract Sum plus Retention of% of the value of Works</td><td> </td></tr> <tr> <td>Performance Guarantee of% of the Contract Sum plus Retention of% of the value of Works</td><td> </td></tr> <tr> <td> </td><td> </td></tr> </tbody> </table>	Type of Security	Contractor's choice <i>Indicate "Yes" or No"</i>	<i>Is Value Added Tax included in the Contract Sum and value of Works for calculating percentages?</i>		Cash deposit of% of the Contract Sum		Performance Guarantee of% of the Contract Sum		Retention of% of the value of Works		Cash Deposit of% of the Contract Sum plus Retention of% of the value of Works		Performance Guarantee of% of the Contract Sum plus Retention of% of the value of Works			
Type of Security	Contractor's choice <i>Indicate "Yes" or No"</i>																
<i>Is Value Added Tax included in the Contract Sum and value of Works for calculating percentages?</i>																	
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Performance Guarantee of% of the Contract Sum																	
Retention of% of the value of Works																	
Cash Deposit of% of the Contract Sum plus Retention of% of the value of Works																	
Performance Guarantee of% of the Contract Sum plus Retention of% of the value of Works																	
6.8.3	Price variation for special materials:(<i>Indicate "Yes" or No"</i>)																

PART C1: AGREEMENT AND CONTRACT DATA
 BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

REF. CLAUSE No	DATA BY CONTRACTOR		
	Type of Special Material	Unit	Rate
6.8.2	Rate of price for base month of:		

Clause 4.4.3: Selection of Sub-Contractors

The Tenderer shall list on FORM A10 the Subcontractors and Suppliers whom he intends to appoint in respect of the various specialist items of work to be done or goods supplied on this contract. Alternatives may be mentioned.

The Tenderer shall state whether he intends to carry out any specialised work or supply of goods himself.

Acceptance of this tender shall not be construed as approval of all or any of the listed specialist Subcontractors or Suppliers. Should any of or all of the specialist Subcontractors or Suppliers not be approved subsequent to the acceptance of the tender, it shall in no way invalidate this tender, and the tendered unit rates for the various items of work shall remain final and binding, even in the event of a Subcontractor or Supplier not listed below being approved by the Employer.

The sub-contractors listed exclude the identified local emerging contractors who will be identified by the Employer.

SIGNATURE:
 (of person authorised to sign on behalf of the Tenderer)

DATE:

C1.3 FORMS OF SECURITIES

FORMS FOR COMPLETION BY THE CONTRACTOR THE FOLLOWING FORMS ARE TO BE COMPLETED BY THE CONTRACTOR AFTER THE TENDER HAS BEEN AWARDED TO THE SUCCESSFUL TENDERER

Form	Page
C1.3.1 Form of Guarantee	F.2
C1.3.2 Agreement with Adjudicator	F.6
C1.3.3 Agreement in terms of the Occupational Health and Safety Act	F.8
C1.3.4 Blasting Indemnity	F.10

The forms will be completed by the Contractor who will be instructed to do so in the Form of Acceptance. The completed forms will become part of the Contract.

The Form of Guarantee is a pro forma document. An original document, from a financial institution, with the same text will be provided by the Contractor within the time stated in the Contract Data. Only a Bank or approved Insurance Company or Guarantee Corporation is acceptable as Guarantor.

Pro Forma Performance Guarantee

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means: _____

Physical address: _____

"Employer" means: Chief Albert Luthuli Municipality

"Contractor" means: _____

"Employer's Agent" means: _____

"Works" means: _____

"Site" means: _____

"Contract" means: The Agreement made in terms of the Form of Offer and Acceptance and such amendments or additions to the Contract as may be agreed in writing between the parties.

"Contract Sum" means: The accepted amount inclusive of tax of R_____

Amount in words: _____

"Guaranteed Sum" means: The maximum aggregate amount of R_____

Amount in words: _____

Type of Performance Guarantee: _____ (*Insert Variable or Fixed*)

"Expiry Date" means: _____ (*Give date*) or any other later date set by the Contractor and/or Employer provided such instruction is received prior to the Expiry Date as indicated here.

CONTRACT DETAILS

Employer's Agent issues: Interim Payment Certificates, Final Payment Certificate and the Certificate of Completion of the Works as defined in the Contract.

1. VARIABLE PERFORMANCE GUARANTEE

- 1.1 Where a Variable Performance Guarantee has been selected, the Guarantor's liability shall be limited during the following periods to diminishing amounts of the Guaranteed Sum as follows:

- 1.1.1 ~~From and including the date of signing the Performance Guarantee up to and including the date of the interim payment certificate certifying, for the first time, more than 50% of the Contract Sum:~~

R_____

Amount in words_____

- 1.1.2 From the day following the date of the said interim payment certificate up to and including the Expiry Date, or the date of issue by the Employer's Agent of the Certificate of Completion of the Works, whichever occurs first:

R_____

Amount in words_____

- 1.2 The Employer's Agent and/or the Employer shall advise the Guarantor in writing of the date on which the interim payment certificate certifying, for the first time, more than 50% of the Contract Sum, has been issued and the date on which the Certificate of Completion of the Works has been issued.

2. FIXED PERFORMANCE GUARANTEE

- 2.1 Where a Fixed Performance Guarantee has been selected, the Guarantor's liability shall be limited to the amount of the Guaranteed Sum.
- 2.2 The Guarantor's period of liability shall be from and including the date on which the Performance Guarantee is signed, up to and including the Expiry Date, or the date of issue by the Employer's Agent of the Certificate of Completion of the Works, or the date of payment in full of the Guaranteed Sum, whichever occurs first.
- 2.3 The Employer's Agent and/or the Employer shall advise the Guarantor in writing of the date on which the Certificate of Completion of the Works has been issued.

3. CONDITIONS APPLICABLE TO VARIABLE AND FIXED PERFORMANCE GUARANTEES

- 3.1 The Guarantor hereby acknowledges that:
- 3.1.1 Any reference in this Performance Guarantee to the Contract is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship.
- 3.1.2 Its obligation under this Performance Guarantee is restricted to the payment of money.
- 3.2 Subject to the Guarantor's maximum liability referred to in 1.1 or 2.1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 3.2.1 to 3.2.3:

- 3.2.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Employer's Agent in an Interim or Final Payment Certificate has not been made in terms of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of 3.2.2;
- 3.2.2 A first written demand issued by the Employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 3.2.1 and the sum certified has still not been paid;
- 3.2.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 3.2.
- 3.3 Subject to the Guarantor's maximum liability referred to in 1.1 or 2.1, the Guarantor undertakes to pay to the Employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:
 - 3.3.1 the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 3.3;
 - 3.3.2 a provisional or final sequestration or liquidation court order has been granted against the Contractor and that the Performance Guarantee is called up in terms of 3.3; and
 - 3.3.3 The aforesaid written demand is accompanied by a copy of the notice of termination and/or the provisional/final sequestration and/or the provisional liquidation court order.
- 3.4 It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 3.2 and 3.3 shall not exceed the Guarantor's maximum liability in terms of 1.1 or 2.1.
- 3.5 Where the Guarantor has made payment in terms of 3.3, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.
- 3.6 Payment by the Guarantor in terms of 3.2 or 3.3 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.
- 3.7 Payment by the Guarantor in terms of 3.3 will only be made against the return of the original Performance Guarantee by the Employer.
- 3.8 The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may consider fit and the Guarantor shall not have the

PART C1: AGREEMENT AND CONTRACT DATA
BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.

3.9 The Guarantor chooses the physical address as stated above for the service of all notices for all purposes in connection herewith.

3.10 This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 1.1.2 or 2.2, where after no claims will be considered by the Guarantor.

The original of this Guarantee shall be returned to the Guarantor after it has expired.

3.11 This Performance Guarantee, with the required demand notices in terms of 3.2 or 3.3, shall be regarded as a liquid document for the purposes of obtaining a court order.

3.12 Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrates' Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

Signed at: _____

Date: _____

Guarantor's signatory (1): _____

Capacity: _____

Guarantor's signatory (2): _____

Capacity: _____

Witness signatory (1) _____

Witness signatory (1) _____

C1.3.2: AGREEMENT WITH ADJUDICATOR

This agreement is made on the.....day of 20.....between: the Employer
(name of company / organisation).....
of (address).....
.....and the
Contractor
(name of company / organisation)
of (address).....
.....
(hereinafter called **the Parties**)

and

(name).....
of (address)
.....
(hereinafter called **the Adjudicator**)

Disputes or differences may arise/have arisen* between the Parties under a Contract dated.....
and known as Contract No.....
(Contract
title).....

and these disputes or differences shall be/have been* referred to adjudication in accordance with the
CIDB Adjudication Procedure, (hereinafter called "**the Procedure**") and the Adjudicator may be or has
been requested to act. (* Delete as necessary)

IT IS NOW AGREED as follows:

1. The rights and obligations of the Adjudicator and the Parties shall be as set out in the Procedure.
2. The Adjudicator hereby accepts the appointment and agrees to conduct the adjudication in accordance with the Procedure.
3. The Parties bind themselves jointly and severally to pay the Adjudicator's fees and expenses in accordance with the Procedure as set out in the Contract Data.
4. The Parties and the Adjudicator shall at all times maintain the confidentiality of the adjudication and shall endeavour to ensure that anyone acting on their behalf or through them will do likewise, save with the consent of the other Parties which consent shall not be unreasonably refused.
5. The Adjudicator shall inform the Parties if he intends to destroy the documents which have been sent to him in relation to the adjudication and he shall retain documents for a further period at the request of either Party.

SIGNED by:

(Signature): (Signature): (Signature):
Name: Name: Name:

who warrants that he/ she is authorised to sign for and
who warrants that he/ she is duly authorised to sign for
the **Adjudicator** in the duly presence of on behalf of the

First Party in and on behalf of the **Second** the presence of
Party in the presence of

Witness: **Witness:** **Witness:**
(Signature)..... (Signature)..... (Signature).....

Name: Name: Name:.....

Address: Address: Address:

.....

.....

Date: Date: Date:

..

C1.3.3: AGREEMENT IN TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT No 85 OF 1993

THIS AGREEMENT is made between **Chief Albert Luthuli Municipality** (hereinafter called the **EMPLOYER** of the one part, herein represented by:

.....
in his capacity as:
; AND:
.....

(hereinafter called the **CONTRACTOR**) of the other part, herein represented by
.....
in his capacity as:
duly authorised to sign on behalf of the Contractor.

WHEREAS the **CONTRACTOR** is the Mandatory of the **EMPLOYER** in consequence of an agreement between the **CONTRACTOR** and the **EMPLOYER** in respect of

BID No:.....
.....
.

AND **WHEREAS** the **EMPLOYER** and the **CONTRACTOR** have agreed to enter into an agreement in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act No 85 of 1993, as amended by OHSA Amendment Act No 181/1993 (hereinafter referred to as the **ACT**);

NOW THEREFORE the parties agree as follows:

- 1. The **CONTRACTOR** undertakes to acquaint the appropriate officials and employees of the **CONTRACTOR** with all relevant provisions of the **ACT** and the regulations promulgated in terms thereof.
- 2. The **CONTRACTOR** undertakes to fully comply with all relevant duties, obligations and prohibitions imposed in terms of the **ACT** and Regulations: Provided that should the **EMPLOYER** have prescribed certain arrangements and procedures that same shall be observed and adhered to by the **CONTRACTOR**, his officials and employees. The **CONTRACTOR** shall bear the onus of acquainting himself/herself/itself with such arrangements and procedures.
- 3. The **CONTRACTOR** hereby accepts sole liability for such due compliance with the relevant duties, obligations, prohibitions, arrangements and procedures, if any, imposed by the **ACT** and Regulations, and the **CONTRACTOR** expressly absolves the **EMPLOYER** and the Employer's **CONSULTING ENGINEERS** from being obliged to comply with any of the aforesaid duties, obligations, prohibitions, arrangements and procedures in respect of the work included in the contract.
- 4. The **CONTRACTOR** agrees that any duly authorised officials of the **EMPLOYER** shall be entitled, although not obliged, to take such steps as may be necessary to ensure that the **CONTRACTOR** has complied with his undertakings as more fully set out in paragraphs 1 and

- 2 above, which steps may include, but shall not be limited to, the right to inspect any appropriate site or premises occupied by the CONTRACTOR, or to take such steps it may deem necessary to remedy the default of the CONTRACTOR at the cost of the CONTRACTOR.
5. The CONTRACTOR shall be obliged to report forthwith to the EMPLOYER any investigation, complaint or criminal charge which may arise as a consequence of the provisions of the ACT and Regulations, pursuant to work performed in terms of this agreement, and shall, on written demand, provide full details in writing of such investigation, complaint or criminal charge.

Thus signed atfor and on behalf of the **CONTRACTOR**

on this the day of 20.....

SIGNATURE:

NAME AND SURNAME:

CAPACITY:

WITNESSES: 1.

2.

Thus signed at for and on behalf of the **EMPLOYER** on

the day of 20.....

SIGNATURE:

NAME AND SURNAME:

CAPACITY:

WITNESSES: 1.

1.

C.1.3.4 BLASTING INDEMNITY

Contract No. _____ Given by _____

*Company Registration No. _____

Address _____

a *Company incorporated with limited liability according to the company laws of the Republic of South

Africa, *Partnership, *Close Corporation, *Public Company (hereinafter called the Contractor),

represented herein by _ in his capacity as the Contractor's

_____ duly authorised hereto by a resolution of the Contractor dated

_____ a certified copy of which resolution is attached to this Indemnity.

WHEREAS the Contractor has entered into a Contract with the Chief Albert Luthuli Municipality (hereinafter called the Company) for,

_____ and the Company requires this Indemnity from the Contractor

NOW THEREFORE THIS DEED WITNESSETH that the Contractor does hereby indemnify and hold harmless the Company in respect of all loss or damage that may be incurred or sustained by the Company by reason of or in any way arising out of or caused by blasting operations that may be carried out by the Contractor in connection with the aforementioned Contract and also in respect of all claims that may be made against the Company in consequence of such blasting operations, by reason of or in any way arising out of any accidents or damage to persons, life or property or any other cause whatsoever, and also in respect of all legal or other expenses that may be incurred by the Company in examining, resisting or settling any such claims; for the due performance of which the Contractor binds itself according to law.

THUS DONE AND SIGNED for and on behalf of the Contractor at _____ on the

_____ day of _____ 20____ in the presence of the subscribing witnesses.

AS WITNESSES

1. _____
SIGNATURE

2. _____
DESIGNATION OF SIGNATORY

PART C2: PRICING DATA

PRICING INSTRUCTIONS	C2.1
BILL OF QUANTITIES	C2.4

PRICING INSTRUCTIONS**C2.1 Pricing Instructions**

- 1 The Conditions of Contract, the Contract Data, the Specifications (including the Project Specifications) and the Drawings shall be read in conjunction with the Bill of Quantities.
- 2 The Bill comprises items covering the Contractor's profit and costs of general liabilities and of the construction of Temporary and Permanent Works.

Although the Tenderer is at liberty to insert a rate of his own choosing for each item in the Bill, he should note the fact that the Contractor is entitled, under various circumstances, to payment for additional work carried out and that the Engineer is obliged to base his assessment of the rates to be paid for such additional work on the rates the Contractor inserted in the Bill. Clause 8 of each Standardized Specification, and the measurement and payment clause of each Particular Specification, read together with the relevant clauses of the Project Specifications, all set out which ancillary or associated activities are included in the rates for the specified operations.

- 3 Descriptions in the Bill of Quantities are abbreviated and may differ from those in the Standardized and Project Specifications. No consideration will be given to any claim by the Contractor submitted on such a basis. The Bill has been drawn up generally in accordance with the latest issue of Civil Engineering Quantities from the South African Institution of Civil Engineers. Should any requirement of the measurement and payment clause of the appropriate Standardized or Project Specification(s) be contrary to the terms of the Bill or, when relevant, to the Civil Engineering Quantities, the requirement of the appropriate Standardized, Project, or Particular Specification as the case may be, shall prevail.
- 4 Unless stated to the contrary, items are measured net in accordance with the Drawings without any allowance having been made for waste.
- 5 The amounts and rates to be inserted in the Bill of Quantities shall be the full inclusive amounts to the Employer for the work described under the several items. Such amounts shall cover all the costs and expenses that may be required in and for the construction of the work described, and shall cover the costs of all general risks, profits, taxes (but excluding value-added tax), liabilities and obligations set forth or implied in the documents on which the Tender is based.
- 6 The tenderer has to complete the schedule of quantities in full. Items against which no price is entered are to be considered as incomplete and invalidate the tender. Items against which **N/A**, **left blank** or **–** (dash) is entered are to be considered as incomplete and will also invalidate the tender. Items against which **Nil** or **zero (0)** is entered are to be considered to be fully priced and the tenderer will provide the items in questions as specified at **zero (0)** or **Nil** price

Rates are to be inserted in **BLACK ink**. Any amendments must be neatly crossed and initialled. The use of correction ink is **NOT** permitted.

The Tenderer shall also fill in a rate against the items where the words "rate only" appear in the amount column. Although no work is foreseen under these items and no quantities are consequently given in the quantity column, the tendered rates shall apply should work under these items actually be required.

A Tenderer is **NOT PERMITTED** to group a number of items together and tender one sum for such group of items. **IF THIS IS DONE IT WILL RENDER THE TENDER INVALID.**

The tendered rates, prices and sums shall, subject only to the provisions of the Conditions of Contract, remain valid irrespective of any change in the quantities during the execution of the Contract.

PART C2: PRICING DATA

BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

- 7 The quantities of work as measured and accepted and certified for payment in accordance with the Conditions of Contract, and not the quantities stated in the Bill of Quantities, will be used to determine payments to the Contractor. The validity of the Contract shall in no way be affected by differences between the quantities in the Bill of Quantities and the quantities certified for payment.

Ordering of materials are not to be based on the Bill of Quantities, but only on information issued for construction purposes.

- 8 For the purposes of this Bill of Quantities, the following words shall have the meanings hereby assigned to them:

Unit	:	The unit of measurement for each item of work as defined in the Standardized, Project or Particular Specifications
Quantity	:	The number of units of work for each item
Rate	:	The payment per unit of work at which the Tenderer tenders to do the work
Amount	:	The quantity of an item multiplied by the tendered rate of the (same) item
Sum	:	An amount tendered for an item, the extent of which is described in the Bill of Quantities, the Specifications or elsewhere, but of which the quantity of work is not measured in units

Abbreviations used in the Bill of Quantities are as follows:

Ha	=	hectare
h	=	hour
kl	=	kilolitre
kg	=	kilogram
km	=	kilometre
kW	=	kilowatt
km-pass	=	kilometre pass
MN	=	Mega Newton
kPa	=	kilopascal
MN.m	=	Mega Newton- metre
l	=	litre
%	=	percentage
m	=	metre
PC Sum	=	Prime Cost Sum
mm	=	millimetre
P Sum	=	Provisional Sum
PS/m	=	Provisional Sum per month
PS/d	=	Provisional Sum per day
Sum/wd	=	Sum per working day
m ²	=	square metre
No.	=	number
m ² .pass	=	square metre-pass
R/Only	=	Rate Only
m ³	=	cubic metre
Sum	=	lump sum
m ³ .km	=	cubic metre-kilometre
t	=	ton (1 000 kg)
MPa	=	Mega Pascal
W/day	=	Work day

PART C2: PRICING DATA

BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

% = percentage
mth = month

The parts of the contract to be constructed using labour-intensive methods have been marked in the Bill of Quantities with the letters LI in a separate column filled in against every item so designated.

LABOUR INTENSIVE WORK

The works, or parts of the works so designated, are to be constructed using labour intensive methods only. The use of plant to provide such works, other than plant specifically provided for in the scope of work, is a variation to the contract. The items marked with the letters LI are not necessarily an exhaustive list of all the activities which must be done by hand, and this clause does not over-ride any of the requirements in the generic labour-intensive specification.

Payment for items which are designated to be constructed labour-intensively will not be made unless they are constructed using labour-intensive methods. Any unauthorised use of plant to carry out work which was to be done labour-intensively will not be condoned and any works so constructed will not be certified for payment.

C2.2 BILL OF QUANTITIES

SUMMARY OF BILL OF QUANTITIES – CIVIL ENGINEERING WORKS

SECTION A	PRELIMINARY AND GENERAL.....	R
SECTION B	EARTHWORKS	R
SECTION C	CONCRETE WORKS	R
SECTION D	BRICKWORK AND PLASTER.....	R
SECTION E	STEELWORKS AND METAL WORKS.....	R
SECTION F	PIPEWORK.....	R
SECTION G	SUNDRIES.....	R
SECTION H	DAYWORKS	R
SUBTOTAL	.....	R
ADD CONTINGENCIES @ 10%.....	.....	R
SUBTOTAL	.....	R
ADD CONTRACT PRICE ADJUSTMENT (CPA) @ 8% .....	.....	R
SUBTOTAL	.....	R
ADD VAT @ 15 % .....	.....	R
SUB TOTAL CIVIL ENGINEERING WORKS	.....	R

SIGNED ON BEHALF OF TENDERER:
(of person authorised to sign on behalf of the Tenderer)

PART C3: SCOPE OF WORKS

BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

C2.2.1 BILL OF QUANTITIES

SUMMARY OF BILL OF QUANTITIES – MECHANICAL AND ELECTRICAL WORKS

SECTION 1	PRELIMINARY AND GENERAL	R
SECTION 2	SCREENS AND DE-GRITTERS	R
SECTION 3	MECHANICAL MIXERS AND AERATORS.....	R
SECTION 4	CLARIFIER EQUIPMENT	R
SECTION 5	PUMPING EQUIPMENT	R
SECTION 6	ELECTRICAL EQUIPMENT	R
SECTION F	MISCELLANEOUS WORKS	R
SUBTOTAL	.....	R
ADD CONTINGENCIES @ 10% .....	.....	R
SUBTOTAL	.....	R
ADD CONTRACT PRICE ADJUSTMENT (CPA) @ 5% .....	.....	R
SUBTOTAL	.....	R
ADD VAT @ 15 % .....	.....	R
SUB TOTAL MECHANICAL AND ELECTRICAL WORK		R

SIGNED ON BEHALF OF TENDERER:
(of person authorised to sign on behalf of the Tenderer)

PART C3: SCOPE OF WORKS

BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

SUB TOTAL CIVIL ENGINEERING WORKS R.....

SUB TOTAL MECHANICAL AND ELECTRICAL WORKS R.....

GRAND TOTAL CARRIED TO FORM OF OFFER PAGE C1.1 R.....

SIGNED ON BEHALF OF TENDERER:
(of person authorised to sign on behalf of the Tenderer)

THE CONTRACT
PART C3: SCOPE OF WORKS

PART A- CIVIL ENGINEERING WORKS

PART C3:

SCOPE OF WORK

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Part C3: Scope of Work

3.1 DESCRIPTION OF WORKS

C3.1.1 EMPLOYERS OBJECTIVES

This project forms part of the Chief Albert Luthuli Municipality's overall development of infrastructure within the municipality's boundaries.

C3.1.2 OVERVIEW OF THE WORKS

The Municipality is a Water Services Authority (WSA) as well as Water Service Provider (WSP) in terms of the Municipal System Act, Act No. 32 of 200 which provided the powers and functions to the local authority to regulate the provision of municipal services. CALLM is responsible for the provision of sanitation services to all the urban and rural towns in its area of jurisdiction.

Under this Bid No. ALMT10/2023, Chief Albert Luthuli Municipality intends to construct civil works to upgrade the Emanzana Wastewater Treatment Works from a maturation ponds system to a biological nutrient removal (BNR) system. Simultaneously with this contract, the complimentary mechanical and electrical works has been advertised as follows:

Contract No.	Description
Bid No.ALMT10/2023	Supply, Installation and Commissioning of Electro-Mechanical Equipment for the 1.4Ml/d Biological Nutrient Removal Upgrade of the Emanzana Wastewater Treatment Works

C3.1.2.1 Extent of the Works

The work to be executed under this contract includes inter alia, for the supply of all prescribed materials, the plant and labour involved for the construction of the following, and not limited to the same for the following:

- Inlet works composed of screening facility in the form of channels equipped with the following:
 - a manual hand raked screen
 - Suitable sized inlet works channel with weir
- 1 No Bioreactors each comprising the following:
 - 1 100 m3 anoxic zone, equipped with 1 No. (5.5kW) Anoxic Mixers
 - 600 m3 aeration zone, equipped with 2 No. x 22kW surface aerators
 - A Mixed Liquor Recycle (MLR) pumpstation with 2 No. MLR pumps delivering up to 40 l/sec,
- 1 No. clarifiers of 20m diameter, equipped with half bridge centre mechanism,
- Pump stations with each pumpstation equipped with 2 No. pumpsets in 1 duty/1 standby configuration;
 - Bioreactor/ Clarifier Drainage (RCD) with a duty point of 20 l/s x 15m head
 - Return Activated Sludge (RAS) Pumpstation with a duty point of 10l/s x 10 m head
 - Waste Activated Sludge (WAS) Pumpstation with a duty point of 5l/s x 10m head.
 - Sludge Drying Beds (SDB) Pumpstation with a duty of 5l/s x 15m head,

- Effluent Discharge Pumpstation with a duty point of 100 l/s x 22m head
- 75m³ Chlorine contact tank complete with chlorine dosing equipment with a dosing capacity of 17kg/h,
- Control Building and pumpstation electrical works and area lighting
- Flow metering equipment
 - Ultrasonic flowmeter capable of measuring incoming raw sewage flows of up to 8.5Ml/day at PWWF,
 - 200mm diameter RAS Magflow meter
 - 300mm diameter effluent discharge Magflow meter.
- Laboratory equipment

C3.1.2.2 Location of the Works

Emanzana Waste Water Treatment Works is located on the banks of the Seekoeispruit in the township of Emanzana, Mpumalanga within the jurisdictional boundary of Chief Albert Luthuli Local Municipality (CALLM).

The details of the project location are displayed in the table and figure below.

Table 1: Project location details

Town	Emanzana
Province	Mpumalanga Province
District	Gert Sibande District Municipality
Locality	Chief Albert Luthuli Local Municipality
Co-ordinates	25° 57' 34.37" S
	30° 35' 21.06" E

C3.1.3 Labour Intensive Construction

Labour Intensive Construction shall mean the economically efficient employment of as great a portion of labour as is technically feasible to produce a standard of construction as demanded by the Specifications with completion by the Due Completion Date, thus the effective substitution of labour for equipment.

Appropriate portions of the Works included in the Contract shall be executed using Labour Intensive Construction methods.

Except where the use of plant is essential in order, in the opinion of the Engineer, to meet the specified requirements by the Due Completion Date, the Contractor shall use only hand tools and equipment in the construction of those portion(s) of the Works that are required in terms of these Project Specifications to be constructed using Labour Intensive Construction methods.

These portions of the Works shall be constructed utilising only locally employed labour and/or the labour of local sub-contractors, supplemented to the extent necessary and unavoidable by the Contractors key personnel as provided for in sub-clause C3.1.3 unless otherwise instructed by the Engineer and in accordance with the further provisions of the relevant sections of Part C3 of the Scope of Works.

The portions of the Works to be executed using Labour Intensive Construction methods are:

- Clearing and grubbing of the Site;
- Excavation for structures up to 1,5 m deep;
- Bedding, selected fill, backfilling and compaction of all pipe trenches irrespective of depth, but assisted by mechanical compaction equipment in order to achieve the specified densities;
- Transportation and spoiling of all trench materials, where the disposal site is located within 20metres of source;
- Cleaning and tidying up of the Site;
- Dismantling and re-erection of fences;
- Construction of all brickworks required for structures;

In respect of those portions of works which are not listed above, the construction methods adopted and plant utilised shall be at the discretion of the Contractor, provided always that the construction methods adopted and plant utilised by the Contractor are appropriate in respect of the nature of the Works to be executed and the standards to be achieved in terms of the Contract.

C3.1.4 Sub-Contracting

- C3.1.4.1** Contractor shall appoint such authorities and/or specialist subcontractors and suppliers as may be designated or nominated by the Employer or the Engineer.
- C3.1.4.2** The Contractor shall sub-let to local small sub-contractors appropriate portions of the works that are designated in Clause C3.1.3 as being reserved for labour intensive construction methods.
- C3.1.4.3** As required by Clause 4.4.5 of the Conditions of Contract, the Contractor shall be responsible for all work carried out by sub-contractors (whether nominated by the Employer or selected by the Contractor) on his behalf. The Engineer will not liaise directly with any such sub-contractor, nor will he become involved in any problems and/or disputes related to payments, programming, workmanship, etc. unless provided for in the Conditions of Contract. Such problems and/or disputes shall remain the sole concern of the Contractor and his sub-contractors.
- C3.1.4.4** The Engineer may at his discretion, upon receipt of a written and fully motivated application from the Contractor, and where he deems the circumstances so warrant, and provided always that the Contractor has complied fully and in all respects with the provisions of the Contract pertaining to subletting to local sub-contractors or has utilised his best endeavours to comply therewith, authorise in writing that the Contractor may employ local residents with the sole intent of executing on-the-job training of such local residents to suitable levels of skill that will enable the Contractor to sub-let appropriate portions of the Works to such local residents.

Without limiting the generality of application of this sub-clause, circumstances, which may be considered by the Engineer to warrant such authorization, include:

- a) non-receipt of valid or acceptable tenders/quotations from local sub-contractors;
- b) serious default or failure of appointed local sub-contractors;

The Engineer shall not grant such authority in cases where it may reasonably be concluded on the available evidence that the invitation of further tenders/quotations in accordance with the terms of the Contract, is likely to result in the successful completion of the portions of the Works concerned by local sub-contractors.

Should the Contractor, after suitable due endeavour, be unable to identify local residents suitable for and desiring to train as sub-contractors for portions of the Works as specified in Clause 3.1.4.2, then the Contractor shall be permitted to undertake the Works in question with his own workforce as provided for in Clause 3.1.3 above.

The Engineer shall monitor progress achieved with subcontractor training, and successful completion of this training shall be subject to his approval or instruction. The Contractor shall tender rates for the training of subcontractors and labour.

As specified in Clause C3.1.4, the Contractor shall approach the Labour Desk that is established for purposes of the Contract for assistance and advice regarding conditions of employment, minimum wages, disputes and disciplinary procedures in respect of local sub-contractors.

C3.1.5 CONSTRUCTION AND MANAGEMENT REQUIREMENTS

C3.1.5.1 General

The Contractor is referred to SANS 1921: 2004 parts 1, 2, 3 and 5: 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.

Certain aspects however require further attention as described hereafter.

C3.1.5.2 Quality Assurance (QA) *(Read with SANS 1921 – 1: 2004 clause 4.4)*

The Contractor will be solely responsible for the production of work that complies with the Specifications to the satisfaction of the Engineer. To this end it will be the full responsibility of the Contractor to institute an appropriate Quality Assurance (QA) system on site. The Engineer will audit the Contractor's quality assurance (QA) system on a regular basis to verify that adequate independent checks and tests are being carried out and to ensure that the Contractor's own control is sufficient to identify any possible quality problems, which could cause a delay or failure.

The Contractor shall ensure that efficient supervisory staff, the required transport, instruments, equipment and tools are available to control the quality of his own workmanship in accordance with his QA-system. His attention is drawn to the fact that it is not the duty of the Engineer or the Engineer's representative to act as foreman or surveyor.

C3.1.5.3 Management and disposal of water *(Read with SANS 1921 - 1: 2004 clause*

4.6)

The Contractor shall pay special attention to the management and disposal of water and stormwater on the site. It is essential that all completed works or parts thereof are kept dry and properly drained. Claims for delay and for repair of damage caused to the works

as a result of the Contractor's failure to properly manage rain and surface water, will not be considered.

4.10) **C3.1.5.4 Disposal of spoil or surplus material** *(Read with SANS 1921 - 1: 2004 clause 4.10)*

The Contractor shall dispose all surplus and unsuitable material at a legal and registered landfill sites within the Municipal area. He shall be responsible for all arrangements necessary to obtain such legal and registered landfill sites from the Municipality.

C3.1.5.6 Testing *(Read with SANS 1921 – 1: 2004 clause 4.11)*

Process control

The Contractor shall arrange for all tests required for process control to be done by a laboratory acceptable to and approved by the Engineer.

The Contractor may establish his own laboratory on site or he may employ the services of an independent commercial laboratory. Whatever method is used, the Contractor must submit the results of tests carried out on materials and workmanship when submitting work for acceptance by the Engineer. The costs for these tests shall be deemed to be included in the relevant rates and no additional payment will be made for testing as required.

Acceptance control

The process control test results submitted by the Contractor for approval of materials and workmanship may be used by the Engineer for acceptance control. However, before accepting any work, the Engineer may have further control tests carried out by a laboratory of his choice. The cost of such additional tests will be covered by a provisional sum provided in the schedule of quantities, but tests that failed to confirm compliance with the specifications, will be for the account of the Contractor.

C3.1.5.7 Survey beacons *(Read with SANS 1921 - 1 : 2004 clause 4.15)*

The Contractor shall take special precautions to protect all permanent survey beacons or pegs such as benchmarks, stand boundary pegs and trigonometrical beacons, regardless whether such beacons or pegs were placed before or during the execution of the Contract. If any such beacons or pegs have been disturbed by the Contractor or his employees, the Contractor shall have them replaced by a registered land surveyor at his own cost.

C3.1.5.8 Existing Services *(Read with SANS 1921 - 1 : 2004 clause 4.17)*

The Contractor shall make himself acquainted with the position of all existing services before any excavation or other work likely to affect the existing services is commenced.

The Contractor will be held responsible for any damage to known existing services caused by or arising out of his operations and any damage shall be made good at his own expense. Damage to unknown services shall be repaired as soon as possible and liability shall be determined on site when such damage should occur.

C3.1.6 Programme to be supplied by the Contractor

The Contractor's programme shall be essentially in accordance with the overall requirements of the project.

The programme shall not be in the form of a bar chart only but shall show clearly the anticipated quantities of work to be performed each month, together with the manner in which the listed plant and other resources are to be used, as well as the anticipated earnings for the various sections of work.

A network-based programme according to the precedence method shall be required by the Engineer. The programme shall be updated monthly in accordance with the progress made by the Contractor. The updated programme shall be submitted to the Engineer at least two working days prior to monthly meetings.

Failure to comply with these requirements will entitle the Engineer to use a programme based on his own assumptions for the purpose of evaluating claims for extension of time or additional payments.

If, during the progress of the work, the quantities of work performed per month fall below those shown on the programme, or if the sequence of operations is altered or if the programme is deviated from in any other way, the Contractor shall, within one week of having been notified by the Engineer, submit a revised programme and network.

If the programme has to be revised by reason of the contractor falling behind his programme, he shall produce a revised programme showing how he intends to regain lost time in order to ensure completion of the Works within the time of completion as defined in Clause 5.7 of the General Conditions of Contract or any granted extension of time. Any proposal to increase the tempo of work must be accompanied by positive steps to increase production by providing more labour and plant on site, or by using the available labour and plant in a more efficient manner.

Failure on the part of the Contractor to submit the programme or to work according to the programme or revised programmes shall be sufficient reason for the Engineer to take steps as provided in Clause 9.2 of the General Conditions of Contract.

The approval by the engineer of any programme shall have no contractual significance other than the Engineer will 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 to the Engineer to instruct the Contractor to vary the programme if required by circumstances. The Contractor is also referred to Clause 5.6 of the General Conditions of Contract when drawing up his programme.

Progress in advance of the programme on certain portions or phases of the Works shall not be considered adequate reason for poor progress on another portion or phase.

C3.1.7 Overhaul

No payment will be made for overhaul on this contract unless provision is made therefore in specific items.

C3.1.8 Site Facilities Available

C3.1.8.1 Location of Site and Depot

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. The Contractor must obtain written permission from the landowner and subsequently from the Engineer for the establishment of his camp.

(a) Contractor's Camp Site/Store Yard

Any clearing of the site that is necessary and the making good after de-establishment will be the responsibility of the Contractor.

In addition to the requirements of SANS 1200A clause 8.3.2.2 the following conditions shall also apply:-

- (i) None of the existing roads shall be damaged in any way.

No waterborne sewerage facilities or potable water connection are available on the site. The Contractor shall make his own arrangements in this regard.

- (ii) No electrical facilities exist on site.

- (iii) It shall be the responsibility of the Contractor to make good any damage caused to the campsite area or any improvements on it, including services, and for reinstating it to its former condition when vacated. The standard of reinstatement must be to the satisfaction of the Engineer or the owner. Particular attention should be directed to these requirements and written clearances from the relevant Departments or other owners will be required.

C3.1.8.2 Source of Water Supply

The Contractor shall be responsible under the Contract for the supply and distribution at his cost of all water that he may require for purposes of constructing the Works. Accordingly, the Contractor shall pay all connection fees and consumption charges, and at his cost provide all connections, consumption meters, pipe work, storage tanks, transport and other items associated with the supply of water for the Works.

The Contractor shall, subject to the approval of the Engineer, make any necessary arrangements with the relevant authority for the connection(s), and shall provide in his tender for the payment of all charges and costs that are associated with making water available for purposes of constructing the Works.

C3.1.8.3 Source of Power Supply

The Contractor shall be responsible under the Contract for the supply and distribution at his cost of all electricity that he may require for purposes of constructing the Works. Accordingly, the Contractor shall pay all connection and consumption charges, and at his cost provide all connections, transformers, consumption meters, cables, distribution boards and other items that are associated with the supply of electricity for construction of the Works.

The Contractor shall, subject to the approval of the Engineer, make any necessary arrangements with the relevant authority for the connection(s), and shall provide in his tender for the payment of all charges and costs that are associated with making electricity available for purposes of constructing the Works. The distribution of electricity shall be in accordance with the applicable bylaws and regulations of the supply authority.

C3.1.8.4 Accommodation of Employees

No employees except for security guards will be allowed to sleep or be accommodated on the site.

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.

No informal housing or squatting will be allowed.

The Contractor shall provide the necessary ablution facilities at his campsite 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.

C3.1.9 Features Requiring Special Attention

C3.1.9.1 Built-up Areas

The Contractor's attention is drawn to the fact that the Works will be constructed within built-up areas. The Contractor shall exercise all necessary precautions and take all necessary steps to ensure the safety and convenience of the public. In addition, the Contractor shall provide access for traffic over and through the works, and for residents to their places of abode, all as described in the Specifications. Allowance must be made by the Contractor in his programming for delays resulting from the aforesaid.

The Contractor shall give residents a minimum of 72 hours written notice of his intent to close access to residential stands. The Contractor shall acquire written confirmation from all owners that they are aware of any intended closures of access. No traffic access to a residential stand shall be closed for longer than 48 hours.

C3.1.9.3 Protection of Buildings and Structures

The Contractor shall give all residents or other parties owning a building or structure within an appropriate radius (not less than 100m) from any point of blasting, a minimum of 48 hours notice of his intent to execute any blasting work.

The Contractor shall note all aspects relevant to the condition of the affected buildings and/or structures prior to blasting, and shall acquire the signature of the owners/occupants agreeing to such conditions.

Subsequent to blasting, both the Contractor and the owners/occupants shall sign the form confirming the condition of the buildings and/or structures. In the event of damage to existing buildings and/or structures as a result of blasting, remedial work shall be done to the satisfaction of the owners/occupants at the Contractor's expense.

Compliance with this clause will not relieve the Contractor of any of his responsibilities in terms of the Contract.

C3.1.9.4 Care of the Site

At all times during construction of the Works and upon completion thereof, the Site of the Works shall be kept and left in a clean and orderly condition. The Contractor shall store all materials and equipment for which he is responsible in an orderly manner, and shall keep the Site free from debris and obstructions.

C3.1.9.5 Control of Water

The Contractor shall at all times and in all respects be responsible for the handling of stormwater from higherlaying areas above the Works, and for the handling of any sub-surface water that may affect the Works. No separate payment shall be made in this regard, as all costs related thereto shall be deemed to be included in the rates tendered for the various items of work that are included in the Schedule of Quantities.

C3.1.10 Management of the environment

The Contractor shall pay special attention to the following:

(a) Natural Vegetation

The Contractor shall confine his operation to as small an area of the site as may be practical for the purpose of constructing the works.

Only those trees and shrubs directly affected by the works and such others as the Engineer may direct in writing shall be cut down and stumped. The natural vegetation, grassing and other plants shall not be disturbed other than in areas where it is essential for the execution of the work or where directed by the Engineer.

(b) Fires

The Contractor shall comply with the statutory and local fire regulations. He shall also take all necessary precautions to prevent any fires. In the event of fire the Contractor shall take active steps to limit and extinguish the fire and shall accept full responsibility for damages and claims resulting from such fires, which may have been caused by him or his employees.

C3.1.11 Community Liaison and Community Relations

In all dealings with nearby communities and beneficiaries of the project, and in all dealings with workers employed from within such communities, the Contractor shall take due cognisance of the character, culture and circumstances of the specific community and/or any group of beneficiaries, and shall at all times use his best endeavours to avoid the development of disputes and rather to foster a spirit of co- operation and harmony towards the project.

The Contractor shall at all times, keep the Engineer fully informed regarding all matters affecting or negotiated between the Contractor and the community and/or beneficiaries, and he shall attend all liaison

meetings as may be arranged by the Engineer and/or the Employer. All matters concerning the community and/or beneficiaries shall be discussed and where possible, resolved at such meetings.

Where any resolution during such negotiations or at such meetings shall be contrary to the terms and provisions of the Contract, the Contractor shall not give effect thereto without a prior written instruction from the Engineer. Where the Contractor is of the opinion that any instruction of the Engineer issued in terms of this clause will result in the incurring of additional costs which were not provided for in his tendered rates and prices and/or that a delay in the progress of the Works will result, he shall be entitled to submit a claim in terms of Clause 10 of the Conditions of Contract, provided always that the period of twenty-eight (28) days referred to in Clause 10 shall be reduced to three (3) normal working days in respect of all claims submitted in terms of this clause.

C3.1.12 Workmanship and Quality Control

The onus to produce work that conforms in quality and accuracy of detail to the requirements of the Specifications and of the Drawings rests with the Contractor, and the Contractor shall, at his own expense, institute a quality-control system and provide experienced engineers, foremen, surveyors, materials technicians, other technicians, technical staff and the user department, together with all transport, instruments and equipment to ensure adequate supervision and positive control of the quality of the Works at all stages of the Contract.

The cost of the Contractor's supervision and process control, including all testing carried out by the Contractor, will be deemed to be included in the rates tendered for the various items of work. The Contractor's attention is drawn to the provisions of the various Standardised Specifications regarding the minimum frequency of process control testing that is to be executed. The Contractor shall, at his own discretion, increase this frequency where necessary to ensure adequate control of the quality of the Works at all times.

Upon completion and submission of each portion of the Works to the Engineer for examination, the Contractor shall furnish the Engineer with the results of relevant tests, measurements and levels, thereby indicating compliance with the Specifications.

The Engineer will not examine or inspect any portion of work submitted for approval unless the request for inspection and approval is accompanied by relevant tests, measurements and levels indicating compliance.

C3.1.13 Samples

Materials or work that do not conform to the approved samples, submitted in terms of Clause 7.4 of the Conditions of Contract, will be rejected. The Engineer reserves the right to submit samples for testing to ensure that the material represented by the samples meet the specification requirements.

C3.1.14 Notices, Signs, Barricades and Advertisements

Notices, signs and barricades (required in terms of Clause 8 of the Conditions of Contract) as well as advertisements may only be erected where approved by the Engineer. The Contractor shall be responsible for their supply, erection, maintenance and ultimate removal and shall make provision for this in his tendered rates.

The Engineer shall have the right to have any sign, notice or advertisement moved to another location, or to have it removed from the Site of the Works, should it in any way prove to be unsatisfactory, inconvenient or dangerous to the general public.

C3.1.15 Requirements for Accommodation of Traffic

General

The Contractor will be responsible for the safe and easy passage of public traffic past and on sections of roads of which he has occupation or where work has to be done near traffic.

Accommodation of traffic, where applicable shall comply with SANS 1921-2: 2004: Construction and Management Requirements for Works Contracts, Part 2: Accommodation of Traffic on Public Roads occupied by the Contractor. The Contractor shall obtain this specification from Standards South Africa if accommodation of traffic will be involved on any part of the construction works.

Basic Requirements

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. 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.

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.

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.

The Contractor shall construct and maintain all temporary drainage works necessary for temporary deviations.

The Contractor shall provide and grant access to persons whose properties fall within or adjoin the area in which he is working.

C3.1.16 Open Trenches

Trenches may not be left open during the builder's holidays, and shall be safeguarded at all times from danger to the public. Safe trench-crossings shall be provided at all intersections with accesses to properties and with public roads and paths. The length of trench left open at any one time may be restricted by the Engineer, should he consider such restriction to be in the interest of public safety.

C3.1.17 Statutory Regulations

The statutory requirement of the Occupational Health and Safety Act, Act 85 of 1993 (referred to as the Act below), and all regulations promulgated there under as well as the other relevant acts must be adhered to by the Contractor, with specific reference to the safety of all employees and the public, irrespective of whether such employees are employed by the Contractor or by his subcontractors (including local subcontractors). The Contractor, in entering into this Contract, hereby agrees with the Employer in terms of Section 37(2) of the Act, that the Contractor as an employer in its own right and in its capacity as Contractor for the execution of the Works, shall have certain obligations and that the following arrangement shall apply between the Contractor and the Employer to ensure compliance by the Contractor with the provisions of the Act, namely:-

- (a) The Contractor undertakes to acquaint the appropriate officials and the employees of the Contractor with all relevant provisions of the Act, and the regulations promulgated in terms of the Act;
- (b) The Contractor undertakes that all relevant duties, obligations and prohibitions imposed in terms of the Act and regulations will be fully complied with; and
- (c) The Contractor hereby accepts sole liability for such due compliance with the relevant duties, obligations and prohibitions imposed by the Act and regulations, and expressly absolves the Employer and the Engineer from being obliged to comply with any of the aforesaid duties, obligations and prohibitions in respect of the Works; and
- (d) The Contractor shall be obliged to report forthwith to the Employer and the Engineer any investigation, complaint, or criminal charge which may arise as a consequence of the provisions of the Act and regulations pursuant to work performed on behalf of the Employer, and shall, on written demand, provide full details in writing of such investigation, complaint or criminal charge.
- (e) The Contractor shall sign the agreement bound into Section C1.2 of this document.

The Contractor shall comply with all the conditions of the Record of Decision in terms of Section 22(3) of the Environmental Conservation Act, 1989.

A time-related and a fixed-charge item have been provided in Schedule A of the Schedule of Quantities. The contractor shall allow for all obligations imposed by the Environmental Management Plan including the appointment of an environmental manager/control officer.

C3.1.18 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) The Principal Contractor must do a Risk assessment and compile an OHS Plan to be evaluated and approved by the Safety Agent prior to commencement of Construction.
- (b) The Contractor must ensure that regular safety meetings be held, and that the minutes of such meetings be kept in a Safety File, which must be available on site at all times.
- (c) 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;

-
- (d) 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;
 - (e) 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;
 - (f) 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;
 - (g) Full compliance with all other requirements pertaining to safety as may be specified in the Contract (Also refer to Notice to Tenderers).

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 Employer's and/or Engineer's representative 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 clause 5.11 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 clause 5.13.1 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 subclause 9.2.1 of the Conditions of Contract and for the Employer to cancel the Contract in accordance with the further provisions of the said clause 9.2."

In addition to all above safety related requirements the Contractor shall take cognisance of the requirements of the construction regulations and OHS Specifications bound in C3.5.2 of this document.

C3.1.19 Safety Officer

OHS must be provided.

The Contractor is required to ensure compliance with the Occupational Health and Safety Act (Act 85 of 1993) and its regulations, in particular the Construction Regulations, 2014, to appoint a Health and Safety Officer for the works.

The safety officer shall have a sound knowledge of the Occupational health and Safety Act. He shall preferably have completed the Safety Management Training Course (SAMTRAC) presented by NOSA. The Contractor shall submit details of the proposed

C3.1.20 Source of Material/Borrow pit

The contractor will be held responsible for locating legal, licenced and approved sources of all materials complying with the relevant minimum requirements to be used in this contract. No separate payment shall be made for this, as all costs related thereto shall be deemed to be covered by the tendered rates.

Where possible materials manufactured or produced locally shall be procured to promote local enterprise.

C3.1.21 Photographic Record

Prior to the commencement of the work, and during the contract period, a photographic record shall be made of all existing stands and structures to be effected by the project, and forwarded to the Engineer prior to the authorisation of the first progress payment.

A payment item is included in the Schedule of Quantities to cover the Contractor's cost for compliance with the above requirements.

C3.2 ENGINEERING

C3.2.1 Design

- The Employer is responsible for the design of the permanent Works as reflected in the Contract Documents unless otherwise stated.
- The Contractor is responsible for the design of the temporary Works and their compatibility with the permanent Works
- The Contractor shall supply all details necessary to assist the Engineer in the compilation of the as – built drawings

C3.2.2 Employer's Design

The Employer has designed the permanent works included in this contract. The detail of the works is indicated on the drawings and in the specifications. The Tenderer may submit alternative offers for designs prepared by himself subject to the conditions specified in clause 05 of the Standard Specifications.

C3.2.3 Drawings

The Contractor shall use only the dimensions stated in figures on the Drawings in setting out the Works, and dimensions shall not be scaled from the Drawings, unless required by the Engineer. The Engineer will, on the request of the Contractor in accordance with the provisions of the Conditions of Contract, provide such dimensions as may have been omitted from the Drawings.

The Contractor shall ensure that accurate as-built records are kept of all infrastructure installed or relocated during the contract. The position of pipe bends, junction boxes, duct ends and all other underground infrastructure shall be given by either co-ordinates or

stake value and offset. Where necessary, levels shall also be given. A marked-up set of drawings shall also be kept and updated by the Contractor. This information shall be supplied to the Engineer's Representative on a regular basis.

All information in possession of the Contractor, required by the Engineer and/or the Engineer's Representative to complete the as-built/record drawings, must be submitted to the Engineer's Representative before a Certificate of Completion will be issued.

C2.3.1.1 Additional construction drawings will, in terms of Clause 5.9 of the General Conditions of Contract (2015), be issued to the Contractor by the Engineer/Employer on the commencement date and from time to time as required."

C3.3 PROCUREMENT

C3.3.2 Restriction of the Utilisation of Personnel in the Permanent Employment of the Contractor

The Contractor shall limit the utilisation of his permanently employed personnel to that of key personnel only on the Works, as defined below, and shall execute and complete the Works utilising a temporary workforce employed directly by the Contractor and/or by his sub-contractors, using the assistance of the labour desk that will be established for the project in consultation with the various communities that are established in proximity to the Works or which will be allocated within the development.

Without derogating from the Contractor's obligations to complete the Works within the specified time for completion in terms of clause 1.1.1.14 of GCC 2015, the numbers in each category of the Contractor's key personnel, as stated by the Contractor in Part T2 of this document, will be strictly controlled during the contract period and any increase in numbers will be subject to the prior approval of the Employer.

"Key personnel" means all contracts managers, site agents, site clerks, materials and survey technicians, quantity surveyors, trainers, supervisors, foremen, skilled plant operators, welders, shutter hands and the like, and all other personnel in the permanent employ of the Contractor or his sub-contractors who possess special skills, and/or who play key roles within the Contractor's or his subcontractor's operations.

The Engineer may at his discretion, upon receipt of a written and fully motivated application from the Contractor, and where he deems the circumstances so warrant, authorise in writing that the Contractor may utilise in the execution of the Works, workers not being his key personnel but who are in his permanent employ.

Without limiting the generality of application of this sub-clause, circumstances which may be considered by the Engineer to warrant authorisation of the use of the Contractor's permanent employees other than key personnel, include:

- (a) The unavailability from local sources of sufficient numbers of temporary workers and/or sub-contractors to execute the Works provided always that the Contractor has satisfied the Engineer that he has exercised his best endeavours and taken all reasonable actions to recruit sufficient temporary workers and sub-contractors from local sources as contemplated above.
- (b) The unavailability within the temporary worker pool and/or from subcontractor sources available to the Contractor in terms of the Contract, of sufficient skills necessary to execute the Works or specific portions thereof, in situations where the completion period allowed in the Contract is insufficient to facilitate the

creation of the necessary skills through the provision of suitable training as contemplated in the Contract;

- (c) Any other circumstances which the Engineer may deem as constituting a warrant.

C3.3.3 Provision of Temporary Workforce for the Contract

The Contractor shall employ labour from the local community through the CLO except for approved key staff in the permanent employ of the Contractor, to the maximum extent that is compatible with the requirements of Clause 4.11 of the General Conditions of Contract 2015.

Although the Contractor shall adhere to the statutory minimum wage rates, he is however at liberty to negotiate additional incentive payments based on performance.

The Occupational Health and Safety Act must be adhered to with reference to the safety of any employee employed by the Contractor.

The successful tenderer shall liaise with the Ward Councillor/Ward Committee whereby the Ward Councillor shall provide to the Contractor the following if necessary:

a) A Community Liaison Officer (CLO) for liaison with the recipient community for labour recruitment

The CLO shall attend all site and other meetings concerning the project.

- Only one CLO shall be appointed per project. If the project spans over more than one Ward, the relevant Ward Councillors shall agree on one CLO to be appointed by the Contractor. Should no agreement be found as envisaged, the relevant Project Manager together with the Engineer, will interview prospective appointees and in their discretion appoint such CLO.
- Notwithstanding the above, if the vastness of the project requires the use of more than one CLO, this will be permitted provided that the total monthly sum paid to all CLO's shall not exceed the amount allowed for in paragraph bill of quantities.
- Should the Contractor experience any difficulties with the community, these difficulties shall immediately be brought to the attention of the Municipality/Project Manager who shall arrange a meeting with the relevant Ward Councillor(s) and the CLO to resolve such difficulties.

The main Contractor shall ensure that any Sub-Contractor he may appoint shall adhere to these conditions but also subject to the provisos applicable to the duration of such sub-contract.

Should any of the above conditions be less favourable than any Bargaining Council Agreement or Act applicable to the Contractor, the more favourable condition will apply.

A contract of employment or subcontract should be signed between the Contractor and each of his employees or sub-contractors, as the case may be. Likewise contracts of employment must be entered into between each such sub-contractor, and each of the specific subcontractor's employees. Employment and subcontract agreements shall make clear reference to at least the following conditions.

- The minimum agreed wage rate per hour in respect of labourers;
- The agreed pay rate per unit of production where applicable;
- UIF and WCA payments;
- Minimum working hours per day;
- Start and end times of a daily shift;

-
- Lunch break times;
 - Company policy regarding:
 - Rain time
 - Sickness and absenteeism
 - Disciplinary matters
 - Grievances
 - Method and frequency of payment;
 - Work clothes and safety equipment to be issued
 - Labour Desk

C3.4 CONSTRUCTION

C3.4.1 Standard Specifications

C3.4.1.1 The Standard specification, are carried out strictly in accordance with SANS 1200 - "Standard Specification for Civil Engineering Construction" as approved by the Council of the South African National Standards.

C3.4.1.2 For the purpose of this Contract the latest issues of the following Standard Specifications for Civil Engineering Construction, applicable at the date of tender advertisement, shall apply –

SANS 1200

A	-	PRELIMINARY AND GENERAL
AB	-	ENGINEER'S OFFICE
C	-	SITE CLEARANCE
DA	-	EARTHWORKS (SMALL WORKS)
DB	-	EARTHWORKS (PIPE TRENCHES)
G	-	CONCRETE (STRUCTURAL)
GB	-	CONCRETE (ORDINARY BUILDINGS)
L	-	MEDIUM PRESSURE PIPELINES
LD	-	SEWER
LB	-	BEDDING (PIPES)
M	-	ROADS (GENERAL)
ME	-	SUBBASE
MF	-	BASE
MH	-	ASPHALT BASE AND SURFACING
MJ	-	SEGEMENTED PAVING

C3.4.1.3 The term "project specifications" appearing in any of the SANS 1200 standardised specifications must be replaced with the terms "scope of work".

C3.4.1.4 References from, and variations and additions to the Standard Specifications and Particular Specifications are included in section **C3.4.2**.

C3.4.2 Variations and Additions to Standard and Particular Specifications

The following variations and additions to the Standard and Particular Specifications will be applicable to this Contract.

The various documents listed in section C3.4.1 shall be treated as mutually explanatory. However, should any requirement of section C3.4.2 conflict with any requirement of the Standardised Specifications or with any requirement of the Particular Specifications, then the requirement of section C3.4.2 shall prevail.

EPWP labour intensive specification

C3.4.3.1 Labour intensive competencies of supervisory and management staff

Contractors having a CIDB contractor grading designation of 4CE 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	

		Use Labour Intensive Construction Methods to Construct and Maintain Water and Sanitation Services	} Any one of these 3 unit standards
		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

C3.4.3.2 Employment of unskilled and semi-skilled workers in labour-intensive works

C3.4.3.2.1 Requirements for the sourcing and engagement of labour

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.

2. The rate of pay per day set for the EPWP shall be obtained from the Municipality
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.
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 C3.4.3.2.1.3.
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 has 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
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.

C3.4.3.3 Specific provisions pertaining to SANS 1914-5**1. Definitions**

Targeted labour: Unemployed persons who are employed as local labour on the project.

2. Contract participation goals

- 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.
- 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.

C3.4.3.4 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.

C3.4.3.5 Variations to SANS 1914-5

1. The definition for net amount shall be amended as follows:

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.

2. 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.

C3.4.3.6 Training of targeted labour

1. 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.
2. 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.
3. 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.

4. The contractor shall do nothing to dissuade targeted labour from participating in training programmes.
5. 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 C3.4.3.6.2 above.
5. Proof of compliance with the requirements of items above must be provided by the Contractor to the Employer prior to submission of the final payment certificate.

VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

SANS 1200 A: GENERAL

PSA 1 QUALITY OF MATERIALS (Sub clause 3.1)

Add the following:

All materials used in this Contract shall be the official SANS mark where applicable.
All materials shall be new and of the best quality available unless otherwise specified.

PSA 2 CONTRACTOR'S OFFICES, STORES AND SERVICES (Clause 4.2)

Add the following to the provisions of Clause 4.2.

- a) The location of the Contractor's offices, stores and services on site shall be subject to approval by the Engineer.
- b) The Contractor's office is to include a facility with furniture suitable for the use during site meetings, accommodating 8 persons.
- c) The Contractor's designated site agent shall be in possession of a cellular telephone.

No additional payment is made for this service, and shall be deemed to be included in the preliminary and general.

PSA 3 SETTING OUT OF THE WORKS (Clause 5.1.1)

Substitute the first sentence of Clause 5.1.1 with the following. The engineer will provide information for setting out of the works.

Add the following:

Setting out the Works will not be measured and paid for directly, and compensation for the works involved in setting out shall be deemed to be covered by the rates and prices tendered and paid for in the various items of works included under this Contract.

PSA 4 WATCHING, BARRICADING, LIGHTING AND TRAFFIC CROSSINGS (Clause 5.2)

The Contractor shall make adequate provision for the supply of temporary warning signs, barriers drums etc to the satisfaction of the Engineer for the entire duration of the contract. Road and traffic signs shall comply with the requirements of the "South African Road Traffic Manual".

PSA 5 LOCATION AND PROTECTION OF EXISTING SERVICES (Clause 5.4)

Add the following provisions of Clause 5.4.1

PSA 5.1 Location of existing services

Before underground or excavation work is carried out, the Contractor shall ascertain the presence and position of all services likely to be damaged or interfered with by his

activities. He shall obtain up-to-date plans from the Engineer for this purpose, showing the position of services in the area where he intends to work.

As services can often not be reliably located from such plans, the Contractor shall determine the exact position of such services by means of suitable detecting equipment and afterwards by careful hand excavation where necessary in order to expose the services at the positions of possible interference by his activities. This procedure shall also be followed in respect of services not shown on the plans but believed to be present.

All such services, the positions of which have been located at the critical points, shall be designated as “known” services and their positions shall be indicated on a separate set of Drawings, a copy of which shall be furnished to the Engineer.

While he is occupying the Site, the Contractor shall be liable for all damage caused by him to known services as well as for consequential damage, whether caused directly by his operations or by the lack of proper protection.

PSA 6 ACCOMMODATION OF TRAFFIC (New clause 5.9)

Temporary traffic signs shall be erected at all diversions.

The number and layout of the traffic signs shall comply with the Site Manual entitled “Safety at Roadwork’s in Urban Areas”, as published by the Department of Transport.

Traffic signs shall have a yellow background with either a red / black border.

PSA 7 TOLERANCES

PSA 7.1 General (New subclause 6.4)

No guarantee is given that the full specified tolerance 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 then 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 Engineers, without any allowances 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 therefore constructed in accordance with the “authorised” dimensions plus or minus the tolerances allowed, 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 Engineers 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 based on the actual dimensions as constructed.

PSA 9 MEASUREMENT AND PAYMENT**PSA 9.1 Contractual Requirements (sub clause 8.3.1)**

Add to sub-clause 8.3.1:

"In addition, the sum tendered shall cover all initial costs incurred in complying with the requirements of the Special Conditions of Contract.

PSA 9.2 Contractual Requirements (sub clause 8.4.1)

The Contractor shall tender a lump sum in the Schedule of Quantities to cover his time-related establishment costs. The amount tendered and paid shall be full compensation to the Contractor for:

- (i) The maintenance of his whole organisation as established for this Contract.
- (ii) The maintenance of all insurances, indemnities and guarantees required in terms of the Conditions of Contract or Tender where applicable.
- (iii) Compliance with all general conditions and requirements, which are not specifically, measured elsewhere for payment in these Contract Documents.

The Contractor shall tender a lump sum for the abovementioned items.

Payment of the lump sum shall be made monthly in compliance with the method laid down in Sub-clause 8.2.2 of SANS 1200:A.

The Contractor will not be paid Time-Related Preliminary and General charges for any Special Non-Working Days, as stipulated in the Appendix, which shall be deemed to have been allowed for in his rates.

PSA 9.3 Adjusted Payment for Time-Related Items

The payment to the Contractor for Time-Related Items shall be adjusted in accordance with the following formula in the event of the Contract being extended by means of a variation order:

Sum of Tendered amounts

for Time Related Items x $\frac{\text{Extension of Time authorised by variation order}}{\text{Tender contract period}}$

*For the purposes of applying this formula "Extension of Time" will exclude the Contractor's December/January close-down period, if applicable.

The abovementioned adjustment of the payment for Time-Related Items shall be made in the Completion Payment Certificate and shall be the only payment for additional Time-Related costs irrespective of the actual period required to complete the Contract including its authorised extensions.

In the case of fixed price contracts, the amount by which the Time-Related Items is adjusted shall not be subject to the Contract Price Adjustment formula.

In the case of contracts subject to Contract Price Adjustment the amount by which the time-related items are adjusted shall be subject to the Contract Price Adjustment formula.

**PSA 9.4 Compliance with OHS Act and Regulations
(Including The Construction Regulations 2014)** **unit:**

sum

The tendered sum shall include full compensation to the Contractor for compliance with all the requirements of the OHS Act and Regulations (including the Construction Regulations 2014) at all times for the full duration of the Contract.

This sum will be paid to the contractor in equal monthly amounts subject to proper/substantial compliance

PSA 9.5 Accommodation of Traffic (Clause 8.8.2)

Where the new works interferes with the existing roads, the Contractor shall construct these sections of the works under traffic. The work will involve catering for the safe and easy passage of public traffic in all weather, both day and night for the full traffic control and signposting.

The Contractor may alternatively make his own arrangement for detours to be constructed, all subject to the Engineers approval.

Add the following after the first paragraph:

“All temporary road signs, devices, sequences, layouts and spacing shall comply with the requirements of the Road Traffic Act, 1996 (Act 93 of 1996), the National Road Traffic Regulations, 2000, the South African Road Traffic Signs Manual and the requirements of the relevant road authority. All temporary traffic control facilities shall also comply with the guidelines set in SA Road Traffic Signs Manual, Volume 2, Chapter 13: Road works Signing, (SARTSM, June 1999, obtainable from the Government Printer, Pretoria)”

SANS 1200 A: PRELIMINARY AND GENERAL

PSA 3.1 Quality of Samples

All materials used shall be suitable for the purposes for which they are intended. Materials shall comply with the requirements of the South African Bureau of Standards, where such standards are available.

PSA 5 CONSTRUCTION

PSA 5.1 Setting out of the work and protection of beacons (Sub-clause 5.1)

The Contractor shall be responsible for the true and proper setting out of the Works from the basic control points shown on the Drawings or indicated by the Employer's Agent Representative on site and shall ensure the correct location of the Works in relation to such points. The Contractor has to ascertain himself of the correctness of the pegs and benchmarks in the field. Any discrepancy shall be immediately reported to the Employer's Agent. Any costs arising from failure to do so, shall be the responsibility of the Contractor. The Employer's Agent may alter any part of the works to suit local conditions if necessary. No claim for incorrect setting out will be considered. Clause PS 10.6 shall also apply.

PSA 5.1.1 Services (Sub-clause 5.2)

All excavations to expose existing known services shall be excavated by hand in all materials by the contractor. Any existing service in the road reserve or municipal servitude that is damaged as a result of negligence by the contractor will be repaired by the contractor to the satisfaction of the Employer's Agent at his own cost. Clause PS 10.1 shall also apply.

PSA 5.2 Watching Barricading, lighting and traffic crossings, (Clause 5.2)

All open excavations shall be properly demarcated with reflective tape, barricading and any other requirements that the Local Authority has.

PSA 5.3 Protection of Structures (Clause 5.3)

The contractor must contact house owners at least two weeks prior to working in close proximity to existing buildings and to inspect buildings before and after work had been completed. Clause PS 10.2 shall also apply.

PSA 5.7 Safety

Add the following:

1. The Contractor shall at all times observe adequate safety precautions on Site to ensure the safety of his own staff as well as that of the public and other persons engaged in or about the Works. In this respect he shall observe all laws, ordinances and regulations pertaining to his work.
2. The Contractor's attention is specifically drawn to the following Acts, and particularly to the relevant regulations under each Act, copies of which shall at all times be kept by him on the Site:
 - The Factories, Machinery and Building Work Act (Act 22 of 1941)
 - The Explosives Act (Act 26 of 1956)
 - The Mines and Works Act (Act 27 of 1956)
 - The Occupational Health and Safety Act (Act 85 of 1993)
3. The Contractor is also required to comply with the safety precautions set out in the following publications, copies of which shall also be kept by him on the Site:
 - i. The Code of Practice relating to the safety of men in civil engineering inspection pits and small – diameter vertical shafts. (Transactions of the South African Institution of Civil Engineers, Vol. 2, No. 11, November 1960, obtaining from the Secretary, S.A. Institution of Civil Engineers, PO Box 93495, Yeoville, 2143).
4. The Contractor shall provide suitable and safe access by way of ladders, gangways, etc. to all parts of the Works as may be required for construction purposes or for inspection by the Employer's Agent or the authorised Inspectors in terms of the above-mentioned Acts.
5. All precautions shall be taken to protect workmen against falling material and/or objects and other dangers whilst they are carrying out their duties. Trenches shall in every way be made and kept safe for persons working therein.
6. All persons working, inspecting or supervising in places where falling material and/or objects could be encountered shall be provided by the Contractor with

- hard hats of a type approved by the Inspector of Mines, the use of which shall be strictly enforced.
7. The Contractor shall provide a properly equipped first-aid box, which shall be accessible at all times.
 8. Where adequate safety precautions are not being observed, the Employer's Agent may order the Contractor to comply with minimum safety requirements at the latter's expense. Compliance with such order will not absolve the Contractor from any of his responsibilities and obligations under the Contract.
 9. The Contractor shall display on a prominent place the following emergency information:
 - i. Local Police:
Telephone number ii.
 - Local Ambulance:
Telephone number iii.
 - Local Fire Brigade:
Telephone number iv.
 - Nearest Doctor
 - v. Name
 - vi. Telephone number (office hours) vii.
 - Telephone number (after hours) viii.
 - Consulting room street address
 10. The Contractor shall furthermore comply with the requirements of the "Safety Instructions" contained at the end of this Document. (See Schedule 13)

PSA 6.2 Degree of accuracy (Sub-clause 6.2)

Degree of Accuracy shall apply to all components of the Works except where otherwise specified in the Schedule of Quantities and/or Drawings and provided that the minimum permissible deviation given for an element will prevail where more than one deviation can be interpreted in Clause 6.2.3(d).

PSA 7 Testing (Sub-clause 7)

The onus rests on the Contractor to produce work, which conforms in quality and accuracy of detail to the requirements of the Specifications and Drawings and the Contractor must at his own expense, institute a quality control system and provide experienced engineers, foremen, surveyors, materials technicians and other technical staff, together with all instruments and equipment, to ensure adequate supervision and positive control of the works.

The cost of the all supervision and process control, including testing, so carried out by the Contractor, shall be deemed to be included in the rates tendered for the related items of work.

The Contractor's attention is drawn to the provisions of the various sections of the Specifications regarding the minimum frequency of the testing that will be required for process control. The Contractor shall at his own discretion increase the frequency where necessary to ensure adequate control.

The Contractor shall submit to the Employer's Agent the results of all relevant tests, measurements and levels indicating compliance with the specifications on completion of every part of the work for examination.

Should the results of any of these tests fall below the required standards as specified in the specifications, the cost of any additional tests required by the Employer's Agent will be to the account of the Contractor.

PSA 7.2 Laboratory (Sub-clause 5.2)

A Laboratory for the use of the Employer's Agent Representative is not required on site. A commercial laboratory approved by the Employer's Agent and appointed by the Contractor shall do all acceptance control tests required in terms of the Contract. All tests must be done according to the tests prescribed in the SANS 1200 under the relevant sections.

PSA 7.4 Statistical analysis of control tests (Sub-Clause 7.4)

Statistical control methods will not be applied under this contract.

PSA 8 MEASUREMENT AND PAYMENT

PSA 8.2.1 Fixed-Charge and Value-Related Items (Sub-clauses 8.2.1. and 8.3)

The tendered sums for the fixed-charge and value related items in the P&G Section of the Schedule of Quantities shall not be subject to any variation if the actual value of the work done exceeds or falls short of the accepted tendered amount within the limit stated in Clause 6.3 of the General Conditions of Contract 2015, or if extension of time for the completion of the works is granted.

Payment for fixed-charged and value-related items will be done in three separate payments as follow:

40% of total cost after the Contractor has stabilised and equipped the site office and after the Employer's Agent is satisfied that a substantial start of the actual construction work has been made;

40% of total cost after 50% of the actual work (excluding material on site) has been completed and approved by the Employer's Agent;

20% of total cost on issue of practical completion certificate by Employer's Agent, according to the guidelines of the GCC.

PSA 8.2.2 Time-Related Items

The tendered amount for a time-related item will be increased if an extension of time for the completion of the works is awarded on the condition that the activity related to the item tendered for must be sustained during the extended period.

The ratio between the increased amount for a time-related item and the tendered amount must be the same as the ratio between the extension of the time period for the completion of the work and the original time period allowed for completion of the works.

If the works is completed before the end of the original time period allowed for completion of the works, the tendered amount of a time related item that is influenced by the earlier completion would be reduced similarly.

PSA 8.2.2.1 Standing time costs due to riot, etc. for the Contractor's total operation.

The unit for measurement shall be a working day, and a working week shall be held to consist of five working days and a working day of 9 hours, unless otherwise agreed upon. The sum per working day tendered under this time-related item shall represent that part of the Contractor's costs for standing time of whatever nature.

This payment item will only be applicable to delays in the execution of the Works and additional costs which in the opinion of the Employer's Agent are incurred as a result of riot, commotion, politically motivated sabotage and acts of terrorism, or disorder outside the control of the Contractor.

The provision of this clause shall in no way prejudice the right of the Employer or the Contractor to terminate the Contract under the provisions of Clause 9 of the GCC (2015).

PSA 8.3.2.1 Facilities for Employer's Agent

The Contractor to provide one furnished site office for the use of the Employer's Agent and his representative save to the requirements of SANS 1200 AB 3.2 or similar approved. A monthly time-related provisional sum has been included in the Schedule of Quantities to cover the rental costs of accommodation for the Employer's Agent Representative. These amounts shall be payable by the Contractor to the Employer's Agent according to the provisional sums allowed and upon receipt of a tax invoice for such amounts.

The Contractor shall provide and maintain one carport with waterproof roofing for the duration of the Contract for the use of the Employer's Agent. The floor shall consist of crushed aggregate to alleviate dusty and muddy conditions or similar approved.

a) Cellular Telephone

No cellular telephone has to be provided for the Employer's Agent Representative for the duration of the contract. Measurement and payment shall only be made for the relevant time related item.

b) Name Board

Number of name boards as per Bill of Quantity will be ordered by the Contractor according to the Employer's Agent's specifications, complete with dimensions, wording and specifications as prescribed, within one month from the commencement date. The Contractor shall be responsible to transport the name board to site and to erect it at the indicated position on suitable supporting posts. The Contractor shall remove the name board completely from site after construction is completed before the last payment certificate shall be approved.

PSA 8.4.2 Operation and Maintenance of facilities on site for the duration of construction, except where otherwise stated

The tendered sums for the fixed-charge and value related items in the P&G Section of the Schedule of Quantities would not be subject to any variation if the actual value of the work done exceeds or falls short of the accepted tendered amount within the limit stated in Clause 6.11 of the General Conditions of Contract (2015).

PSA 8.4.2.1 Facilities for Employer's Agent (Time Related Items)

a) Cellular Telephone

No cellular telephone has to be provided for the duration of the contract. However, the contractor is responsible for costs up to R5000.00/month all-inclusive.

b) Name boards

Name boards shall be maintained for the duration of the Contract.

c) Survey

Assistants and Materials

The contractor shall provide the following survey equipment on the site from the commencement to the completion of the works, which shall also be for the use of the Employer's Agent and his representatives.

a) 1 x 100m steel measuring tape;

b) Steel pegs, shovels, picks etc. which the Engineers Representative may require during the contract;

c) 1 Theodolite with tripod and 5m staff.

d) One complete Troxler test unit, with proof of recent calibration.

a. Hotel or other Accommodation or office required for the Employer's Agent Representative.

These items will include the cost of rented office accommodation and the provision of telecommunication facilities to the Employer's Agent. The Contractor will be responsible for this prime cost items to the amount of R6,000.00 per month. These services will be provided to the Contractor by the Employer's Agent and will be billed in advance. These items will include all overhead costs, maintenance and insurance with respect to the provision of office accommodation and cellular- and landline telecommunication facilities. This item shall be payable to the Employer's Agent prior to certification of the second construction payment certificate.

d) Administrative assistance to the Contractor

This item will entail the pension of administrative assistance to the Contractor by the Employer's Agent and will include assistance relating to the:

- Calculation and determination of project quantities;
- Compilation of construction payment certificates; and
- Copy and submission of construction payment certificate.

The Contractor will be responsible for this prime cost item to the amount of R5,000.00 per month. This item will be billed in advance and will be payable to the Employer's Agent prior to certification of the second construction payment certificate. This item will include all computer related / electronic work, facsimiles, printing and copying as well as travelling and time based work in this instance.

e) Health and Safety Inspections on Site

This item will include the provision of Health and Safety Inspections on Site by a certified Health & Safety Office under the auspices of the Employer's Agent. The Health and Safety Officer will ensure compliance the Contractor with the OHS Act and he will have the authority to stop construction work on Site will be responsible for this prime cost item to the amount of R7,500.00 per month. This service will be billed in advance and the item shall be payable to the Employer's Agent prior to certification of the second construction payment certificate.

f) Environmental Management Plan Audits

This item will include the provision of Environmental Management Plan (EMP) Audits on Site by an Environmental Control Officer (ECO) under the auspices of the Employer's Agent. The ECO will monitor compliance of the Contractor with the EMP and will be responsible for this prime cost item to the amount of R10,000.00 per month. This service will be billed in advance and the item shall be payable to the Employer's Agent prior to certification of the second construction payment certificate.

PSA 8.9 Construction Monitoring

Construction monitoring costs will be claimed by the design engineer on a monthly basis for the duration of construction at a rate of R45,000 per month for construction monitoring services (Level 2 – Part time) rendered by the design engineer's representative (ER). The ER shall:

- a) Regularly visit the site at a frequency which may vary during the course of the project, and such visits may be daily or weekly according to the demand of the project;
- b) Regularly, review samples of materials and work procedures for conformity to the contract documentation and design specifications. The ER shall review regular samples of important completed work prior to covering up, or on completion as appropriate.

The Contractor will take ultimate responsibility for quality of work and remains responsible to put in place quality control processes to control its output in terms of the design specifications and requirements whereas the design engineer will conduct inspections and acceptance testing to confirm conformance to the design specifications prior to certification of the works.

PSA 9.1 Submit detail as-built drawings of existing services and adjustments to construction drawings

The contractor will be responsible for the submission of all as-built drawings of all existing services intersecting pipeline trenches as well as any applicable adjustments to the construction drawings. The lump sum tendered shall include full compensation for all information in the possession of the contractor as required above in order to complete the as-built drawings must be submitted to the Employer's Agent Representative before a certificate of completion will be issued for the works.

PSA 9.2 Detailed setting out of the work

The contractor will ensure that all the works be set out from existing survey beacons by a registered surveyor. The sum tendered shall be regarded as inclusive of all related survey work on site.

The Employer's Agent will provide survey beacons (of adequate type and in sufficient quantity) as bench marks. From information provided on drawings issued by the Employer's Agent, the Contractor shall be responsible to provide all positions and levels, of all intermediate points required for proper control of the works.

As bench marks may be disturbed during the execution of the works, all levels and setting out pegs shall be referred to at least two bench marks. The contractor will ensure that all works are set out from existing survey beacons by a professional registered land surveyor. The setting out data, including the elevation (obtain x, y, z coordinates) from these pegs shall be submitted to the Employer's Agent evaluate final natural ground levels (NGL) prior to the commencement of excavations. In the case of deviation from the original pipe route for whatever reason, the contractor will at his own cost survey the new proposed route, and submit the data to the Employer's Agent for approval.

Preservation and replacement of beacons and pegs will be subject to the Land Survey Act, 1927 (Act No 9 of 1927).

PSA 9.3 Compile and submit Health and Safety Plan

The lump sum tendered shall include full compensation for the provision and maintenance of a Health and Safety Plan, risk assessment, permit applications and notifications as called for in the Act and Regulations.

Eighty percent (80%) of this amount will be paid when an approved Health and Safety Plan has been achieved. A further 10% will be paid when the value of work certified by the Employer's Agent exceeds one half of the tender price and the remaining 10% will be payable upon issue of a completion certificate.

PSA 9.4 Implement Health & Safety Plan

The lump sum tendered shall include full compensation for the compliance with the approved H&S Plan

and inter alia for the following:

- Provision and maintenance of Health & Safety File;
- Provision of construction supervisors and safety officers;
- Health and Safety training for employees and subs;
- Provision of protective clothing;
- Provision of safety fences, signs and barricades; and
- Scheduling of monthly safety meetings and providing monthly reports accordingly, etc.

PSA 9.6 Control of Water

The Contractors are warned that the water table might be high due to the location of the construction site, fact that this site is situated in a high rainfall area and considering that the construction period may run into rainy season.

The Contractor shall at all times and in all respects be responsible for the handling of stormwater from higherlaying areas above the Works and for the handling of any sub-surface water especially in excavations for terraces and trenches that may affect the Works and for the handling of all spoiled water when disconnecting existing water connections or valves. All payments to be made in this regard and all costs related thereto, shall be deemed to be included in the relevant items that are included in the Schedule of Quantities.

SANS 1200 AB: ENGINEER'S OFFICE

PSAB 1 NAMEBOARDS (Clause 3.1)

Substitute the first paragraph of Clause 3.1 with the following.

The Contractor must supply and erect one name board at an approved site, and shall comply as regards site, painting and details municipalities standard name board. A sample is attached.

PSAB 2 SURVEY ASSISTANTS (Clause 5.5)

Substitute "two or more suitable educated survey labourers" in this paragraph with "one semi-skilled labourer".

The Engineer's Representative will occasionally need the assistance of a survey labourer to help with testing, survey, etc., envisaged at approximately 4 hours (non-consecutive) per week.

PSAB 3 SURVEY EQUIPMENT

The Contractor shall provide the following tested and approved survey equipment on site for the duration of the contract and for the use of the Engineer whenever needed.

- a) One automatic level plus tripod,
- b) One level staff, all graduated metrically and
- c) One 5m and one 25m-tape measure.

The above-mentioned equipment may, by arrangement be shared between the Contractor and the Engineer's Representative. The Contractor shall keep the equipment insured against any loss; damage or breakage and he shall indemnify the Engineer and the Employer against any claims in this regard.

PSAB 4 MEASUREMENT AND PAYMENT

PSAB 4.1 Survey Assistant ((New Clause)

Payment for the survey assistant shall be at the tendered day work rates for the hours worked in assisting the Engineer's Representative. No payment shall be made for the survey equipment all costs shall be deemed to be covered by the rates tendered for the Contractor's facilities. No payment shall be made for the survey equipment or survey assistant and all costs shall be deemed to be covered by the rates tendered for the Contractor's facilities.

SANS 1200 C: SITE CLEARANCE

PSC 1 SCOPE (Clause 1.1)

Add the following:

“The specification also covers the removal of unreinforced and reinforced concrete, existing pipe culverts and existing roadway and layerworks, (at tie-ins and road widening), and saw cutting of existing road surfacing.”

PSC 2 MATERIALS

Disposal of Material (Subclause 3.1)

Delete the first two sentences of this clause and replace with:

“Debris arising from clearing operations or from the demolition of existing structures that are not suitable for re-use in the works or for landscaping in areas designated by the Engineer, shall be removed by the Contractor and disposed of at the approved tip site. Transport of such material shall not be paid separately, but shall be included in the relevant items for clearing

The rates tendered shall allow for any fees to be paid at the tip site.”

PSC 3 MEASUREMENT AND PAYMENT

PSC 3.1 Clear And Grub (sub - clause 8.2.1)

The location of disposal or dumping sites shall be the Contractor's responsibility and no overhaul shall be payable to the Contractor for loading, temporary and dumping of material thus cleared under this scheduled item.

Unit of measurement for "clear and grub", for road works shall be the square metre, and clearing for sewer and storm-water routes shall be metre.

PSC 3.2 Removal of Brickwork, Reinforced And Unreinforced Concrete (New Clause) unit: m3

Separate items are scheduled. Measurement shall be net in place before removal. The rates shall cover the cost of complete demolition, all necessary excavation and associated works and disposal as per PSC 3.1.

SANS 1200 DA: EARTHWORKS (SMALL WORKS)

PSDA 1 CLASSIFICATION FOR EXCAVATION PURPOSES (Clause 3.1)

Delete Sub-Clause 3.1.1 and 3.1.2 and replace with the following:

PSDA 1.1 Method of Classifying

The Contractor may use any method he chooses to excavate any class of material but his chosen method of excavation shall not determine the classification of the excavation. The Engineer or his Representative will decide on the classification of materials. In the first instance classification will be based on inspection of the material to be excavated and on the criteria given in PSDA 1.2 (a) and (c).

PSDA 1.2 Classes of Excavation

All materials encountered in any excavation for any purpose including restricted excavation will be classified as follows:

(a) Soft Excavation

Any material, which can be removed by bulldozers or backhoes, shall be classified as soft excavation.

Soft excavation shall be material not falling into the category of hard rock excavation.

(c) Hard rock excavation

Hard rock excavation shall be excavation in material (including undecomposed boulders exceeding 0.17 cubic metre in individual volume) that cannot be efficiently removed without blasting, wedging and splitting, or hydraulic hammers.

This classification includes materials such as:

- solid unfractured rock occurring in bulk
- solid ledges thicker than 200mm
- igneous rock intrusions • cemented sedimentary rocks.

PSDA2 CONSTRUCTION

PSDA2.1 Conservation of Topsoil (5.2.1.2)

Add the following to Subclause 5.2.1.2:

“Topsoil shall not be stockpiled higher than 2,0m. Care shall be exercised to prevent the compaction of topsoil in any way especially by vehicles travelling over such material.”

SANS 1200 DB: EARTHWORKS (PIPE TRENCHES)

PSDB 1 CLASSES OF EXCAVATION (Clause 3.1)

The excavation of material, for the purposes of measurement and payment shall be classified as specified in PSDA 1.

SABS 1200 G: CONCRETE (STRUCTURAL)

PSG 1 MATERIALS

PSG 1.1 Applicable Specifications (3.2.1)

Add the following:

All cement types shall comply with the requirements of SABS ENV 197-1

For this contract only OPC CEM I, Class 42.5, cement shall be used.

PSG 1.2 CEMENT (3.2.1 and 3.2.2)

The grade of concrete shall be as specified on the drawings or schedule of quantities. Cement shall not be kept in storage for longer than four weeks and shall be used in the order in which it has been stored.

PSG 2 PLANT

PSG 2.1 Ties (4.5.3)

Add the following:

Permanent metal ties shall have a minimum concrete cover of 40mm after formwork has been removed.

Tie holes shall be filled with “Durabed” grout supplied by ABE or similar approved. The product shall be prepared to a non-slump consistency, but where no cracking occurs when pressed into a firm ball. Trial mixes shall be made to arrive at the required working consistency.

PSG 3 CONSTRUCTION

PSG 3.1 Fixing (5.1.2)

The welding and the use of heat in cutting high tensile deformed bars (Y bars) shall not be permitted without the approval of the Engineer.

PSG 3.2 Cover (5.1.3)

The reinforcement shall be fixed with the minimum cover as specified on the drawings.

In the case of walls, columns, roof slabs, the minimum specified cover should be attained by one of the following methods, or as approved by the Engineer.

- (1) by using “cover block” manufactured from dense, strong cement/sand formed in a block with wire ties, cured under water for a minimum period of 7 days.
- (2) by the use of plastic spacers, set in an orientation so that no pockets of air can be trapped beneath them during vibration of the concrete.

PSG 4 FORMWORK

PSG 4.1 Design Of Forms

- (i) Forms shall conform accurately to the shape, lines, levels and dimensions of the concrete as shown on the drawings.
- (ii) The design of formwork and supports shall be the responsibility of the Contractor.
- (iii) Forms shall be designed as to support their mass, the load exerted by wet concrete and the vibration, construction or other loads that they may be subjected.
- (iv) All timber shall be free from holes, loose knots, cracks, splits, warps or other defects likely to affect the strength or appearance of the finished structures.
- (v) Wedges and clamps shall be used in preference to nails for securing the form components and wire ties or tie bolts in reinforced concrete, and must be capable of removal after use, except as otherwise specified.

PSG 4.2 Classification of Finishes (5.2.1)

Notwithstanding Sub-clause 5.2.1, finishes shall be classified as rough or smooth, as follows:

- (a) Rough

Concealed surfaces and surfaces more than 200mm below final ground level

- (b) Smooth

All surfaces not classified as “rough” in paragraph (a) shall be classified as “smooth”. All exposed areas, unless otherwise indicated, shall be chamfered 20mm x 20mm by means of a fillet fixed to the formwork.

PSG 4.3 Removal of Formwork (5.2.5)

Add the following:

Removal of forms shall be determined by means of cubes cast with the concrete and cured in accordance with S.A.B.S. 863. The removal shall be carried out under the personal supervision of the Foreman, only after the permission of the Engineer has been obtained and in such a manner that the concrete is not jarred, vibrated or otherwise damaged. Where test cubes to determine stripping times are not made, the minimum periods which shall elapse between the time of the placing of the concrete and the time of removal of the forms, shall otherwise agreed with the Engineer, be in accordance with the table hereunder, where each day covers a full 24 hour period.

Delete Table 2 and replace with the following:

Minimum stripping Times in Days

	CEM I	CEM I	CEM II	CEM II	CEM III	CEM III
Type of structural Member of Formwork	Normal Weather (Above 15° C)*	Cold weather (Below 5°C)*	Normal Weather (Above 15° C)*	Cold weather (Below 5°C)*	Normal Weather (Above 15° C)*	Cold weather (Below 5°C)*
Beam sides, wall or unloaded cols	1	2	2	4	2	6
Slabs, with props left underneath	4	7	5	8	6	10
Beam soffits. Props left underneath	7	12	8	14	10	17
Removal of Slab Props	10	17	10	17	12	21
Removal of beam Props	14	21	14	21	18	28

*Average daily temperature of the atmosphere adjacent to the concrete as measured by a maximum and minimum thermometer.

PSG 5 CONCRETE

PSG 5.1 General (5.5.1.1)

Concrete shall comply with the requirements for strength concrete. (See clause 5.5.1.7)

The maximum cement content for all grades of concrete shall not exceed 450kg per m³ without the permission of the Engineer. In addition, the following will be applicable for this project:

1. The concrete must be resistant to mild acid with a PH of approximately 6.
2. This may be facilitated by slowing the progress of the reaction by using a calcareous aggregate (e.g. limestone) which is susceptible to acid attack and will help to neutralize the acid.
3. Coarse aggregate used must be as large as possible i.e. 26.5 mm to reduce the proportion of paste in the concrete which is vulnerable to acid attack.
4. Fine aggregate must be well graded and able to produce a dense, impermeable matrix that will resist the ingress of aggressive materials. The grading curve given in Fulton's concrete technology and referred to as the preferred grading must be used and not the grading given in SANS 1083.
5. A high proportion of cement i.e. a minimum of 350 kg/m³ must be used to ensure a sufficient content of Ca(OH)₂ which is vulnerable to acid attack. This minimum cement content must be used irrespective of the water/cement ratio requirement for a 35 MPa concrete.
6. The concrete must be resistant to attack by sulphates which are present in sewage.
7. A cement must be used which is resistant to expansive reactions due to sulphates. The best cement available for this purpose will be a 50/50 blend of ground granulated blast furnace slag and clinker cement.

Curing of concrete

Curing of concrete by means of surface water retention or use of an acceptable curing compound must be included to improve the impermeability of the concrete surface to chemical ingress.

Permeability and resistance to chemical attack can be enhanced by using the various proprietary materials available for the purpose which can be used as a coating, either barrier or penetrating. Information must be obtained from the manufacturer/supplier and included in your submission.

PSG 5.2 Sample and Trial Concrete mixes

The concrete mixes for the grade of strength shall be designed by an approved design laboratory. The Contractor at his own cost shall supply to the laboratory samples of the cement and aggregate he proposes to use for the works. The proposed slumps and proportions of the materials to be used for each grade of concrete shall be submitted to the Engineer for his approval.

No structural concrete shall be placed on the job until the Contractor has satisfied the Engineer as to the suitability of the mixes concerned.

Trial panels for durability concrete (W class concrete)

As part of the durability class concrete mix design approval process, trial panels shall be constructed on the site (or at the laboratory) before construction of structural elements commences, to ensure that the contractor can successfully achieve the oxygen permeability and sorptivity targets set for the in-situ concrete with method of construction to be adopted. Each trial panel shall be constructed using the same type of concrete mix, shuttering type, placing and curing methods (including application rates of curing compounds if applicable) as to be used on the final structural element to be constructed. The dimensions of such a trial panel shall be 0.40m wide, 0.60m high and 150mm thick. The panel shall be constructed vertically. It is suggested that 2 lifting hooks be cast into the panel to facilitate lifting, moving or disposal of panel. It most likely will be that one trial panel will be required for substructures (piers, columns, retaining walls, etc) if the same grade concrete is specified for all substructures.

The test area for taking of cores (taken in horizontal direction) shall not be less than 100mm from all horizontal and vertical edges. The number of cores to be extracted and tested is described below.

Test panels for durability concrete (W class concrete)

During casting of concrete on site, test panels shall be constructed on the site adjacent to where the concrete element is being placed. Each test panel shall be constructed with the same concrete, shutter type, compaction and curing methods being used in the element being cast (including same vibrator frequency and curing compound application rates), and be left to cure for 28 days adjacent to the concrete element. Thereafter it shall either be cored on site or transported to the laboratory for testing of the required durability parameters. The dimensions of the test panels shall be 0.4m wide, 0.6m high and 150mm thick and be cast vertically to simulate vertical casts of the substructures and vertical faces of all structures. It is suggested that 2 lifting hooks be installed at both top ends of

the test panel to assist with transport. For precast concrete, test panels will not be constructed, as cores will be drilled from the concrete elements at the Precast yard before being placed at its final location. For the horizontal faces of Columns/Surface Bed Slabs, Water Retaining Walls and All bases/foundations, test panels will also not be constructed. Instead cores will be extracted from the top surface of the test panels.

The frequency of the testing and number of cores to be extracted is described under below.

The test area for the taking of cores (taken in a horizontal direction) shall not be less than 100mm all horizontal and vertical edges.

Testing for concrete durability

Durability predictions for durability concrete prefixed 'W' will be based on the following tests that shall be carried out by an accredited laboratory approved by the Engineer:

- (i) Oxygen permeability
- (ii) Water sorptivity
- (iii) Chloride conductivity

Notes:

The test methods shall be as described below.

For test no's (i) and (ii) (and (iii) when required), cores of 70 ± 2 mm diameter shall be extracted from the test panels when the concrete reaches the age of at least 28 days and tested.

Test No. (iii) may only be required where specified (e.g. within a chloride environment along the coast or where chlorides are present in ground water).

A sample for the purposes of durability testing is as defined in Table B8106/1. The cores for durability testing shall be extracted from the test panels for process and acceptance control (at the frequency as shown in Table B8106/2). Durability testing shall only be required for concrete specified as durability concrete with the prefix "W". The number of samples to be taken shall be as shown in Table B8106/2.

Table B8106/1: NUMBER OF CORE RESULTS REQUIRED FOR A SINGLE SAMPLE FOR DURABILITY TESTING

Durability Parameter	No. of Core Results
a. Sorptivity	1
b. Oxygen Permeability	2
c. Chloride conductivity	1

* Test undertaken only if specified and within a chloride environment.

Table B8106/2: Number of test panels required for durability testing

Element	No. of Test Panels to be taken (see Table B8106/1 for number of core results required for a single sample)
Water Retaining walls	1 (per element/pour) ²
All bases/foundations	1 (per element/pour) ²
Columns/Surface Bed Slabs	1 (per element/pour) ²

Note:

1. Test panels required to be cast vertically. Additional cores required to be extracted from roof slabs/beams, i.e. in-situ cores.
2. Note that where group of elements are cast on the same day, only one test panel will be required, but only if the same grade concrete is used.

For cores to be extracted from precast elements, the engineer will indicate the positions at which the cores will be extracted. Filling of the holes left by the drilling of the cores shall be the responsibility of the contractor and shall be carried out using an approved proprietary non-shrink repair mortar so as to restore structural integrity and durability of the structural element tested.

The methodology and latest revisions for the durability index tests are available at the University of Cape Town's web address at www.civil.uct.ac.za. In addition, the results of all the durability testing shall be submitted at least once a month in the required format to the University of Cape Town, where the present contact person is: Dr. H Beushausen - email: hans.beushausen@uct.ac.za.

Testing for concrete cover

Concrete cover testing shall be conducted using an approved calibrated electromagnetic cover meter, able to comply to requirements as defined in linear and block scans and has the ability to save and calculate data measured.

The testing (non-destructive) shall be conducted to confirm that the specified depth of concrete cover has been achieved. The cover meter tests shall cover at least 1m² for every 20m² surface area of concrete placed. Readings shall be taken to identify individual bars, with at least 3 readings at 100mm spacing on every single bar within 1m². The cover meter must be calibrated whenever being used to test for cover on each project. Standard Calibration block must be used on each project, and where substantial testing is required, the calibration block shall be kept on site. Cover meters shall comply with the relevant modern standards (e.g. EN55011, 50082-1, 6100-6-1, 6100-6-2, 6100-6-3, 6100-6-4 and BS18881 Part 204).

Critical elements for cover surveys are Columns/Surface Bed Slabs, Water Retaining Walls and All bases/foundations. The engineer will identify other critical areas required to be surveyed. Should any of these areas shows deficiencies, the engineer may order additional cover tests on other areas at the contractor's costs.

The procedure for testing for depth of reinforcement from concrete surface shall be in accordance with the manufacturer's requirements for the relevant electromagnetic cover meter. All cover meters shall be calibrated on site under the control of the engineer. The

number of readings taken of the layer of rebar closest to the concrete surface to each 1m² to be tested shall be such that an accurate average cover can be determined for the tested area. For the purposes of calculating the average depth of cover bars that have covers 15mm or greater than what is specified shall be capped at specified cover plus 15mm in the calculations.

Example, where Specified cover = 40mm, test as 35mm, then apply limits, $85\% \times 35 = 30\text{mm}$.

Quick Scan readings are to be taken perpendicular to the layer of rebar closest to the concrete surface for each scan area (+/- 30 per m²), so that an average cover to reinforcement can be determined for the tested area.

Readings are to be taken to identify individual bars within each 1m². At least three cover readings, at 150mm spacing, per an individual bar shall be shown in the test results but only overall cover measurement would be used for payment purposes. Reports generated by the equipment shall be used for determining payment. Where more than 10% of readings are below specified lower limit, the area shall be re-scanned, by Image, Block or Grid scan method, to verify the average cover.

Cognizance to be taken of the effect to cover depth measured, where spliced bars are measured in same area as single bars. The size of rebar shall be corrected manually on the device by means of applying the following formula (approximately $1.41 \times \text{diameter of rebar}$ as shown in design).

Where insufficient cover are established before placing of concrete, e.g. Starter bars from base not correct position, remedial action to be performed before continuing with next concreting – these actions to be clearly recorded and area identified.

SABS 1200 GB: CONCRETE (ORDINARY BUILDINGS)

PSGB 1 SCOPE (Clause 1.1)

This section includes specifications for various aspects of concrete referred to in other sections of the standard specifications as well as the construction of cement screeds and waterproofing of concrete roof slabs.

PSGB 2 GENERAL

PSGB 2.1 WATERPROOFING

Waterproofing materials shall be transported, handled and stored with care and laid strictly in accordance with the manufacturer's instruction. A clean, dry, smooth, firm and structurally adequate base with a fall of at least 1 in 50 (depending on the material selected) is required with drainage to gutters and/or rainwater outlets on roof edges, as relevant. Attention shall be given to the detailed design of openings, projections, gutters, down pipes and finishes to make adequate provision for run-off water and to minimise blockages.

Corners and edges shall be covered or angle-rounded. Run-off over the edges of slabs shall be eliminated as this causes stains to the building. Fillets of 75 x 75 mm shall be provided at upstand corners.

The necessary gradient for waterproof membranes are normally provided on top of structures in low-density screeds and then finished, if necessary, with a cement/mortar topping.

PSGB 2.2 CEMENT SCREEDS

CEMENT

The grade of concrete shall be as specified on the drawings or schedule of quantities. Cement shall not be kept in storage for longer than four weeks and shall be used in the order in which it has been stored.

Mechanised plant e.g. scabblers or abrasive blasters must be used for complete removal of all laitance from the existing surface of the floor slab. Dust pollution should be kept to a minimum during these operations. Once the coarse aggregate of the slab is exposed, all dust and debris should be removed, surface thoroughly wetted and maintained for approximately 12 hours. A bond coat (1:1 mix of cement and fine sand) should be spread evenly over the surface using a stiff fibre brush. The screed must be laid and compacted in 1 layer. Screeds and toppings shall be of sufficient quality to provide a firm base. The following screed characteristics are suggested for waterproofing purposes:

- (a) Compressive strength of at least 25Mpa at 28 days;
 - (b) Steel-trowel finish (light);
 - (c) Drying shrinkage of less than 0.2% when tested in accordance with the testing conditions specified in SABS 836;
 - (d) Minimum screed thickness of 40mm;
 - (e) Maximum moisture content of screeds:
 - (i) Applications with a density of less than 500 kg/m³ : 10%
 - (ii) Applications with a density exceeding 500 kg/ m³ : 7%
- The screed should be cast or sawn into panels that do not exceed 9m² to cater for drying shrinkage and to control cracking.

PSGB 3 MEASUREMENT AND PAYMENT

PSGB 3.1 Cement Screeds for:

- (a) 25mm screed on floors unit: m²
- (b) 25mm screed on roof slabs unit: m²

The unit of measurement shall be the square metre of exposed surfaces to be screed. The tendered rate shall include all costs for supplying, delivering, storing on site, handling, etc of the materials necessary for the screed, including mixing and laying of screeds currents and falls and forming of sundry items such as fillets, etc complete. The tendered rate shall also cover the cost for forming of screeds around outlets, waste and of all scaffolding, temporary supports, hoisting facilities, etc.

m2 PSGB 3.2 Waterproofing of roof slabs with Derbigum or similar approved unit:

The unit of measurement shall be the square metre of the horizontal and vertical surfaces of waterproofing to the approval of the Engineers. All turn-ups and turn-downs will be deemed to be included in the area measured for the waterproofing and will not be paid for separately.

The tendered rate shall include all costs for supplying, delivering, storing on site, handling, moving, installing and fixing the waterproofing system complete with all necessary sundry items, such as flashing strips, dressing waterproofing around pipes and into outlets and channels. The tendered rate shall also cover the cost of cutting and waste and for scaffolding, hoisting facilities, etc.

SANS 1200 GA: CONCRETE (SMALL WORKS)

PSGA 1 SCOPE (Clause 1.1)

This section includes specifications for various aspects of concrete referred to in other sections of the standard specifications.

PSGA 2 CEMENT (3.2.1 and 3.2.2)

The grade of concrete shall be as specified on the drawings or schedule of quantities. Cement shall not be kept in storage for longer than four weeks and shall be used in the order in which it has been stored.

SANS 1200 LB: BEDDING (PIPES)

PSLB 1 SCOPE (Clause 1.1)

This section includes bedding for water pipelines.

PSLB 2 BEDDING MATERIALS (Clause 3.4.1)

PSLB 2.1 Source of material

It is anticipated that selected fill will have to be obtained from commercial sources.

PSLB 2.2 Selective excavation for bedding materials

Notwithstanding the requirements of Clause 3.7 of SANS 1200 DB and Clause 3.4.1 of SANS 1200 LB regarding the use of selective methods of excavation, selective method of excavation and plant shall be adopted by the Contractor as to enable him to avoid burring or contaminating material that is suitable and is required for bedding. The details contained in SANS 1200 LB shall be used for all relevant bedding details as applicable.

PSLB 3 CRUSHED STONE BEDDING (New clause)

Where the conditions on the trench bottom are so wet that the use of selected granular material is not practical, use will be made of 13.2 or 19mm single sized crushed stone

material from commercial sources. The use of such stone will be entirely at the Engineer's discretion.

PSLB 4 FREEHAUL (Clause 8.1.6)

All material for bedding cradle and selected fill obtained from excavations on site shall be regarded as free haul. No overhaul will be payable for obtaining bedding material from within the site.

SANS 1200 LD: SEWERS

PSLD 1 SCOPE (Clause 1.1)

This section provides for the supply and installation of 110mm and 160mm diameter sewers with appurtenant manholes and connections.

PSLD 2 TYPES OF PIPES, PIPE JOINTS AND FITTINGS (Clause 3.1)

PSLD 2.1 The sewer pipes and couplings shall be of the following as detailed on the relevant drawings and included in the Schedule of Quantities:

- 110mm and 160mm diameter heavy duty uPVC pipes with flexible coupling to SABS 791 and appurtenant plain junctions for house connections

PSLD 3 STEP IRONS (Clause 3.5.7)

The provision of step irons is not required.

PSLD 4 MANHOLE COVERS AND FRAMES (Clause 3.5.8)

Manhole covers located in roadways or as directed by the Engineer must be supplied with Type (2A) – 153 kg heavy-duty Polymer Concrete manhole covers and frames cast integrally with the top slab. (National Manhole Covers Product No. 119105 or similar approved).

PSLD 5 CONNECTIONS TO MANHOLES (Clause 5.4)

Notwithstanding the provisions of clause 5.4, Drawing No. LD-2 (a) shall apply to uPVC pipes. In addition, the short pipe that is built into the manhole shall have clean coarse sand glued to the outside surface to facilitate a watertight bond.

PSLD 5.1 Finished Cover Levels (New Clause)

Unless otherwise ordered or dimensioned explicitly on the working drawings, the level of the top surface of the cover shall be

- flush with the final surface of a carriageway, footway or any paved areas
- 50 mm above the surface of a grassed or gravelled verge, or service lane
- 250 mm above the finished ground level for manholes situated at the mid block of private or municipal property.

-
- 500 mm above ground level in undeveloped open space.

PSLD 6 WATERTIGHTNESS OF MANHOLES (Clause 7.2.6)

All manholes will be subjected to a test for water tightness.

PSLD 7 TOLERANCES (Clause 6.0)

PSLD 7.1 The permissible deviation of the location in plan, of the centre line of the sewer and of the position of manholes and junctions, from the designated location shall be $\pm 50\text{mm}$.

PSLD 7.2 The permissible deviation from the designated level to the invert at each manhole shall be $\pm 5\text{mm}$ and the fall between successive manholes shall be at least 90% of that specified.

PSLD 8 TESTING (Clause 7.0)

PSLD 8.1 Torch and Mirror Test (New Clause)

For the pipeline to be acceptable the visibility of the plug/reflector shall be at least 50% of its area.

PSLD 8.2 Acceptance Criteria (New Clause)

The acceptance of the pipe length or manhole shall depend upon whether it satisfies the criteria set out in SABS 1200 LD clauses 6 and 7.

Where pipes other than vitro clay pipes are laid, only tests carried out on the pipelines after completion of the backfilling to ground level (excluding surface restoration) and completion of the construction of manholes to roof height, including benching, will be considered for acceptance purposes.

In the case where vitro clay pipes are being laid, no pipelines are to be covered prior to inspection and approval by the Engineer. Once the pipeline has been laid and bedded in the compacted bedding cradle (to half pipe) between control points, the Engineer must be called out to inspect the installation. The Contractor is to provide the necessary equipment in order for the Engineer to adequately assess that the pipeline has been laid to the specified tolerances. Further, an air test, in accordance with the specifications, is to be conducted and witnessed by the Engineer prior to the placing of the Fill Blanket.

PSLD 8 CONNECTIONS TO EXISTING SEWERS AT MANHOLES (New clause)

The contractor shall under no circumstances connect the new reticulation into the existing without the prior written instruction of the Engineer. This instruction will only be given after acceptance, by the Engineer, of the sewer lines and manholes of the new reticulation upstream of the connection point.

The rate for this item shall allow for accommodation of flow in existing sewer mains and all other incidental labour and material required while making connections into and altering benching in existing manholes.

PSL SANS 1200 L: MEDIUM PRESSURE PIPELINES

PSL 1 SCOPE

All water pipelines in this contract shall be deemed to be medium pressure pipelines.

PSL 2 MATERIALS (Sub-clause 3.1)

PSL 1.1 CI PIPES FITTINGS AND SPECIALS

Add: " All cast iron fittings to be cement mortar or coated with Rilsan or fusion-bonded epoxy"

PSL 1.2 STEEL PIPES, FITTINGS AND SPECIALS

Delete sub items 3.4.2 and 3.4.3 and replace with the following:

- "All steel pipes, fittings and specials, larger than 150mm diameter to be 4.5mm wall thickness, grade B steel to SANS 719/1971.
- All steel pipes, fittings and specials, 150mm diameter and smaller to be heavy duty to SANS 62.
- All bolts, nuts and washers to be stainless steel.
- All steel pipes, fittings and specials to be Rilsan coated. "

PSL 1.3 uPVC PIPES AND SPECIALS

uPVC pipes and specials to comply with to SANS 966 part 1 specification.

PSL 1.4 FLEXIBLE COUPLINGS

Add: "The shortest length of pipe which may be used in the pipeline is 0,5m, thus the shortening of an adjacent pipe may be necessary so as to ensure compliance with the position of the specials. When pipes of 1,0m or less, in length, are used they shall be jointed by means of C.I. short collar detachable couplings".

PSL 1.5 Flanges and Accessories

Add to sub clause 3.8.3:

"The insertion piece shall be such as to cover the full face of the flange (i.e. the O/D). Bolts and nuts shall comply with SANS 135. Drilling shall conform to BS4504 Table 16/11".

PSL 1.6 Loose Flanges

With regard to sub clause 3.8.4 the following standard shall apply:

"Bolts and nuts shall comply with requirements of SANS 135".

PSL 1.7 VALVES

Delete the contents of this Sub clause and replace by:

“Only one type of valves is acceptable:

a) Wedge gate type valve

Valves shall comply with the requirements of SANS 664 1989 as amended, and shall bear the SANS quality mark. A test certificate as per Clause 3.5.20 of compliance with SANS 664 will be acceptable.

Valves shall display the following features;

- A minimum of 250 microns coating of Rilsan Nylon 11.
- Class 16
- Clockwise closing
- Non rising spindle type with cap.
- May have spigotted, socketted or flanged end connections. When flanged valves are specified, the drilling shall be to Table 16/11 of BS 4504".

PSL 2 CONSTRUCTION (Sub clause 5)

PSL 2.1 General

Add to sub clause 5.1.1

"The center line of the pipeline shall normally be 2,5m from the road reserve boundary inside the road reserve. The pipeline is to be laid continuously and leaving gaps for fittings will not be allowed.

PSL 2.2 Depths and Cover

Unless otherwise shown on the drawings or instructed by the Engineer, cover to pipes shall be as follows:

During Construction:

Where construction traffic is liable to cross over pipes, they shall be laid so that there is not less than 0,75m of cover over the pipe. Road crossings shall be constructed after the construction of the road layers has reached the stage where 0,75m cover is available.

Pipes beneath Verges and Open Spaces:

The tops of pipes beneath verges shall be not less than 0,75m and not more than 1,25m below the final verge level.

Supply Connection:

The tops of pipes shall not be less than 450mm and not more than 600mm below the final road surface.

Pipes beneath existing roadways:

The tops of pipes beneath a road shall not be less than 1m and not more than 1,25m below the road level.

PSL 2.3 SETTING OF VALVES, SPECIALS AND FITTINGS

Add to Clause 5.3:

"The hydrant shall be bolted to the tee such that the outlet is in line with the pipeline. Valves shall be positioned opposite the erf splay peg at intersections".

PSL 3 TOLERANCES

PSL 3.1 CONTROL POINTS

Add: "Valves shall be located as indicated on the plan layout opposite the boundary peg of the erf, and to within a longitudinal tolerance of 100mm."

PSL 3.2 ALIGNMENT (PLAN AND LEVEL)

Add to last sentence: "provided this does not result in a reversal of the grade of the pipeline."

PSL 3.3 Testing of pipelines

PSL 3.3.1 Test pressure (sub-clause 7.3.1)

All pipes shall for test purposes be assumed to have a working pressure of 600kPA for class 6 pipes, 900kPA for class 9 pipes, 1200kPA for class 12 pipes and 1600kPA for class 16 pipes. Test pressure for field-testing shall be 1.25 times the working pressure. The Contractor shall allow for the testing of pipes in short sections so that the difference in minimum and maximum pipe elevation does not exceed 60m for class 6 pipes, 90m for class 9 pipes, 120m for class 12 pipes and 160m for class 16 pipes.

PSL 3.3.2 Method of testing

- a) The Contractor shall provide an approved test pump, an accurate water meter, sealed pressure gauge, tested and certified by an independent testing organization, and all other equipment, materials and labour required for the test.
- b) The section of pipeline to be tested shall be clean and closed off at the ends by isolating valves, end caps or approved end-closure pieces. Free ends shall be firmly strutted against solid supports or trust blocks designed to withstand safely 2 times the calculated and thrust under maximum test pressure. It shall be incumbent on the Contractor to establish the need for blank flanges or isolating valve flanges in order to limit leakage rates past gates, blades and seals.
- c) During this initial filling stage, the pipeline joints and all specials, fittings and valves shall be visually inspected for visible leaks and same rectified before proceeding with the test.
- d) The pressure shall be maintained for one hour and if a pressure drop occurs, more water shall be added to reinstate the test pressure and the valve closed again. The

quantity of water added shall be measured by recording the readings before and after pumping.

This procedure shall be repeated for a period of 24 hours, with water added at hourly intervals where necessary to reinstate pressure and water meter reading recorded. At the end of the 24-hour period, the aggregate quantity of water required to reinstate pressure over 24 hours shall be determined.

e) The contractor shall give the Engineer 48 hours written notice of his intention to commence pressure testing and the Engineer may attend and supervise all or any part of tests. All records and recording charts shall be handed to the Engineer as soon as tests over any section have been completed.

f) All valves, specials, fittings and exposed joints, shall be inspected visually during the 24 hours pipeline test and all visible signs of leaks, sweating and distress shall be reported and attended to without delay.

PSL 3.3.3 Remedial Measures

a) Should the maximum leakage limits as specified be exceeded; the contractor shall determine the position and cause of the leaks and shall take remedial measures at his own expense and to the satisfaction of the Engineer to stop such leaks to ensure the specified degree of water tightness.

b) If during the contract period of maintenance, the number of leaks and other defects is considered by the Engineer to be more than could reasonably be expected from a well-laid pipeline operating under normal conditions, he may order the contractor to retest parts or the whole of the pipeline at the Contractors own expense and no claims for escalation in costs or for whatever other reasons the Contractor might consider to submit claims shall be considered, except where such retests are the result from damages caused to the pipeline by the Employer.

PSL 3.4 Anchor / thrust blocks and pedestals

Dimensions at all anchor / thrust blocks shall be supplied by the Engineer as and when required. The Contractor shall request such information not less than seven (7) calendar days in advance.

PSL 4 MEASUREMENTS AND PAYMENT

PSL 4.1 Supply, lay and bed of pipes complete with couplings Unit: m

Notwithstanding the provision of sub clause 8.2.4, 8.2.6 & 8.2.7, separate items will not be scheduled for the cutting of pipes. The rates tendered shall include the supply & fixing of extra coupling, supply & installing joints special couplings, and the encasing of joints.

PSL 4.2 Extra over PSL 4.1 for the supply lay and bed of fittings and specials complete with couplings

Notwithstanding the provision of sub-clause 8.2.4, 8.2.6 and 8.2.7, separate items will not be scheduled for the cutting of the pipe. The supply and fixing of the extra couplings, supply and installing joints with machined collars and special coupling, and the encasing of joints will therefore be deemed to be included in the rates tendered.

PSL 4.3 CONNECTION INTO MAINS (New Clause)

The contractor shall under no circumstances connect the new reticulation into the existing without the prior written instruction of the Engineer. The Engineer will only give this instruction after acceptance of the new reticulation system

PART B- MECHANICAL AND ELECTRICAL WORKS

CONTRACT N° ALMT10/2023

UPGRADE OF EMANZANA WASTEWATER TREATMENT WORKS – MECHNICAL AND ELECTRICAL WORKS

PART 1: SCOPE OF WORK

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PART 1: SCOPE OF WORK

Description of the Works

Employer's objectives

The Chief Albert Luthuli Municipality (the Employer) is responsible for the treatment of wastewater in the Chief Albert Luthuli municipal area. To this end, the Employer owns and operates wastewater treatment facilities, one of which is the Emanzana Wastewater Treatment Works located in Emanzana at the periphery of the Town Centre.

The existing Emanzana Wastewater Treatment Works comprises oxidation ponds with a treatment capacity estimated at ADWF of approximately 0.5MI/day. Because of existing and planned development, the Employer wishes to upgrade the existing plant to meet the future wastewater treatment requirements of 1.4MI/day (ADWF). The following scope of work comprising construction and equipping of primary treatment facilities is envisaged:

- Inlet works composed of screening facility in the form of channels equipped with the following:
 - a manual hand raked screen
 - Suitable sized inlet works channel with weir
- 1 No Bioreactors each comprising the following:
 - 1 100 m³ anoxic zone, equipped with 1 No. (5.5kW) Anoxic Mixers
 - 600 m³ aeration zone, equipped with 2 No. x 22kW surface aerators
 - A Mixed Liquor Recycle (MLR) pumpstation with 2 No. MLR pumps delivering up to 40 l/sec,
- 1 No. clarifiers of 20m diameter, equipped with half bridge centre mechanism,
- Pump stations with each pumpstation equipped with 2 No. pumpsets in 1 duty/1 standby configuration;
 - Bioreactor/ Clarifier Drainage (RCD) with a duty point of 20 l/s x 15m head
 - Return Activated Sludge (RAS) Pumpstation with a duty point of 10l/s x 10 m head
 - Waste Activated Sludge (WAS) Pumpstation with a duty point of 5l/s x 10m head.
 - Sludge Drying Beds (SDB) Pumpstation with a duty of 5l/s x 15m head,
 - Effluent Discharge Pumpstation with a duty point of 100 l/s x 22m head
- 75m³ Chlorine contact tank complete with chlorine dosing equipment with a dosing capacity of 17kg/h,
- Control Building and pumpstation electrical works and area lighting
- Flow metering equipment
 - Ultrasonic flowmeter capable of measuring incoming raw sewage flows of up to 8.5MI/day at PWWF,
 - 200mm diameter RAS Magflow meter
 - 300mm diameter effluent discharge Magflow meter.
- Laboratory equipment

Overview of the Contract

The work envisaged will be undertaken through two inter-dependent contracts, as follows:

Contract ALMT10/2023 – Civil and Electro-Mechanical contract for the construction of civil structures, installation of the Electrical and Mechanical works and site works.

This Contract, ALMT10/2023 covers the supply, factory testing, insurance, delivery, transport, handling, storing, erection, site welding and making good coatings, aligning, fixing, supporting, connecting, adjusting, drilling for and grouting in and caulking up all holding down bolts, bedplates and pipework, balancing, guaranteeing, site testing, painting, commissioning, handing over in complete working order, providing drawings, operating and maintenance instructions in quadruplicate, instructing staff and operating and maintaining for 20 weeks after completion, the mechanical and electrical plant and equipment, pipework, valves and other plant all as described in greater detail elsewhere in this document and/or shown on the drawings and set out in the Bills of Quantities and as described below:

The Contract is sub-divided for convenience into seven separate sections:

(a) Preliminary and General

This section covers general items and provisions that are common to all other sections of the Contract detailed below

(b) Inlet Works

This section of the Contract covers the design, supply, installation, testing and commissioning of the following electro-mechanical equipment, to be installed at the inlet works:

Manual Screens

Two (2) No. hand raked screens made of grade 304L stainless bars with a spacing of 10mm in order to retain and handle the screenings

Mechanically Screens

Two (2) No. mechanically driven and raked screens preferably Huber or similar approved capable of handling peak flows of up to 50 l/s each. The screens are to be supplied complete with Compactor and bagging equipment.

Grit Classifier

1 No, Grit Classifier

Mechanical Mixers

This section of the Contract covers the design, supply, installation, testing and commissioning of 2 No. x 5.5kW mechanical mixers to be installed in the anaerobic and/or anoxic zones of the bioreactor.

Mechanical Aerators

This section of the Contract covers the design, supply, installation, testing and commissioning of four surface aerators comprising aerators, gearboxes and motors (2No. x 22kW) for the aeration of mixed liquor in the aerobic zones.

Secondary Clarifiers.

This section of the Contract covers the supply, installation, testing and commissioning of equipment for two No. x 18 m diameter secondary clarifiers complete with rotating bridge and scraper; inlet pipe, stilling chamber, electric power cabling and controls all as described elsewhere and shown on the clarifier drawings.

Pumps

This section of the Contract covers the supply, installation, testing, and commissioning of the following pumps:

- A Total of four (4) No. Mixed Liquor Recycle (MLR) pump sets (2 No. per process stream) with a maximum duty point of 40 l/s at 1.2 m head.
- A total of two (2) No. Return Activated Sludge (RAS) per stream process centrifugal pump sets each with a duty point of 10l/s at 10 m head together with pipework, valves and other related equipment.
- A total of two (2) No. Waste Activated Sludge (WAS) Pump station with a duty point of 5l/s x 10m head together with pipework, valves and other related equipment.
- A Total of two (2) No. Reactor/Clarifier Drainage (RCD) submersible pump sets, to pump clarifier and bioreactor drainage from a drainage sump (located and detailed as per Drawings) to a drainage manhole situated at the head of the works, with a duty point of 20l/s at 15m head complete with pipework, valves and other related equipment
- Two (2) Sludge Drying Bed (SDB) submersible pump sets with a duty of 5l/s at 15m head, to pump supernatant from the sludge drying beds to the head of the inlet works,
- Two (2) No. dry well pump sets with a duty of 100 l/s at 22m head for pumping effluent from the chlorine building to the existing maturation ponds.
- Chlorine dosing equipment complete with a capacity of dosing 17kg/h

Electrical Equipment

This section of the Contract covers the supply, installation, testing, and commissioning of the following electrical equipment:

- a) New Incomer to new MCC in the new switch room.
- b) New MCC for all the pump stations located in the control room or pump station buildings.
- c) Extensions to area lighting.
- d) Power and control cabling
- e) Signal cabling to mimic panel in control building.

Overflow Weirs

This section of the Contract covers the supply, installation, testing, and commissioning of:

1. A 4.0m long manually adjustable outlet weir to the new bioreactor.

-
2. 4m long manually adjustable weir for the waste sludge outlet and scum removal from the new bioreactor.

Metering Equipment

The following metering equipment is to be supplied:

1. Ultrasonic flowmeter capable of measuring the anticipated incoming raw sewage flows (of up to 3.4Ml/day),
2. 200mm diameter RAS Magflow meter to measure the activated sludge returned to the bioreactor
3. 300mm diameter effluent discharge meter to measure the flow of effluent pumped for the chlorine contact tank to the head of the existing maturation ponds.

Laboratory Equipment

The following laboratory Equipment is to be supplied under the Contract:

- Dissolved Oxygen Meters
- Total Organic Carbon Analyser
- Drying Oven
- Depth Samplers
- Automatic Samplers
- Reference Book

Spares

The Contractor will be required to supply spares for the main equipment, which will include:

- Bearings
- Seals

NOTE: The structures to accommodate the mechanical equipment to be supplied have been completed by a Civil engineering contractor under a separate contract. The Mechanical Contractor under this contract will be required to inspect all relevant structures that will receive mechanical and electrical equipment and submit report of acceptance or corrective work to be done. This inspection and report must be completed within 3 weeks of the commencement date of the contract. An item for carrying out this work has been included in the schedule of quantities.

The Contractor under this Contract is to be responsible for the supply and installation of all of the mechanical and electrical plant, pipework and valves, and electric cabling, and for all drilling and fixing of bolts and bedplates required for the proper installation and operation of the plant in accordance with this Contract. However, a Provisional Sum(s) has been included in this Contract for carrying out any work of a Civil engineering nature.

Location of the works

Refer to Section C4.

Temporary works

The Contractor is to allow for all temporary works required for the complete erection and installation of the mechanical and electrical plant and equipment to be supplied under this Contract.

Engineering

Design services and activity matrix

The responsibilities for design and documentation are identified below:

Description	Responsible Party
Concept, feasibility and overall process	Employer
Basic Engineering and detail layouts to tender stage	Employer
Final design of mechanical and electrical works for approval by the Engineer	Contractor
Temporary works	Contractor
Preparation of as-built drawings	Contractor

Employer's design

The hydraulic and process analysis of the system has been completed by the Employer.

The conceptual electrical design has been based on the requirements arising from the hydraulic and process analyses.

Design brief

The Contractor is responsible for the design of the mechanical and electrical plant and equipment to be supplied under this Contract. The Contractor's layout of plant and equipment should suit the Employer's proposed layout.

Drawings

The drawings issued to tenderers as part of the tender documents must be regarded as provisional and preliminary for the Tenderer's benefit to generally assess the scope of work. The drawings are issued separately to this document.

The work shall be carried out in accordance with the latest available revision of the drawings approved for construction.

At commencement of the contract, the Engineer shall deliver to the Contractor, copies of the as built drawings and any instructions required for the commencement of the works. From time to time thereafter during the progress of the works, the Engineer may issue further drawings or revisions for construction purposes as may be necessary for adequate construction, completion and defects correction of the works.

Drawings issued separately and that form part of the tender documentation are included in Section C5 of the tender documents.

Design procedures

Within **six** weeks of the acceptance of his tender for the Contract, the Contractor shall supply the Engineer, in duplicate, with fully dimensioned drawings of the plant ordered from him, superimposed on the as-built drawings supplied for approval by the Engineer.

Any re-design and/or cutting or alteration of new structural or building work arising from inadequate or incorrect dimensions and particulars afforded by the Contractor under this Contract, or through late

receipt of any such particulars, and any modifications to existing structures to suit plant supplied under this Contract will be arranged by the Engineer to be carried out as he thinks fit, at the expense of the Contractor under this Contract.

Procurement

Requirements

The conditions associated with the granting of preferences, if any, and the sanctions relating to a breach of preferencing conditions are contained in the tender data.

Subcontracting

Should the Tenderer wish to employ Sub-Contractors for part of the works this is to be clearly indicated and the schedule in this document is to be completed to indicate the full names and addresses of all proposed Sub-Contractors for which approval of the Employer (or the Engineer acting on his behalf) is sought, stating the section of the works that each will be handling.

Construction

Works specifications

The standard specifications on which this contract is based are those included in 1.6 of the Scope of Work.

The variations, additions and amendments to the standardised specifications are included as 1.7 Project Specifications. The Project Specifications take precedence over the Standard Specifications.

The Particular Specifications are included as 1.8 and take precedence over the Standard Specifications, but not over the Project Specifications

Applicable national and international standards

Wherever possible items and materials for construction of the works shall comply with the relevant South African National Standards Specifications and with the British Standards where these are applicable in the absence of local standards.

The Contractor, when using materials conforming to a Standard Specification shall if called upon furnish the Engineer with certificates of tests showing that the materials do so conform.

Plant and materials

Plant and materials supplied by the employer

No plant or materials will be supplied by the Employer under this Contract.

Construction Equipment

Equipment provided by the employer

No construction equipment will be made available for use by the Employer. All construction equipment required for the completion of the works shall be provided by the Contractor.

Site establishment

Facilities provided by the employer

Water

The Chief Albert Luthuli District Municipality is the Water Services Authority and Provider. The Contractor will be required to make his own arrangements with, and pay all the requisite connection and consumption charges for the cost of all water drawn from the water supply authority's system at the ruling tariffs in force at the time and his tender will be held to include for all such requirements throughout the duration of the Contract.

Electricity

The Power Supply Authority is Eskom. The Contractor will be required to make his own arrangements with and pay all the requisite connection and consumption charges for whatever temporary power supplies he may require for his use on the site and his tender will be held to include for all such costs and charges. The Employer will allow the contractor to take power from the existing supply provided that the Contractor supplies and installs a meter(s) and pays the Employer for all power used.

Facilities provided by the contractor

Telephone

The Contractor is to provide his own telephone facilities on site. A telephone may be required for the use of the Engineer or his representative for the duration of the Contract. Provisional sum(s) have been allowed for in the Bill of Quantities as will be appropriate.

Temporary Housing, Stores, etc

The Contractor shall provide and maintain at his own cost all sheds and housing of a temporary nature necessary for the convenience of his workmen and for the accommodation and proper protection of his erection or other equipment from damage or loss. These are to be erected only on sites which shall have been approved by the Engineer and they shall be removed as soon as their necessity ceases and the site thereof restored to its original condition and the ground left clean and sanitary.

No employees except for security guards will be allowed to sleep or be accommodated on the site.

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.

No informal housing or squatting will be allowed.

Storage

No storage facilities will be available or provided by the Employer and the Contractor is to make suitable arrangements to deliver materials as and when required for erection purposes and when called for by the Engineer, whether such call be issued on or after the delivery date offered by the Tenderer.

Vehicle

No vehicle will be required for use by the Employer or his Representatives.

Management

Management of the works

Applicable SANS Standards

The following SANS 1921 Construction and Management requirements for works standards and associated specification data are applicable:

SANS 1921-1 - General engineering and construction works
SANS 1921-6 - HIV/AIDS Awareness

The specification data applicable to the SANS 1921 standards mentioned above are as follows:

SANS 1921-1 Specification Data

SANS 1921-1 Essential Data

Clause 4.1.7

The requirements for drawings, information and calculations for which the contractor is responsible is detailed in Clause 1.2.5.

Clause 4.2.1

The responsibility strategy assigned to the contractor for the works is B.

Clause 4.2.2

The structural engineer for the reinforced concrete structures is Appollo Engineering (Pty) Ltd, from which clarification or further details can be sought.

Clause 4.2.3

The Contractor shall submit drawings / data to the Engineer for approval within the time period specified in 1.2.5.

Clause 4.3

The programme is to show critical path activities and shall be submitted in hard copy and MS Project format (.mpp)

When work under this Contract, out of necessity must be carried out in conjunction with the work of other contractors or with that of the Employer, it shall be co-ordinated and programmed in such a manner as to interfere as little as possible with the progress of such other work, and so as to offer every reasonable facility to other contractors and to authorised employees of the Employer.

Accordingly, this Contract shall be carried out in five separate stages, viz:

Stage 1 – Preparation and supply of detailed drawings to suit as built drawings supplied, and carry out electrical inspections and produce line diagrams thereof – **six (6) weeks**

Stage 1a - Approval of diagrams by the Engineer – **four (4) weeks**

Stage 2 – Manufacture; supply and delivery of plant and equipment to site – **Tenderer is to state the time period required.**

Stage 2a – Insure/Care/Store of all equipment while awaiting civil structures – **(thirty) 30 weeks,**

Stage 3 - Erection, installation and commissioning of the plant and equipment – **Tenderer is to state the time periods required.**

Stage 4 - Operation and Maintenance and train the Employer's personnel, of installed electro-mechanical equipment following successful commissioning– **twenty (20) weeks.**

The Tenderer is to state in the Contract Data the periods of time he requires for delivery, installation and commissioning.

The Engineer will specify the required delivery, erection and commissioning dates (if delayed beyond the tendered periods).

The Contractor must be ready to commence erection and installation within an agreed period not exceeding two weeks of an order being given to him by the Engineer that erection and installation of the plant is to commence, and he shall thereafter carry out erection and installation continuously.

Clause 4.4

The Contractor will be solely responsible for the production of work and materials that complies with the Specifications to the satisfaction of the Engineer. To this end it will be the full responsibility of the Contractor to institute an appropriate Quality Assurance (QA) system on site. The Engineer will audit the Contractor's quality assurance (QA) system on a regular basis to verify that adequate independent checks and tests are being carried out and to ensure that the Contractor's own control is sufficient to identify any possible quality problems which could cause a delay or failure.

The Contractor shall ensure that efficient supervisory staff, the required transport, instruments, equipment and tools are available to control the quality of his own workmanship in accordance with his QA-system. His attention is drawn to the fact that it is not the duty of the Engineer or the Engineer's representative to act as foreman or surveyor.

Clause 4.12.2

The samples of materials, workmanship and finishes that the contractor is to provide and deliver to the Employer are: Nil

The drawings that the Contractor is to provide and deliver to the Employer are detailed in 1.2.5.

Clause 4.14.3

No office or testing laboratory is required for use by the Employer and his agents under this Contract.

Clause 4.14.5

No toilet facility is required for the Employer and his agents under this Contract.

Clause 4.14.6

A nameboard showing contract details of this Contract will be required.

Clause 4.17.1

The requirements for the termination, diversion or maintenance of existing services are as outlined in the specifications. In this regard the wastewater treatment works is an essential service and where existing services are to be disrupted in any way, the work must be carried out as agreed with the Employer and in such a way as to minimise downtime.

Clause 4.17.3

As the wastewater treatment works is an essential service special care must be taken at all times to prevent any damage to any service.

Clause 4.17.4

The requirements for detection apparatus are: Nil

Clause 4.17.7

Existing services, which are damaged by the Contractor, shall be repaired by the Contractor and all costs of the repairs shall be borne by the Contractor.

Clause 4.18

The safe conduct of the Works shall be a primary consideration and the entire Works shall be carried out in conformity with all applicable statutory regulations and requirements and the Client's Health and Safety specification included as a particular specification. Tenderers must price their tenders accordingly.

Particular attention is drawn to the following Acts and Regulations:

Occupational Health and Safety Act 1993 and Regulations;

Minerals Act, 1991 and Regulations;

The Explosives Act, 1956 as amended and Regulations.

The Employer reserves the right to rectify any faults or conditions which could cause a safety hazard or endanger the lives of the Employer's personnel entering the Works. Any such rectification shall be at the Contractor's expense. All equipment and machines must be in a safe condition and registered as required by the Occupational Health and Safety Act.

The Contractor shall submit written proof of payment of contribution in accordance with the Compensation for Occupational Injuries and Diseases Act (1993).

The Employer's safety officer may at any time enter the premises or site to carry out safety inspections. The safety officer will notify the Contractor or his duly appointed representative of any safety hazards that he may find.

Clause 4.18.2

It is important that the excavations be fenced off to prevent unauthorized entry to the site. Bonnox fencing 1,5m in height may be used supported off creosote poles with a single strand of barbed wire attached at the top. Chevron tape should be attached to the top of the fence all-round the site to clearly mark off the working area. Notices should be attached to the fence indicating that the site is for personnel employed on the contract only and not for unauthorised person.

At weekends or holidays the site must be completely closed off to the public. It is the responsibility of the Contractor to ensure that the sites are closed off. Standard type farm gates can be used for access points and locked when the Contractor is not in attendance. All fencing and gates must be maintained until the work is complete.

Clause 4.22

The works to be undertaken by selected subcontractors comprise: Nil

SANS 1921-1 Variations

Clause 4.1.1 o)

Record drawings are to be provided electronically and at least one copy is to be provided on paper.

Clause 4.1.10

Where reference is made to "SANS 2001", substitute with "SABS 1200".

SANS 1921-1 Additional Clauses

Clause 4.6 e)

The Contractor is to ensure that any stormwater runoff or groundwater seepages into the works are avoided.

Clause 4.9.5

The provision of security for the Contractor's site establishment, plant and personnel is sole responsibility of the Contractor and no claims for payment for additional security measures taken during the currency of the contract will be entertained.

Clause 4.9.6

The Contractor is to comply with the Environmental Management Plan included as a Particular Specification.

Clause 4.17.8

The Contractor shall so carry out all his operations as not to encroach on, or interfere with, trespass on, or damage adjoining land, buildings, properties, road structures, pipelines, places and things, in the vicinity of the Works.

SANS 1921-6 Specification Data

SANS 1921-6 Essential Data

Clause 4.2.1a)

A qualified service provider is one that appears on the list of recommended service providers, which is available from all regional offices of the Department of Public Works.

No HIV / AIDS awareness programme is required under this Contract, but the Contractor is to include HIV/AIDS awareness on the agenda for toolbox talks and health & safety meetings.

SANS 1921-6 Variations

Clause 4.3.2

The Employer's representative shall certify the report and schedule described in 4.3.1 whenever a claim for payment is issued to the Employer.

SANS 1921-6 Additional Clauses

Clause 4.1h)

Provide information about the names of the closest service providers to be displayed on a poster of size not smaller than A2.

Clause 5

In the event that the contractor fails to satisfy the requirements of this specification, the Employer may apply sanctions which include the rejection of claims for payment as being incomplete or the withholding of completion certificates (interim or final).

Recording of Weather

The Contractor shall be permitted to take his own rainfall measurements on site subject to the Engineer's approval, but access to the measuring gauge(s) shall be under the Engineer's control. The Contractor is to provide and install all the necessary equipment for accurately measuring the rainfall as well as to provide, erect and maintain a security fence plus gate, padlock and keys at each measuring station, all at his own cost.

Management Meetings

The Contractor and such other persons as may be nominated by the Engineer shall be required to attend monthly site meetings, the date and place for which will be set by the Engineer in consultation with the Employer and Contractor.

A main purpose of these meetings will be to review and discuss progress and programme, and all persons attending the site meetings must be empowered to act on behalf of the firms they represent.

Daily Records

The Contractor is to provide a site diary, which is to be kept on site, for the purpose of keeping daily records in respect of work performed on the site.

Testing, Completion, Commissioning and Correction of Defects

Performance Tests

On completion of erection and installation the Contractor must carry out the following tests, where applicable, in addition to any other tests which may be specified elsewhere:

Before Commissioning

Tests for correct alignment of all equipment.

Tests for correct direction of rotation of motors.

Tests for water tightness, where applicable.

Test for correct operation of control gear.

Before Taking Over

Check all rotating or moving equipment for correct and smooth operation.

Check and calibrate all items of plant for correct delivery and power consumption.

Check all controls for correct operation and functioning.

Check accuracy of measurements in conjunction with the Engineer against known operating conditions such as emptying a sump, pumped flow of known values, etc. For certain of these tests, the Contractor will have to make temporary recording facilities available.

During Defects Liability Period

Check all equipment for correct operation and functioning.

Check accuracy of measurement of all meters, as detailed in (d) above.

The entire cost of providing all test equipment must be borne by the Contractor, and an adequate allowance for such tests must be made in the tendered price for commissioning, testing and adjusting which is included in the Bill of Quantities where applicable.

Completion and Taking Over Date

As soon as the Contractor has handed over all of the plant and equipment that has been supplied, installed, satisfactorily tested, and commissioned as a complete unit in proper working order in accordance with the specifications and the General Conditions of Contract, the Certificate of Completion will be issued.

If any significant item(s) of plant or equipment fails to perform to the approval of the Engineer and the Contractor is unable, within three months of the prescribed date, to rectify the matter, the Employer retains the right to reject the item(s) and to instruct the Contractor to remove, at his own cost, all such plant and/or equipment after refunding to the Employer any or all monies which may at that time have been paid to the Contractor or otherwise expended.

Defects Liability Period

During the defects liability period the Contractor must visit the site at least three times, say 1, 6 and 12 months respectively after the commissioning date, to inspect and check all the plant supplied and installed by him for proper operation and to adjust where necessary, and to satisfy himself that the regular maintenance of the plant is being carried out correctly and in accordance with the written instructions supplied by him. Those written instructions should also contain a routine preventive maintenance schedule of significant plant operating parameters which the plant supervisor will be expected to attend to on a regular basis.

An item to enable Tenderers to price for these visits has been provided in the Bills of Quantities.

Operation and Maintenance Instructions

Operating and maintenance instructions, are required for all new plant and equipment supplied and/or installed under this Contract. Such instructions shall be prepared by the Contractor and supplied as part of the contractual obligations. Quadruplicate copies of instructions shall be prepared and supplied by the Contractor to the Engineer not less than four weeks before performance tests are conducted on the site.

The instructions shall be made up in the form of one or more hard-covered books with rear pockets enclosing prints of all the drawings relevant to the Contract.

On the cover of each set of instructions for each Section of the Contract, the following information shall be indelibly printed in bold lettering:

**CHIEF ALBERT LUTHULI MUNICIPALITY
EMANZANA WASTEWATER TREATMENT WORKS UPGRADE
CONTRACT ALMT10/2023
SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT
MAIN CONTRACTOR**

Mechanical Mixers

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

Surface Aerators

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

Electric Motors for Mixers and Aerators

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

Gearboxes for Aerators

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

Secondary Clarifier equipment

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

Geared motor drive for Secondary Clarifier

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

ALL PUMPSETS (MLR., RAS, RCD, SDB) Pumps

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

ALL PUMPSETS (MLR., RAS, RCD, SDB) Pumps

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

ALL PUMPSETS (MLR., RAS, RCD, SDB) Pump Electric Motors

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

All Other Mechanical Plant and Equipment

(Name, address and telephone number of Sub-contractor(s))

MAIN ELECTRICAL SUB-CONTRACTOR

(Name, address and telephone number of Sub-contractor)

MCC's

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

Magnetic Flow Meter Equipment

(Name, address and telephone number of Manufacturer and Supplier/Sub-contractor)

All Other Electrical Plant and Equipment

(Name, address and telephone number of Sub-contractor(s))

The first page of each set of Instructions shall be an index to the Instructions and shall include a list of the numbers and descriptions of all drawings and pamphlets included in the set and also a list of the Engineer's drawings relating to the relevant sections of the Contract.

The instructions shall be carefully prepared so as to provide in detail and with clarity a complete description of all components of the plant and equipment, and all information and drawings required to give a complete record of the commissioning tests, and complete guidance to operators and maintenance staff on all matters relating to the proper and safe operation and maintenance of the plant and equipment, and on all matters relating to the future ordering of spare parts which may be required for maintenance purposes and relating to the use of testing equipment and conduct of regular testing required to establish and maintain the quality and economy of operation of the plant.

Inter alia, the instructions for each component supplied and installed under the contract shall include the following:

- List of spares, tools and testing equipment supplied under the contract. This list shall include the full details referred to in the contract and relating to spares and testing equipment for mechanical and electrical plant and tools.
- List of spare parts and testing equipment which are not supplied under the contract, but which may be required for future major overhaul and/or testing of mechanical or electrical plant and equipment.
- List of "name plate data" giving full particulars of serial numbers and other descriptive data pertaining to the plant and equipment installed.
- List of points requiring lubrication, stating for each point the type and grade of lubricant recommended and full details as to quantity, timing and renewing of lubricant. Before typing the instructions, the Contractor shall contact the maintenance engineer responsible for the new works to obtain the name and brand of lubricants generally in use by the Employer and, wherever possible, suitable grades of lubricant of that particular brand shall be nominated by the Contractor in the instructions.
- Particulars of bearings, contacts and other moving parts with instructions relating to any special attention which may be required.
- Precautions to be taken in starting, running and stopping the plant or equipment, by automatic or manual control.
- Routine tests which the supplier recommends to be carried out on the plant to ensure that it is kept in good repair.
- Drawings depicting all pumps, motors, couplings, guards, bedplates and connecting pipework.
- Copies of all pump test sheets (signed by the manufacturer or agent's engineer in the case of factory testing of pumps)
- All dimensions of all switchgear, MCC's and switchboards and all other electrical equipment.
- Schematic diagrams of electrical equipment, control and protection systems and light and plug circuits.
- Wiring diagrams of all MCC's and switchboards, and all other electrical equipment, control and protection systems, and light and plug circuits.

- Cable schedule giving the description and length and tag number of every cable.
- Manufacturer's pamphlets and catalogues edited and clearly marked so as to describe the particular equipment and plant supplied. (NOTE: Pamphlets and printed catalogue data shall be bound into the instructions rather than pocketed with the drawings and all information in such pamphlets and catalogues which is relevant to this contract shall be clearly marked.) Information shown in 'general' catalogues and brochures that is not applicable to plant and equipment supplied and installed under this contract is to be neatly deleted.

The prices and rates tendered for the supply of plant and equipment will be deemed to include allowances for the supply of instructions in terms of this clause. However, an item has been included in the Bills of Quantities to cover the preparation and supply of instructions.

The operating instructions shall first be prepared in draft form and one copy shall be submitted to the Engineer at least four weeks prior to commissioning date for comment, amendment where necessary, and approval. Upon receipt of such approval, the operating instructions in book form shall be prepared by the Contractor and issued at least 7 days before the scheduled day of commissioning the plant.

Instructing Operators During Initial Period of Operation

Experienced representatives of the Contractor and, where applicable, of the electrical and other sub-contractors shall attend the commissioning and performance testing of all equipment and shall explain in detail and demonstrate to at least one mechanical and one electrical operator employed by the Employer, the contents of the instructions referred to above and the correct methods of operating and maintaining the plant and equipment. The prices tendered in the Bills of Quantities will be deemed to include allowances for such explanation and demonstration as may be required to be provided by the Contractor and sub-contractors to ensure that the Employer's operating staff is fully informed as to how the plant and equipment is to be cared for, operated, maintained and safeguarded.

The contractor will be required to provide staff and all consumables to operate and maintain the completed works for a continuous period of twenty (20) weeks following completion of the works. Items are provided in the Schedule of Quantities, for this work.

Permits and Wayleaves

The Employer is to obtain the necessary approvals and the authorities likely to be involved regarding obtaining wayleave and/or permits are:

- Eskom

The Contractor is to obtain confirmation from the Employer that the requisite approvals have been granted before commencing work.

STANDARD SPECIFICATIONS

INTRODUCTION

The Standard Specification gives a general description of the requirements to be met, and sets out the relevant specifications relevant to the Contract as well as other relevant and additional clauses. In certain clauses the standard specifications allow a choice to be specified in the project specifications between alternative materials or methods of construction and for additional requirements to be specified to suit a particular contract. Details of such alternative or additional requirements applicable to this contract are contained in the project specifications.

Materials and Workmanship

All materials and components used in the manufacture and fabrication of plant to be supplied under this contract shall be the best quality and suitable for the purposes for which they are intended.

Quality Management

Applicable Quality Assurance Standards

The Tenderer shall provide a co-ordinated and formally documented statement of his quality management system, including quality management objectives, policies, organisation and procedures, for the compulsory implementation of SABS 0157, Code of Practice for Quality Management Systems, Part III. The same applies to Part II of the said Code of Practice which must be implemented on certain selected items only. However, although Part II will not be implemented in all instances it will not exempt the Contractor of compliance with the quality requirements laid down in the tender documents. Monitoring and control by the Engineer may be done at any time on any material.

The Contractor shall submit with his tender an assessment report on his quality management and quality control system issued by an independent Quality Assurance Authority approved by the Engineer. The inspection on which this assessment report is based shall have taken place not more than 12 months prior to the closing date for this tender.

Responsibility for and all associated costs of compliance with this sub-clause shall rest with the Contractor.

Quality Assurance Enhancement

Should the Contractor or any of the proposed sub-contractors not comply with Sub-Clause 1.6.2.1 at the time of tender, a Contract may be awarded subject to a written undertaking to enhance his own and/or Sub-Contractor's quality assurance system to the satisfaction of the Engineer before commencement of the contract.

Quality Assurance Staff

The Contractor shall satisfy the Engineer that a quality specialist together with sufficient and suitably qualified staff will be assigned to control the quality of the material used by each sub-contractor engaged in the supply of critical and major components and sub-assemblies.

Engineer's Quality Assurance Representative/Inspector

The Engineer may elect to appoint an independent quality assurance representative to act in a surveillance capacity on his behalf for part or all of the contract.

The Engineer's Quality Assurance Representative will be a selected Sub-Contractor and will be paid by the Contractor under this Contract for all tests passed by the Inspector and certified by the Engineer. The Inspector will not act as the quality controller for the Contractor or his Sub-Contractors and accordingly any tests failing inspection will be for the account of the Contractor. Similarly, the costs of all inspections arising following any failed tests will be for the account of the Contractor.

Classification of Material

Part II of the above-mentioned Code of Practice, ie a quality system for manufacture and installation, will apply only to certain critical material, products and services if and where indicated hereunder in this document.

Sub-Letting

All enquiries made and contracts placed by the Contractor for critical components shall require that sub-contractors comply with the requirements of the preceding sub-clauses. Responsibility for and all associated costs of compliance shall rest with the Contractor. In instances where SABS 0157 is not applicable, Tenderers must indicate what equivalent alternative Code of Practice is being implemented.

Disqualification

Tenderers who do not include the formally documented statements called for in Sub-Clause 1.6.2.1 and who do not respond in terms of Sub-Clause 1.6.2.2 above may be disqualified.

Standard Specifications

Reference made hereinafter to specifications of the South African Bureau of Standards (SABS) or the British Standards Institute (BS) shall be deemed to include all revisions of and/or additions to such specifications ruling at the closing date of tenders.

Protection Against Corrosion and Paint Coatings

Where corrosion of metal may be expected, the Contractor shall supply materials which are resistant to corrosion. Any material showing signs of corrosion, tuberculation or pitting before expiry of the Defects Liability Period must be replaced by the Contractor at no cost to the Employer. The Tenderer's prices will be held to include the cost of all painting or other surface treatment which is not separately specified or scheduled but which is nevertheless necessary for the protection of surfaces against corrosion.

The coating systems to be applied under this Contract shall be carried out strictly in accordance with the manufacturer's instructions which written instructions shall be obtained by the Contractor and a copy handed to the Engineer's Representative prior to commencing painting operations. Overcoating times shall be strictly adhered to.

The paint system to be used shall be as specified below or an equivalent approved by the Engineer:

Paint System No 1

Epoxy coating for internal and external surfaces of Mild Steel pipes and/or Steelwork immersed in or located within 1 metre above the Polluted Water level. Surface Preparation - Sa 2½.

- Sigmacover 522 – Epoxy primer 50µm Dry Film Thickness (DFT)
- Sigmaguard 790.- Epoxy coating 2 coats x 150µm DFT

Paint System No 2

Structural Steelwork Coastal Regions - Exterior Work. Surface Preparation - Sa 2½

Coating for external surfaces of Mild Steel pipes and/or Steelwork both located more than 1 metre above the Polluted Water level.

- Sigmazinc 160 – Zinc primer 60µm DFT
- Sigmacover 435 .- General purpose epoxy build coat 150µm DFT
- Sigmadur 550 - Polyurethane finishing coat 60µm DFT

Paint System No 3

Structural Steelwork: Coastal Regions Interior Work. Surface Preparation - Sa 2½

- Sigmacover 280 – Zinc phosphate primer 75µm DFT
- Sigmadur 550 - Polyurethane finishing coat 60µm DFT

Paint System No 4

Overcoating Galvanised Steel. Surface Preparation -Clean Surface with approved cleaner

- Sigmacover 280 – Zinc phosphate primer 75µm DFT
- Sigmacover 456 - Epoxy finishing coat 75µm DFT

Application of Paint Coatings

No application of paint shall be carried out before the paint manufacturer has approved both the proposed firm of applicators and the plant he proposes to use, except where instructed to the contrary by the Engineer.

When applicable, the range of temperature within which paint may be applied (outside the range from + 5° to + 35°C) shall be that range which the manufacturer of the paint shall approve in writing. Such approval shall be obtained by the Contractor.

Stripe coating to all sharp edges is required under this Contract.

The embedded lengths of irremovable fasteners which penetrate deeper than 75 mm from a concrete face, may be left as base metal. The remaining portion shall comply with the paint system specified for the adjacent steelwork.

Surfaces which will become inaccessible for coating after fabrication or erection shall be given the full paint treatment specified plus one further top coat prior to the surfaces becoming inaccessible. Surfaces of welded connections must be painted before welding is carried out and painted surfaces damaged by welding must be repainted without delay. In the case of bolted connections, edges of bolt holes must

also be painted, and bolts, nuts and washers must be similarly treated. Washers must be used under all nuts to prevent damage to the treated surfaces of the plate.

Generally, the paint system shall be applied at the factory and damage to the system caused during transport or erection shall be repaired on Site after erection has been completed.

Application of Metal Coatings

The grade of hot dip galvanising (HDG) required shall be that for SABS 935 heavy duty coatings carried out in accordance with that specification. This shall be applicable to all metalwork where HDG is called for either on the Drawings or in the Schedule of Quantities.

Structural Steelwork

The design of structural steelwork and the materials and workmanship used in the construction of same shall comply with the requirements of Part B of The National Building Regulations (Act 103 of 1977 as amended).

In the case of welded connections, in addition to welds required for structural strength, a sealing weld shall be carried right around the connection so as to facilitate protection against corrosion.

Screwed and Socketed Steel Pipes and Malleable Cast Iron Fittings

Screwed and socketed mild steel pipes shall comply with the requirements of SABS 62 and shall be galvanised. Unless otherwise specified, all screwed and socketed pipes shall be of medium quality. Malleable cast iron fittings used in conjunction with screwed and socketed pipes shall comply with the requirements of SABS 509 and shall be galvanised.

Steam, Gas and Compressed Air Pipework

Pipework for conveying steam, gas and compressed air in sizes up to and including 150 mm nominal bore shall comply with the requirements of SABS 62 for seamless steel pipes. Unless otherwise specified, these pipes shall be of heavy quality with flanged joints, the latter suitable for a working pressure of 2,5 MPa.

Polyethylene Pipes and Fittings

Polyethylene pipes shall be of high density type complying with the requirements of this specification and shall be of type(s) and class(es) as specified for each application.

The manufacturer/supplier shall maintain a quality system that conforms to the requirements of the SABS ISO 9001:2000 or national equivalent. Applicable standard for manufacture of pipe shall be the SABS ISO 4427.

The Client (or the Engineer on his behalf) may, at its discretion, appoint an Inspection Officer/Inspection Body to carry out pre-delivery tests at the manufacturers/suppliers works.

The manufacturer/supplier shall allow the Inspection Officer/Inspection Body access to his works for the purpose of inspecting either during the course of manufacture or when completed and shall afford the Inspection Officer/Inspection Body all reasonable facilities.

Copies of all test schedules and manufacturers quality control records shall be available for examination by the Inspection Officer/Inspection Body.

The following documents are to be submitted for pipes supplied:

- Certificate of Registration – SABS ISO 9001:2000 or National Equivalent
- Permit Certification – SABS ISO 4427: 1996 for PE 80 and PE 100
- Quality Control Plan (QCP shall include Raw Material and Product Test Certificates)
- SABS or National Equivalent Quality Systems Audit Reports – Last 2 Audits

The finished product shall be free from cracks, voids, foreign inclusions and other defects, which would impair the overall performance. It shall be smooth walled inside and out and shall conform to the material requirements outlined below.

Pipe and Fittings (e.g. stubs) raw material composition shall be PE 100 (for solid wall pipes) and PE 80 (for structured wall pipes) pre-compounded black.

List of Positive Raw Materials – PE 100 and PE 80:

M5010 PE 100, CRP 100, HE 3490-LS, A 6060 R, TUB 121, XS 10 B, P 110 BL

Technical Considerations for Raw Material and Finished Product:

<u>Physical/Chemical Property</u>	<u>Standard</u>	<u>Value</u>	<u>Unit</u>
Density ISO 1183	0.949-0.960	g/cm ³ P	
Melt Flow Index (190°C/5Kg)	ISO 1133	0.20-0.35	g/10min.
Vicat Softening Point	ISO 306	64-68	°C
Crystalline Melting Range	ISO 3146-85	130-135	°C
Viscosity Number	ISO 1628-3	390	cm ³ P/g
<u>Mechanical Property</u>	<u>Standard</u>	<u>Value</u>	<u>Unit</u>
Shore D, Hardness	ISO 868	61	-
Elastic Modulus	ISO 527	>900	MPa
Tensile @ Yield	ISO 527/ISO 6259	24	MPa
Ultimate Tensile	ISO 527/ISO 6259	35	MPa
Ultimate Elongation	ISO 527/ISO 6259	>600	%
Flexural Stress (3.5% Deflection)	ISO 178	19	MPa
Thermal Stability (OIT @ 210°C)	ISO 10837	>20	minutes
Carbon Black Content	ASTM D 1603/	2.25 +/- 0.25	%

ISO 6964

<i>Pipe Characteristics</i>	<i>Applicable Standard</i>
Outer Diameter	ISO 11922-1 (Grade B)
Min Wall Thickness at any point	ISO 11922-1 (Grade U)–ISO 4065
Ovality	ISO 11922-1 (Grade N)

All HDPE Pipes shall be indelibly marked at 1 metre intervals with the following details:

TRADE NAME	Manufacturer/Supplier Name
SPECIFICATION	SABS ISO 4427
PIPE OD	e.g. 1000
PIPE OD TOLERANCE	Grade B
WALL THICKNESS	e.g. 47.7
NOMINAL PRESSURE	e.g. PN 8
MATERIAL DESIGNATION	PE 100 or PE 80
BATCH No.	Manufacturer/Supplier Traceability

HDPE pipework on his contract is to be jointed by the following methods (and approved by the manufacturer) and where indicated on the drawings or elsewhere described or as instructed by the Engineer.

Structured wall pipes up to and including 800 mm internal diameter:

“water-tight” socket and rubber seal

in-situ welding

flexible/stepped couplings

Structured wall pipes over 800 mm internal diameter and all solid wall pipes:

in-situ welding

flexible/stepped couplings

All welding is to be heat-tool butt welding in accordance with SABS 0268–H.S. Welding (and the pipe manufacturer’s instructions) and is to be carried out only by welders certified under the Thermoplastics Welding Institute of South Africa (TWISA).

The following standards shall apply:

SABS 0270	–	Approval of Welding Procedures
SABS 0268 Part 1	–	Heat Tool Welding (Butt-welding)
SABS 0286 Part 10	–	Weld Processes and Defects
SABS 1671	–	Testing of Welds
ISO 12176 Part 1 of Polyethylene’s	–	Equipment and Machinery for Heated Tool jointing
SABS 0269	–	Testing & Approval of Welders
SABS 0268 Part 4	–	Weld Processes
DIN 16963 Part 1	–	4 (Fabricated Fittings – PE-HD Systems)

Raw Material Acceptance Tests:

The material used for the production of the Pipe & Fittings shall be a high-density polyethylene (HDPE). To ascertain the quality of this product the following tests shall be performed, prior to manufacture of the pipes or fittings.

Density
Melt Flow Index
Carbon Black Content
Thermal Stability

Testing as contained in the SABS ISO 4427 Specification shall apply. Tests shall also be conducted ad-hoc by a registered and authorised Testing Body.

Unplasticised Polyvinyl Chloride Pipes and Fittings

Unplasticised Polyvinyl Chloride (uPVC) pipes and fittings shall comply with the requirements of SABS 966 and shall be of the class(es) as specified for each application.

Copper Tubes

Copper tubes shall be of Class suitable to the plant operating conditions and conforming to SABS 460. Where bends are required they shall be formed with a proper tube bending machine. Joints shall be brass compression fittings conforming to BS 864.

Cast Iron Pipes and Fittings

All cast iron pipes and fittings shall comply with the requirements of BS 2035 and unless otherwise specified, shall be of Class D quality for straight pipes and of Class D quality for fittings. Materials used shall comply with the requirements of BS 1452 Grade 14 for "Grey Iron Castings".

Before leaving the foundry all cast iron pipes and fittings shall be thoroughly cleaned internally and externally and immediately thereafter given the following treatment:

Internally (including end of plain ended pipes and fittings)	:one coat bitumen paint to give an average dry film thickness of 50 microns.
Externally	:one coat zinc chromate primer to SABS 679 Type 1 applied at the factory, plus a further coat of primer, one coat of approved undercoat and one coat of approved gloss enamel applied after erection. The total dry film thickness of the system shall be an average of at least 200 microns.

For treatment of mating faces of flanges see Clause 1.6.16.

Stainless Steel Pipes and Fittings

All stainless-steel pipework is to be Grade 304 L welded austenitic pipe in accordance with the American Standard ASTM A312.

Mild steel flanges may NOT be used on stainless steel pipes and MAY NOT be joined with mild steel bolts and nuts and, in cases where stainless steel and mild steel flanges are joined together, nylon or plastic washers shall be used to prevent galvanic corrosion.

All welds on stainless steel are to be pickled and passivated.

Mild Steel Pipes and Fittings

Pipework

All mild steel pipes and fittings other than screwed and socketed pipes, shall comply with the requirements of SABS 719 Grade B, except where scheduled to the contrary. Unless otherwise specified, all pipes and fittings shall have a wall thickness of 6 mm.

Coating of Pipes and Fittings

Before leaving the factory all mild steel pipes greater than 150 mm diameter, fittings and other steelwork shall blast-cleaned internally and externally to Grade Sa 2,5 of the Swedish Standard SIS 05-5900 and then be coated in accordance with Clause:1.6.4

Pipes and fittings with nominal diameter less than or equal to 150 mm are to be hot dipped galvanised (heavy duty coating) with final coating in accordance with Clause 1.6.4.

For treatment of mating faces of flanges see Clause 1.6.16.

Plain ends of pipes and fittings shall be covered and protected against damage whilst being transported from the factory to the site. After installation, all coated pipes are to be further given two coats of gloss paint plus primer as required to suit the Employer's colour scheme for pipework and pumps.

Internal Rubber Lining of Pipes and Fittings

Where stated in the scope of work/project specification, mild steel pipes and fittings are to be rubber lined as described below, and not epoxy lined as described above.

Materials:

The material to be used shall be a Type 1, Grade A, Class 60 natural rubber compound to SABS 1198 – 1978 such as Natural Rubber - 153", having the following minimum physical properties:

Hardness Shore "A":	50 deg
Tensile strength:	18 Mpa
Elongation at break:	600%
Specific gravity:	1,08

and with a maximum service temperature of 90P°C.

Surface Preparation:

The internal surfaces to be lined shall be prepared as follows:

Clean by grit blasting to SA 2,5 as per Swedish Standard SIS 055900 – 1967 to provide an anchor profile of between 80 and 100 microns, with a minimum of 65 microns.

All dust and debris shall be removed and the surfaces solvent wiped.

Bonding System:

The cleaned and prepared surfaces are to receive the primer and tie coats associated with the application of the requisite rubber bonding system where such a process forms part of the lining procedure.

Application and Curing:

The bonding and rubber lining shall be applied by specialists to a minimum thickness of 10 mm unless otherwise stated in the project specification, and cured as necessary, all in accordance with the requirements of British Standard BS 6374 Part 5.

Testing and Repair:

All lined surfaces shall be visually inspected and shall undergo a holiday detection spark test using a pulse holiday detection unit set at 3 000 volts per mm thickness of the lining.

Repairs to defective or damaged areas of coating shall be carried out in strict accordance with the specialist applicator's instructions and under the supervision of their accredited representative

Notwithstanding the foregoing specification, the rubber lining applicator shall meet with representatives of the Engineer and the Employer prior to commencement of any rubber lining and agree the materials and application specifications and methodology to be used.

Valves

All valves shall be SABS approved and provided with individual test certificates for each valve from the manufacturer; and are to be inspected, and the hydraulic tests witnessed, by an Inspector to be appointed by the Engineer. The tendered rates for the valves shall include for making arrangements for independent inspections. The Inspectors' fee and recoverable expenses will be for the account of the Employer, fees and expenses arising from abortive or repeat visits due to non-compliance with the specified requirements will be for the Contractor's account and will be deducted from amounts due to the Contractor.

Gate Valves:

Gate valves shall be double flanged and shall be SANS approved and comply with requirements of SABS 664, and to Class 10, i.e. 1000 kPa working pressure for the suction valves and delivery valves except where otherwise specified.

Valves shall be drop tight under test and working conditions and shall have non-rising spindle, wedge closure, and suitable for repacking under pressure. Bodies, gates and glands shall be cast iron or cast steel, spindles bronze, and seal rings on gate and body gunmetal or stainless steel.

All sluice valves shall be fitted with square caps or hand wheels as appropriate. The direction of rotation shall be anti-clockwise for closing when viewed from above. The direction of opening or closing of each valve, and the appropriate words shall be embossed on the cap and superfluous arrow heads shall be completely ground off the castings.

Gate valves shall be of the classes specified and shall be tested in accordance with SABS 191. The valves shall be subjected to both the "closed end" test and the "open end" test. There shall be no leakage under any of the test conditions.

Each gate valve shall be capable of being opened and closed by one man when the unbalanced head on the gate is equal to the rating of the valve as specified. If the design of the valves is such that gearing is necessary to achieve this, then the valves shall be equipped with machine-cut spur gearing and differential gear indicators.

All gate valves shall be double flanged with flanges drilled off-centre and with drillings to match existing flanges where applicable and/or to suit the pressure ratings of the valves. The non-rising spindles shall be bronze or stainless steel and the spindle nut either bronze or gun metal.

A complete specification, accompanied by drawings, is to be submitted at the time of tendering. Rates for all the gate valves shall include for testing and supply of test certificates, copies of which shall be attached to each relevant invoice and to each copy of each invoice. The open end test pressure shall be stamped on the top of one flange of each valve. No payment will be made for valves unless the test certificates have been submitted. Valves not complying with SABS 664 will be considered as an alternative offer provided full technical details are submitted with the tender. Resilient seal valves will be accepted for this contract.

Butterfly Valves:

Butterfly valves shall be manufactured in accordance with BS5155 (cast-iron and carbon steel butterfly valves for general purposes), as far as is applicable. Where conflict exists, the requirements of this specification shall take precedence.

The following criteria for construction shall be met:

Body

These shall be of the wafer-lug type, with drilled/tapped bolt holes, to allow the valve to be used at the maximum pressures specified in terminal positions. This is to allow downstream pipework to be disassembled with the upstream pipework remaining under pressure.

Double flange valves and U-section wafer-type valves, as described in BS 5155 shall be acceptable, provided that:

The valve is suitable for individual bolting of each flange and, the dimension between the inside faces of the flanges is not less than $3D$, where D is the diameter of the flange bolts as specified in SABS 1123.

The use of single flanged and flangeless valves shall be permitted only if provision is made for downstream pipework to be disassembled with upstream pipework under pressure.

Bodies shall be one piece casting Ductile Iron, UTS 400 MPa, YP250 MPa, (elongational 12%) GGG42, or equivalent for sizes up to ND 1 500. Sizes above ND 1 500 shall be of cast steel. Bodies shall never be in contact with the fluid conveyed and shall be fully protected internally by the resilient seat.

Disc

These shall be cast or stamped, spherically machined and positively splined or keyed internally to the driving shaft. (Use of plinths or bolts is totally prohibited).

Selection of the disc material shall be made, taking into account the aggressivity of the fluid. (Cupro-aluminium or stainless steel Grade 316 or equivalent). A suitably coated ductile iron disc will be considered.

Shaft

Butterfly valve technology shall "dry shaft" ie such that the shaft will never be wetted. The shafts shall be manufactured from stainless steel and shall be positively splined or keyed to the disc. The upper and lower shaft and tie-bolt, when assembled to the disc, shall give in effect a one-piece shaft/disc assembly.

The valves shall be capable of being easily operated by one person, against the maximum unbalanced pressure and the effort required to operate each valve shall not exceed a torque of 180Nm.

Liner

The resilient, synthetic rubber seat shall be easily replaceable (bonded liners are prohibited), and shall entirely cover the inside of the body overlapping over the sides to form the seal between the body and matching pipework.

Note that the dimensions of flanges to be used on connecting pipework shall comply with the relevant requirements of SABS 1123. The valve supplier shall ensure that the dimensions of the liner shall enable it to form the seal between the valve body and these flanges.

Where necessary, the liner shall be keyed to the body with annular grooves, in the bore of the valve. The design shall be such as to allow the disc to seal drop-tight to the liner, so that there is no ingress of fluid to the shaft area.

Valves with "O" ring shaft backup seals will not be acceptable. The valve manufacturer shall offer alternative grades to cope with the specified fluid(s).

General

Quarter-turn handles shall be supplied for valves up to and including ND 150. The handle shall be lockable in all intermediate positions and be adaptable to the valves.

For valves larger than ND 150, a gear shall be used. The gear operator shall be designed with a worm and nut system. The gear operator shall be irreversible in any position. The gear shall have a handwheel and an indicator protected by plexiglass or equivalent showing the position of the disc. If specified, limit switches shall be fitted, mounted in a waterproof and dustproof housing.

The pipe ND will be as specified in the Project Specification. The supplier shall ensure that the operation of the valve will not be impeded by the presence of cement mortar or other specified lining in the adjoining pipes/fittings.

Air Valves:

The materials and workmanship employed in the manufacture of air valves shall be of a similar standard to that set out in SABS 664 for waterworks pattern gate valves.

Types of Air Valves:

Air Valves shall be fully stainless steel (including all flanges, bolts, nuts, studs etc), of the double orifice type, and shall be equal or similar to the "Vent-O-Mat" (RBX series) type in which a small orifice, manufactured from Grade 316 stainless steel and having a minimum orifice size of 2,0 mm diameter, shall be capable of releasing accumulations of air at all pressures throughout the specified working pressure range and shall be drop-tight at the specified minimum working pressure. The large orifice shall be suitable for admitting or expelling large quantities of air during emptying and filling of the pipeline. The opening of the valve (to atmosphere) shall be enclosed by a stainless-steel mesh which has been fixed into the valve body to prevent the entry of small insects or vermin into the valve.

All welding of stainless steel shall be carried out in workshops dedicated to the fabrication of stainless-steel products. Care shall be taken that the correct welding rods and approved welding procedures have been used for each application, and the Engineer shall have the right to request a certificate from the manufacturer in which the weld procedures used for the manufacture of valves supplied are stated.

All welds and weld beads, internal and external, shall be smoothed down by grinding and buffing. All stainless steel shall be pickled and passivated before the valve is assembled and tested.

Testing:

Each air valve is to be subjected to the following tests at the factory:

- a. First, fill the valve with water and apply the factory test pressure through the inlet of the valve. Under this condition there shall be no weeping from any part of the valve.
- b. Second, drain the valve and refill the valve with water and apply the maximum working pressure through the inlet of the valve and maintain for at least five minutes. Under this condition there shall be no loss of water from the valve.
- c. Third, gradually reduce the pressure applied under b) above to atmospheric pressure, empty the valve and refill slowly expelling the air through the valve until it is full of water. Raise the pressure to the minimum working pressure, maintain that pressure for at least five minutes and against there shall be no loss of water from the valve.
- d. Fourth, maintain the minimum working pressure applied in c) above, isolate the water inlet and introduce small amounts of compressed air into the valve without lowering the pressure in the valve. The lower float shall drop away from the upper float when sufficient air has accumulated in the valve. As soon as the accumulated air in the valve has discharged through the small orifice, the valve shall again close to a watertight condition. This process shall be repeated for at least five different pressures which are equally spaced between the specified minimum and maximum operating

pressures and the valve shall close automatically when all the air has escaped without any dribbling and shall have a drop-tight shut-off.

Reflux Valves:

Reflux valves shall, except where otherwise specified, be double flanged single door swing type and shall be fitted with gun metal seats and bronze hinge and clack pins. In the case of reflux valves to be mounted horizontally, the design shall be such that the gate rests against the seat in the absence of flow or of differential pressure, without the aid of springs or external counterweights. Reflux valves shall comply with the requirements of SABS 144 for working pressures as required for each application. The valves shall be at Class 10, i.e. 1000 kPa working pressure, except where otherwise specified.

Reflux valves shall incorporate, inter alia:

Bronze bushes at each end of the shaft which are capable of being maintained via a removable flange.

Extended shaft to which is attached an adjustable lever arm and counterweight.

Manually operated bypass valve.

Coatings to Valves:

Before leaving the factory, valve bodies shall be treated as follows:

Externally – one coat zinc chromate primer to SABS 679 Type I

Internally – Clause 1.6.4 – System 1

After installation, valves shall be further treated with one coat of undercoat and one coat of approved gloss finish.

Flanges

The dimensions and drilling of standard flanges shall comply with the requirements of SABS 1123, 16 bar rating. Flanges shall be machined flat, ie without a raised joint face. Puddle flanges shall have the same dimensions as standard flanges but shall be undrilled.

Faces of flanges which will be in contact with jointing gaskets shall receive a protective coating of such thickness and consistency as will not impair the air/gas/water tightness of the joint. Where flanged pipes and fittings are rubber lined the rubber lining is to be wrapped around from the barrel onto the face of the flange and that rubber will form the gasket.

Flanges are to be drilled “off-centre” ie off horizontal and vertical centrelines.

Joints and Flexible Couplings**Jointing Material for Flanged and Coupled Joints**

Bolts for flanges shall comply with the requirements of SABS 1123 for the working pressures specified and shall furthermore, together with the nuts and washers used in conjunction therewith, be of the

material as specified in Clause 1.6.18. The jointing gaskets shall comply with the requirements of the relevant SABS specification and shall be cut to fit inside the bolts.

Gaskets in flanged joints shall comprise EPDM compound “Klinger 80” to SABS 974: 1986/ ISO 4633 : 1983 and shall be inside bolt circle (not full face) gaskets.

All flexible/stepped couplings shall be as “Aqualok/Stepfit” (as manufactured by Rare Pipe Specials) or similar and approved and to the following minimum specifications:

Centre sleeve/body and endings: Rolled steel to SABS 1431: 1987 Grade 300W

Coatings (sleeve/body and endings):

Fusion-bonded epoxy to SABS 1217: 1986 minimum 300 microns externally

Each steel coupling shall be suitably protected externally by an approved anti-corrosion system after installation and the Tenderer is to include for his aspect in the pricing of the elements.

Bolts, Nuts and Washers

All bolts and nuts shall comply with the SABS 135. Washers shall be provided at each nut and shall be of the same material and coated where applicable to match the bolt and nut. Single coil square section spring washers shall be fitted to all nuts subject to vibration.

Bolts other than jacking bolts shall project not less than 3 mm and not more than 10 mm from the heads of the nuts after tightening.

Jacking bolts and holding down bolts to be built into concrete work as well as bolts to be installed under water shall all be of stainless-steel Grade 304. Bolts for flexible couplings and flanges for underground installation shall be of Grade 4,6 steel hot-dip galvanised in accordance with SABS 763 and once fitted be given 2 coats of epoxy to give a dry film thickness of not less than 200 micron. Notwithstanding these requirements, the Contractor shall verify that the material of the bolts, nuts and washers used will not cause any galvanic action between itself and the surrounding material. Should galvanic action be possible, the Contractor shall provide suitable non-metallic sleeves and washers for such bolts.

Spares, Tools and Lubricants

Tenderers must submit in the appropriate Schedule a priced list of spare parts which it is recommended should be kept by the Employer for maintenance of the plant. All spares must be packed separately, and the cases appropriately marked. All spares must be new and unused.

Tenderers must submit a price for any special spanners, keys and tools required for the operation, adjustment and overhaul of the plant supplied, together with a metal cabinet for same for mounting in a convenient position in a nearby building. All spanners, keys and tools shall be new and unused.

In addition to the lubricating oil to be provided for commissioning the plant (where applicable) an additional quantity of oil adequate for at least two complete refills of such plant must also be provided.

A grease gun suitable for use in conjunction with all the grease nipples on the plant must be provided together with at least 5 kg of the appropriate grease to be used. If more than one type of grease is

required, a separate grease gun for each type of grease and 5 kg of each type of grease must be provided.

The spare parts to be offered shall not be limited to but shall include the following:

Centrifugal Pumps:

ImpellerShaft sleeves

Spacers	Keys
Bearings	Seals
Races	Glands
Wearing rings	Shaft

Two complete sets of gland packing and sufficient other parts for the complete replacement of all moving and wearing parts of one pump.

Electrical:

One set of bearings for each size of motor.

Two sets of fixed and moving main contacts for each type of contactor.

One set of fixed and moving auxiliary contacts for each type of contactor.

One operating coil for each type of contactor.

One set of fixed and moving contacts for each type of relay.

Two sets of HRC fuses for each size of fuse.

All spares that are ordered shall be supplied and handed over to the Employer. Each part shall be hermetically sealed and labelled by means of a metal label firmly affixed to it by wire. On each label shall be stated:

- The Manufacturer's name and address.
- The Manufacturer's catalogue or part number.
- A description of the spare part.
- A description of the particular equipment for which the spare is supplied and the Contract Bills of Quantities item number under which the particular equipment was supplied originally.
- The date of supply of the spare part.

Galvanising

Galvanising shall be carried out strictly in accordance with the requirements of SABS 763 (hot-dip zinc coatings) for heavy duty applications.

The Tenderer shall submit the name of the Sub-Contractor contracted to perform the galvanising, for approval by the Engineer. After delivery of the material to the galvanising plant, the Contractor shall inform the Engineer, who will arrange for inspection of the equipment, should he so require to ensure compliance with SABS 763.

After galvanising, the equipment shall be loaded carefully, making ample use of wooden spacers to prevent damage to the galvanised surface. Equipment with extensive damage to the galvanised surface will be accepted only after satisfactory re-galvanizing.

Electric Motors

The detailed specifications for the electric motors are included in the electrical specifications that form part of this document.

Pumps

The pumps offered shall be pumps of proven performance and preferably of standard design, except that the pumps must be located to suit the layout shown on the relevant drawing issued with the Tender Documents by the Engineer.

All parts are to be properly designed with ample margin of safety and are to be suitable for their pumping duties.

The speeds should preferably be as stated in the relevant clauses and should be such as to permit direct drive by a squirrel cage induction motor except in those cases where the drive is to be adapted to suit future changes in duty or where stated otherwise.

Pumps shall be of maker's standard and approved design, capable of doing the duty required at a speed preferably not exceeding 3000 rpm and shall be so balanced that there will be no end thrust when the pump is new or after wear has taken place, or alternatively, suitable heavy duty thrust bearings must be provided. Pump casings are to be of high-grade close-grained cast iron or cast steel of grade suitable to withstand the field or factor test pressure specified elsewhere, rigidly secured to a neat, properly designed bedplate or base. Impellers and guides shall be of CI (for sewage pumps) or stainless steel or phosphor bronze (for potable water pumps) and the shaft of high tensile steel with protecting sleeves of bronze or other suitable metal, the diameter being sufficient to withstand and transmit without whip and with ample margin of safety all torsional and bending stresses to which it may be subjected. The pump manufacturer shall utilise suitable materials for impellers, guides, shafts and protecting sleeves and other parts in contact with the fluid to be pumped so as to enable them to resist all corrosions and erosion damage. Bearings are to be of ample bearing area, dustproof with suitable provision for continuous lubrication.

The pumps offered are preferably to be of the self-regulating type with a "stable" characteristic ie for any selected manometric head each pump shall be capable of pumping at only one rate. Performance particulars and characteristic curves for each type of pump shall be submitted at the time of tendering. Efficiencies should be as high as possible in the normal indicated operating range. These will be taken into account in the adjudication of tenders.

Wherever possible axial thrusts should be counteracted by hydraulic balancing rather than by thrust bearings. The pumps shall be statically and dynamically balanced.

Components of the pumps should be so fitted and fixed that neither normal nor contra rotation can give rise to torques which will set them free to move out of their proper position.

The arrangements for bearing lubrication, water seals, air bleeding and priming of all pumps and pipework shall be such as to permit unattended stopping, starting and operation of the pumping plant by means of automatic remote control for the longest possible period under the control and operating conditions specified and in accordance with the general duty requirements.

The parts of each pump from suction inlet flange to delivery outlet flange shall be capable of withstanding the internal hydraulic pressures specified elsewhere or at least four times higher than those applicable under normal working conditions on the site, whichever is the higher.

Bedplates, Couplings and Guards

Each pump and its corresponding motor is to be mounted on a common bedplate of rigid construction which shall be provided with all holding down bolts and nuts for fixing pump and motor to bedplate and bedplate to concrete base. Each bedplate shall be provided with suitable openings for pouring in grout.

The tops of the concrete bases, constructed under another contract, will be at the elevations indicated on the drawings to be furnished by the Contractor and a space shall be left for grouting between the concrete and the bedplate.

In each case the bottom of the bedplate shall be set 25 mm above the concrete base, and in erecting the plant, the Contractor for the supply of the plant shall set each unit to precise line and level by means of brass shims and steel wedges and shall grout up the holding down bolts and carry out all grouting and finishing below, inside and round each bedplate.

Except in cases where special drives are required for future duty changes, in which cases the drive shall be arranged by the Contractor to suit his plant, each pump shall be direct coupled to its corresponding motor by means of pin and bush type, shrouded, flexible couplings of robust design constructed to restrict end-float of the motor shaft as required to prevent damage to motor bearings. Coupling halves shall be precisely machined and securely fitted so that the rims and faces of the two halves of any coupling may be used for checking alignment errors of parallelism and angularity of motor and pump shafts to accuracies of $\pm 0,025$ mm and $\pm 0,025$ mm on 100 mm, respectively, by means of feeler and/or dial gauges.

The coupling shall be of the so-called “tyre” type (“Fennaflex” or similar approved) which can tolerate slight misalignments.

Clearance between the two halves of the flexible couplings shall be adequate to avoid interference between the metal halves. Sufficient clearance is to be provided between the halves of the coupling to allow unhampered end-wise movement of the shaft of the motor to the limit of its bearing clearance. The running position of the motor-half of the coupling is to be checked by the Contractor by running the motor alone and the couplings halves set on the shafts accordingly.

Alignment errors shall be measured by the Contractor using dial gauges after final grouting and final tightening of holding down bolts and warming up of the motors by running for at least half an hour and the Contractor shall furnish the Engineer with a certificate stating that the positions of the coupling halves have been checked in accordance with the foregoing paragraphs and also stating the measurements of errors of angularity and parallelism of coupled shafts. The former shall not exceed 0,025 mm on 100 mm and the latter shall not exceed 0,025 mm.

The importance of ensuring that the suction and/or delivery pipework does not impose any forces onto the pump casing(s) is recognised. The Engineer will therefore require the Contractor to complete carry out the following after completion of the installation of the pump sets and pipework but before hydraulic testing:

Remove all of the bolts and nuts in the pump suction/suction pipework connecting flange.

Remove all of the bolts and nuts in the pump delivery/delivery pipework connecting flange.

There shall be no apparent movement of either the pump flanges or the pipe flanges and each bolt shall not require excessive force to insert it back into its hole in the abutting flanges. In the event of it not being possible to easily (without force) insert every bolt, the Contractor shall rectify the matter.

Thereafter the hydraulic pressure test shall be carried out.

Rigid steel guards shall be provided and bolted to the bedplate in such a way as to ensure protection of operators from moving parts.

Factory Tests on Pumps

Unless otherwise stated in the Project Specification/Scope of Work, the prices tendered for all pump sets will be held to cover all factory testing of pumps in compliance with this clause. The following tests shall be carried out in the manufacturer's works or in approved testing premises:

- Each new pump to be supplied under the Contract shall be tested in the Manufacturer's Works, or in other approved premises, in accordance with BS 5316 by Class "C" methods of measurement under the standard test conditions as laid down in that document. Before performance tests are carried out, each pump shall be subjected to an internal static hydraulic test pressure as stated in the Project specification (Section 1.7) with suction and delivery flanges blanked off. The pumps shall be watertight (except at packed glands if mechanical seals are not installed) under this test.
- The range of the performance tests shall be sufficient to enable the Engineer to compare the actual test performance of each pump with the performance figures entered on the data sheets and/or otherwise presented by the Tenderer at the time of tendering.
- The results of the tests on each pump shall be prepared in triplicate in the form of pump test sheets drawn up in the manner of Appendix Z to BS 5316:1976 and signed by the Manufacturer or Agent's Engineer who shall witness each test by the arrangement of and at the expense of the Contractor. Each such sheet or copy thereof shall be accompanied by curves accurately plotted on squared paper and depicting the following characteristics:
 - Test Curve: Total Pumping Head (metres of water) vs Discharge (ℓ/s)
 - Tender Curve for comparison with above
 - Test Curve: Pump Efficiency vs Discharge
 - Tender Curve for comparison with above
 - Test Curve: Input power (kW absorbed by pump) vs Discharge
 - Tender Curve for comparison with above
 - Test Curve: Amps per phase of motor vs Pumping Head (metres)
 - Tender Curve for comparison with above; calculated from tendered data relating to pump and motor.

NOTE: The above-mentioned test curve shall be calculated on the basis of the results of the aforementioned pump tests in conjunction with the results of simultaneous or separate tests on the appropriate motor, without allowance for the operating effect of power factor correction capacitors and

assuming a 415 V, 50 Hz electric power supply and operating at the altitude of the site as specified elsewhere.

The triplicate copies of pump test sheets certified by the Manufacturer or Agent's Engineer and the above-mentioned curves shall be posted timeously to the Engineer so as to reach him at least one week before erection of the appropriate pump is completed on site so that the last listed curves above may be used for the purpose of re-checking the performance of the appropriate pump-motor-combination set at the time of commissioning.

Elsewhere in this specification the Employer's right to reject unsatisfactory plant is stated.

Electrical Standard Specification

Introduction

This Electrical Standard Specification specifies the standard of workmanship and the quality of the material for the supply, delivery and installation, the scope of which is specified in the project specification, on the drawings and listed in the schedules and where applicable in the Bill of Quantities.

Where trade names and marks are specifically mentioned, then it will only relate to the type and quality of the product and it will not necessary exclude similar and equal products or equipment from other manufactures unless specifically so stated.

Switchgear and Electric Motor Control Equipment

- (1) The equipment shall be designed to operate at the altitude of the site, as specified in Section C4 an area subject to thunderstorms and an ambient temperature that may vary from -5°C to 45°C. The equipment shall be suitable for operation on three phase 50 hertz AC systems with neutral solidly earthed at the step down transformers. The short circuit capacity at the low voltage busbars shall be determined by the Contractor and shall comply with the Supply Authority's requirements in this regard.

The Supply Authority is Eskom.

Switchboards shall be to approval, of the metal enclosed, indoor, cubicle type conforming to the requirements of SABS 1180 and suitable for the service and electrical system conditions specified herein. The cabinets shall be of sheet steel construction braced and framed to approval and provided with hinged locking doors or removable bolted panels to provide access to the interior. Switchgear control components and associated instruments shall be flush mounted and grouped to approval on the front of the assembly in such a way that they are within reasonable reach and view of an operator, both for maintenance and normal operating purposes.

Approved automatic shutters shall be provided to close all openings giving access to live conductors after the withdrawal of circuit breakers or other removable equipment.

The switchboards shall be floor mounted, bolted on to the concrete floor and designed for front access only. Cables shall enter the assembly from the cable holes to be cut by the Contractor. End box glands shall be positioned at a suitable height to facilitate terminating of cables provided that the minimum radius of bends in the cables shall not be less than 12 times the overall diameter of the cable. All entries and openings to the assembly shall be vermin proofed to approval and all enclosed compartments shall be ventilated to approval to prevent condensation. The interior of the switchboard shall be partitioned off from the chamber housing cable entries by means of approved vermin proofing plates fixed at the level of the tops of the cable glands. Terminals for cable tails to each circuit shall be arranged not more than 300 mm above each

cable entry. All cable terminals shall be marked to approval and be provided with appropriate cable lugs for the cables to be installed. For low voltage cables a gland plate shall be provided which shall be drilled and fitted with the appropriate glands for terminating PVC and swa cables.

Short circuit ratings shall apply not only to the switch but also to all component parts and jointings on each assembly. All components shall withstand for three seconds a symmetrical current stated in rms values corresponding to the short circuit rating of the switchgear specified.

In addition, the maximum continuous working loads which can be carried shall be as stated.

Temperature rises shall be in accordance with BS 116:1952 as amended and current densities for all current carrying parts of each assembly shall not exceed the limits laid down in BS 159:1957.

The Contractor shall submit a photographic or certified copy of short circuit type tests proving the rupturing capacity of the switchgear.

- (2) Busbars shall be of solid hard drawn high conductivity copper in accordance with SABS 1195 BS 159 and BS 1433. Busbars shall be suitable for the maximum total loads to which they can be subjected.

Busbars and busbar connections and risers shall be air insulated and supported upon approved ceramic or fibreglass insulators and shall conform to the requirements of BS 159:1957. Fibreboard busbar supports will not be acceptable. Clearances from phases to earth and between phases or parts subject to potentials above earth shall be in accordance with SABS 1180.

All connections from the busbars shall be supported on insulators to provide the same spacing between phases and to earth as the busbars, up to the point of entry into an hrc fuse or circuit breaker.

An approved copper earth bar shall be provided along the entire length of the assembly to which all metal parts of the assembly shall be earthed. The earth bar shall be not less than 25 x 3 mm in section. This earth bar shall be brought down and connected at both ends of the assembly to a 10 mm minimum diameter earthing terminal located within 100 mm of the bottom of the switchboard all to approval. An earth is to be provided in accordance with the Supply Authority's Regulations.

A bolted link to connect the neutral busbar to the switchboard earth bar shall be provided.

Secondary wiring to approval consisting of suitably rated high conductivity stranded copper conductors insulated with PVC in the appropriate colours shall be cleated to approval within the switchboard. All conductors shall be numbered at both ends in accordance with the markings shown on the schematic and wiring diagrams. The connections from all dual ratio current transformers shall be brought to approved easily accessible link boards to facilitate change of ratio, and an approved clear engraved plate describing the linking arrangement shall be fixed to the link board.

The secondary wiring earth leads shall be brought to marked, easily accessible links for insulation resistance testing purposes. All secondary fuses shall have approved spring type fuse holders and cartridge fuses with spare fuses mounted on approved racks.

The marking of conductors and terminals of power and secondary circuits to show phase sequences shall comply with BS 158:1961.

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- (3) The main incoming switches, fuse-switches and any feeder fuse-switches shall be mounted so that their operating handles are exposed at the front of the board. The operating handles shall move in a downward direction to open the switches or fuse-switches and provision shall be made to lock the handles in the off position only.
- (4) HRC fuse-links and fuses shall comply with requirements of SABS IEC 60269. The category of duty shall be AC4 as defined in Table III of SABS IEC 60269. HRC fuses shall be provided wherever necessary, whether specified or not.
- (5) Each lighting circuit shall be protected by means of a single pole moulded case circuit breaker of 10 A rating. Each socket circuit shall be protected by means of a single pole moulded case circuit breaker of 15 A rating. In addition, earth leakage protection shall be provided for socket outlet circuits and shall have a sensitivity of 20 mA and be sealed in a case with no de-sensitizing device.
- (6) Moulded case circuit breakers shall comply with SABS 156.
- (7) Starters for electric motors shall comply with BS 587 for motor starters and SABS 60947 for contactors. The starters and contactors with their associated interconnections, isolating switches and HRC fuses shall be suitable for operation under normal, overload and fault conditions in the 380/400 V, 3 Ph, 50 Hz system with a solidly grounded neutral and having a symmetrical fault capacity of 20 MVA.
- (8) The power rating of the starters and contactors shall be either equal to or in excess of the rating of the motors and shall comply with the requirements of BS 587 for a duty rating in service of up to 20 starts per hour.

All contacts for both contactors and relays shall be solid or sintered silver alloy or equal and approved electrical contact material.

- (10) The contacts shall be securely fixed to the contact carriers either by welding or the sintering process. The contact carriers shall be robustly constructed and suitably reinforced to minimise the effects of contact bounce. Contacts which are either riveted or soldered to the contact carriers are not acceptable. Contacts which are made from either plain copper or plain copper which is silver plated are not acceptable. Indicating instruments shall be contained in approved metal cases and shall be of the dead band type to the requirements of BS 89 Grade 1. They shall have long, clearly divided and indelibly marked scales and the full load current of the circuit shall be indicated by a red line. Means shall be provided for zero adjustment without dismantling the instrument. Ammeters associated with starters shall indicate at least seven times the full load current of the motor, the full load current of the motor being at least two thirds of the full scale deflection.
- (11) Where necessary for protection of instruments against short circuit faults, current transformers shall be provided whether specified or not.
- (12) All instruments, relays and other panel devices shall be back connected and all metal parts of the front and back of the panel shall be effectively earthed.
- (13) The wiring and power connections to devices in the panels shall be carried out by means of PVC insulated copper conductors. The minimum conductor size shall be 1,5 mm² unless otherwise approved. Solid copper connections may be employed, if necessary, for power connection only.
- (14) The colours to be used for the wiring and power connections to the devices shall be as follows:
- | | | |
|--------|---|---------|
| Red | - | Phase 1 |
| Yellow | - | Phase 2 |

Blue - Phase 3
 Black - Neutral
 Green - Earth

- (15) In the case of the internal wiring of the devices themselves, the details of the manufacturer's standard insulated conductors and colour code shall be referred to the Supply Authority for approval.
- (16) Where the connection arrangements or special types of control circuit equipment present difficulties in complying with the colour code detailed above, the proposed alternative colour code shall be referred to the Supply Authority for approval.
- (17) All pilot lights shall be of the transformer operated type with 6-8 V, 2,5 watt, long life bulbs accessible from the front of the pilot light and removable shatter-proof glass colour caps to give an indication when illuminated, which is clearly visible through an arc of 180° with respect to the mounting panel under both natural and artificial lighting.
- (18) Panel wiring shall have numbered ferrules brought out to approved terminal strips with numbered terminals conveniently located in relation to the main gland plate which shall be situated not less than 225 mm from the bottom of the panel. The panel wiring and the stranded power connections shall be made by the use of crimped cable lugs using an AMP crimping tool or approved equivalent.
- (19) The power connections whether stranded or solid shall be conveniently located to the main gland plate. All ferrule and terminal numbering shall correspond with the wiring diagram to be provided by the Contractor.
- (20) All the necessary mechanical armour grip type glands similar to "Pratley" or equal and approved type and manufacture for both the control circuit cables and the outgoing cables to equipment shall be provided. These cables shall be PVC insulated, single wire armoured PVC. Space shall be allowed on the main gland plate and the gland plate shall be drilled for the reception of the main incoming PVC SWA PVC cables and glands.
- (21) The panels shall be labelled as specified or required by the Engineer. Clearly lettered, engraved, plastic or approved labels and legend plates shall be provided. All labels and legend plates shall be fixed by screws or other approved means. Glued labels and legend plates are not acceptable.
- (22) All relays controlling either the operation or the tripping and re-closing of AC contactor coils shall have making and breaking VA rating at least 50% in excess of the inrush and sealed VA ratings of the associated contactor coils. Where the VA rating of the relay contacts are insufficient to meet this requirement, separate reinforcing relays shall be provided.
- (23) All electrodes required to sense water, sewage or effluent levels for the automatic control of plant shall be of 20 mm diameter stainless steel tube and shall operate at voltage not exceeding 32 volts. Such electrodes shall be firmly mounted with provision for not less than 500mm vertical adjustment. All parts of mountings and all fittings shall be of stainless steel or other non-corrodible materials. All electrodes shall be sheathed (insulated) over their full length by means of heat-shrink plastic with only the ends bare.
- (24) Except where otherwise specified, the overload relays, or releases, or tripping devices shall be of the thermal melting alloy type to approval and ambient temperature compensation is not required. They shall be mounted in a position such that they cannot be affected by the heat from the contactor contacts under either normal or arduous operating conditions. In those cases where they are incorporated in the contactor block as a unit, they shall be mounted at the bottom of the contactor block assembly.

- (25) Isolators shall be of the quick-make and quick-break type suitable for operating on load. A mechanical interlock shall be provided between the isolating switch operating handle and the panel door which normally prevents the panel door from being opened without firstly opening the isolating switch. The isolating switch handle shall move in a downward direction to open the isolator and provision shall be made to lock the handle in the "off" position only. A special arrangement which will allow authorised personnel to open the cubicle door when the isolating switch is closed so as to examine the equipment when alive would be an advantage. This arrangement shall require a special tool for its operating and not an ordinary screwdriver. In addition, the arrangement shall be effectively rendered inoperative when the isolating switch is locked in the "off" position to prevent any person from opening the cubicle door under these conditions.
- (26) In the event of it being the manufacturer's standard practice to include an electrical interlock between the isolating switch and the contactor, this is acceptable. Nevertheless, this shall not relieve the manufacturer from providing quick-make quick-break on-load isolating switches as specified above.
- (27) The required switchgear is to be installed in rigidly steel framed 2 mm thick sheet steel clad or approved tough durable plastic clad, firmly mounted, back to wall, front access, multi-panelled, cubicle type distribution switchboards complete with a totally enclosed air insulated busbar chamber containing four busbars of suitable section. All sides and doors shall be perfectly flat and free from both blemishes and weld marks and all metal surfaces shall be finished in best quality light grey baked enamel. Internal mounting arrangements shall be provided such that the board is neat in appearance and has not external mounting lugs. A sufficient number of suitably placed conduit knock-outs shall be provided at the top and bottom of the board.
- (28) The panels of all the distribution switchboards required under this Contract shall house equipment listed in the appropriate clause of this Specification relating to each section of the Contract.
- (29) Capacitors shall be suitable for a 400 volt, 3 phase, 50 Hz supply and shall comply with BS 1650 and IEC 70 as amended and suitable for operating in an ambient temperature of 40°C at altitudes as specified in Clause 1.2.1.16.

The capacitors shall be totally enclosed and resistors shall be fitted directly across the terminals to reduce the terminal voltage to 50 volts within one minute of disconnection.

The impregnant shall be non-inflammable, non-toxic with optimum qualities of viscosity and stability and possessing a high dielectric constant and low losses.

Each capacitor shall comprise a number of internal elements each made of highest quality low loss capacitor tissue and high purity aluminium foil and each element shall be separately fused internally.

Admissible overloads shall be 10% excess voltage continuously, 15% excess voltage for six hours in 24 hours, 30% excess current continuously and 35% excess kVAR continuously.

Losses shall be limited to 0,5 watt/kVAR and an earth terminal shall be provided.

To reduce the effects of harmonics in the supply system at the Site, the capacitors shall have a rated voltage, as defined in BS 1650, of 500 V. Accordingly, they shall be de-rated for use with their associated 380/400 V motors so that the power factor of these motors is corrected to not less than 0,95 lagging at the mean motor operating voltage of 400 V.

The cable from the switchboard to the capacitor shall be rated at one and a half times the kVA rating of the capacitor. The capacitor rating shall not exceed 0,85 times the no-load kVA of the motor.

- (30) All ammeters, including those on starter panels serving motors equipped with capacitors, shall be so connected as to register the actual current in motors, not the current as reduced by the power factor correction capacitors.
- (31) The flow switch type protection devices required for pumps in terms of Clause 1.2.1.20 shall be of robust design and securely mounted. The Tenderer shall state at the time of tendering the type and arrangement of protection equipment he offers to fulfil this function and the tendered prices shall include for mounting and cabling of this equipment in positions where it will not be vulnerable to corrosion.
- (32) All control equipment shall comply with the foregoing stipulations with regard to electrical equipment and it shall be robust and reliable and it shall comply with all the requirements of the Local and all Statutory regulations pertaining to the use of such equipment. Furthermore, the tendered prices shall include allowance for everything involved in arranging compliance with such requirements and regulations, including registration of the equipment if so required in terms of the regulations and for providing all fixings, lightning protection devices, weatherproof housings, cabling and everything necessary for completing the control equipment, handing it over in perfect working order, providing operating instructions and maintaining the equipment until the end of the period of maintenance.
- (33) Proving tests shall be carried out in the manufacturer's works to establish that all relay panels, starters, circuit breakers and protective devices, switchgear and remote control equipment correctly perform the functions required.

The tests to be carried out on all switchboards at works after assembly shall include the following:

- (i) The insulation resistance to earth of all power and secondary circuits shall be measured by means of a 2 000 V insulation resistance tester and results recorded.
- (ii) Power frequency high voltage tests shall be carried out in accordance with SANS 61000 of main and secondary circuits.
- (iii) Primary current injection tests shall be undertaken on all power circuits to check operation of tripping devices and accuracy of ammeters connected to CTs.
- (iv) Operational test of all switchgear, instruments and control circuits.

The prices tendered for electrical work shall include for all testing and everything necessary for compliance with the operating requirements of the Works whether specifically scheduled as separate items or not.

In the case of motors situated more than 4 m on a direct line of visibility, or in the case of those not clearly visible from their respective starters, lockable isolating switches shall be provided within 2 m of motors, with all necessary cabling, for the safety of maintenance personnel. The prices tendered for plant shall be deemed to include provision for compliance with this requirement whether isolating switches are separately scheduled or not.

Where called for in Part C.3.3, a distribution board complete with approved electrical meter shall be provided to record power utilized at the pumpstation. The installation shall comprise of current transformers, a KVA-kilowatt hour meter (Enermax Meter or similar approved) and any other equipment to enable the power supplied to the pumpstation to be correctly measured.

Cables

The cabling between and in the various structures and plant units included in the electrical power installation shall be carried out by means of PVC insulated, steel wire armoured and PVC sheathed cables. Cable glands similar to "Pratley" or of equal and approved type and manufacture, shall be used.

Cables shall be rated in accordance with the Supply Authority's Regulations provided that no cable having a core cross sectional area less than 4 mm² shall be used and the voltage drop measured between the incoming terminals of the supply and the terminals of the equipment being connected when carrying full rated load shall not exceed 1 V plus 2% of the voltage at the supply terminals.

The Contractor shall draw in, lay, thread through pipes, ducts or channels, fix in position, clamp to walls, cable trays, supports or switchgear to approval, the cables to be provided taking care to avoid twisting, ensuring that cables are not bent to a radius less than 12 times their overall diameter and providing overlap for joints and terminations. The cable shall be drawn directly off the drums, the inner end having been loosened to permit slack to be released through the flange hole. The cables shall be paid off steadily onto cable rollers or manually supported at regular intervals during laying.

The electrical power installation will comprise the electric motors, the electric motor control gear, the special controls, such as pump control valves, together with all other devices included in the contract works for the operation and control of all the plant as required for its proper operation as described in the Schedule of Quantities.

The Contractor shall be responsible for the complete electrical power installation from the Employer's points of supply.

The Contract work will include the terminating, connecting, testing and setting to work of all cables and associated electrical equipment.

Cables shall be selected by the Contractor in accordance with the requirements of the Standard Regulations for the Wiring of Premises, due allowance being made for the climatic conditions, and the sizes selected and the current rating of each cable shall be stated on the numbered cable schedule required in terms of the following paragraph.

The Contractor shall prepare a numbered cable schedule indicating the route, length where important, sectional area and number of cores of the power and control circuit cables. The cables themselves shall be labelled to indicate the cable number, sectional area and number of cores. Labels similar to "Dymo" stainless steel punched tape or of equal and approved type shall be used. The labels shall be attached to the cables in an approved manner.

When laying the cables, an allowance shall be made to provide a sufficient degree of slack and the cable tails shall be long enough to facilitate making the terminations and re-arranging the connections when necessary.

Approved concrete cable markers are to be provided and installed at intervals along the routes of all cable trenches. Markers shall be clearly inscribed 'ELECTRIC CABLE' in letters not less than 50 mm high and shall preferably be of precast concrete. Two such markers shall be set at each change of direction approximately 1,0 m from the point of intersection of the adjacent lines of the cable. Thereafter the markers shall be provided at uniform intervals not exceeding 20,0 m along each straight cable run. Care is to be taken to ensure that the markers have been erected over the cable and the methods adopted shall be to the approval of the Engineer. Markers should be of minimum dimensions 75 mm x 120 mm and shall be steel reinforced.

The Contractor shall be responsible, where cables enter or leave switchgear, or other circuit controlling equipment, for the provision of approved measures for the prevention of the ingress of rats, mice, spiders and other vermin.

All work in connection with the termination and jointing of cables shall be carried out to approval and in accordance with good modern practice.

All insulating materials and each length of cable shall be examined for damage before being installed. An insulation test with a 500 V megger and a test of each core in turn with the remaining conductors connected to the armouring shall be carried out before jointing is commenced.

Where necessary the Contractor shall provide and fix to approval to walls, columns, beams and ceilings of buildings approved perforated metal cable trays, racks and cleats necessary for the support of cables. Such trays, racks and supports shall be thoroughly cleaned after installation and shall be painted to approval with an undercoat and two coats of approved non-inflammable paint before the installation of cables. All cables shall be cleated or clipped neatly to approval to racks or trays at intervals not exceeding 750 mm. The design and general arrangements of all cable trays and the cables secured to them shall be to approval.

The cores shall be rung through, provided with numbered ferrules corresponding to the wiring diagram of the plant to be connected, fitted with crimped lugs crimped by AMP crimping tool or approved equivalent and made off neatly and securely on to the terminals of the equipment.

Correctly selected dies for the crimping tool and lugs for the cable cores shall be used. The crimping tools shall be of a type that will not release the lug, once the action has been started until the lug has been crimped on to the core properly and completely. The types of crimping tools and lugs shall be the best that can be made available.

Any locking arrangements provided on the terminals of plant supplied by others shall be used to the approval of the Engineer.

To the extent that the required data and drawings are timeously supplied by the Contractor in terms of Clauses 1.1.5 and 1.1.6 of this specification, the new civil works will incorporate suitable ducts for the main power cables and pipes for control circuit cables between these ducts. When the installation has been completed, tested and commissioned to the satisfaction of the Engineer, such ducts in new works are to be filled with clean, fine builders sand and covered neatly with a thin layer of sand-cement mix to match the adjacent floor surfaces.

The tendered prices for cabling shall include for everything involved in connecting both ends of the switchboards earth-bar to the earth point using 70 mm 2 stranded copper conductor and for meeting the requirements of Clause 1302 (E) of the Standard Wiring Regulations and the supply Authority's requirements providing for the earthing of the housings of all motors, units of electrical control equipment, loose motor starters, stop/start buttons etc, through the cable armouring supplemented where required in order to reduce the resistance of the earth path to less than 0,2 ohms, by stranded copper earth conductors connected direct to the earth terminal bars (conduiting shall not be used as an earth connection) and providing for earthing all building metal work as laid down in Clause 1313 of the Regulations including ladders, handrails, etc.

The cables are to be laid in trenches excavated by the Contractor under this Contract if so stated in the Schedule of Quantities. The laying of cables and installation of concrete markers and everything necessary for compliance with this Clause shall be included in the tendered prices for cables and other electrical work.

Earthing

All motors, switchgear, control gear, cable armouring and every metallic part of the plant and equipment supplied under this contract are to be connected to earth by means of bare copper conductors of adequate size for each circuit, but not smaller than No 8 SWG run, alongside cables.

Earthing conductors are to be fitted with sweated lugs at ends and are to be solidly bonded to each other and to the earth plate.

The Contractor under this Contract shall provide earth plates wherever necessary to achieve proper earthing.

An earth plate consisting of a 6 m length of 25 mm x 3 mm copper strip coiled into a 900 mm OD spiral shall be provided and shall be buried 2 m deep adjacent to each building. The earthing lead from the earth plate is to consist of a 70 mm² copper conductor. The earth plate is to be covered with a 100 mm layer of fine wood charcoal, and a 38 mm diameter galvanised steel pipe shall be laid from this charcoal to the surface and capped at its upper end.

The cost of earthing, including the supply and installation of all earth plates (for which no special item is included in the Schedule) will be deemed to be spread over and included in the prices tendered for the supply and installation of electrical equipment.

Site Conditions

All the equipment and material shall be rated for both the expected and extreme site conditions.

Quality Standards, Regulations and By-Laws

All workmanship, material and equipment supplied and installed under this contract, shall be new, undamaged and of the best quality and shall be to the satisfaction of the Engineer.

All workmanship, materials and equipment shall comply with the requirements as laid down in the latest editions and amendments of the relevant SABS, BS and IEC standards.

Materials of local manufacture and with the SABS mark will receive preference.

Unless otherwise specified the earthing shall comply with the AMEU and/or Local Supply Authority standards.

The work shall be also be carried out in strict accordance with the following:

The latest issue of the "SANS 10142: Code of Practise for the Wiring of Premises" hereafter called the "Wiring Code".

The Occupational, Health and Safety Act of 1993 as amended to date and hereafter called the "Act".

The Municipal By-laws and other special requirements of the local Supply Authority.

The local Fire Office Regulations.

Drawings

Contract Drawings

The drawings accompanying this Specification are as stipulated in 1.2.6 hereof. The working drawings of the Contract shall, however, consist of:

- The Civil Engineer's drawings, as applicable
- The Engineer's drawings of other disciplines, as applicable
- The drawings of other service installations that are relevant for co-ordination and installation purposes
- The installation drawings of other sub-contractors, where applicable

All drawings and layouts shall be regarded as diagrammatic and all positions and dimensions shown on drawings shall be verified on site.

The Contractor shall check with the Principal Contractor before putting work in hand on any section of the work that he is in possession of the latest drawings. Should any discrepancy be found between the Contractor's drawings as issued by the Engineer and those in possession of the Principal Contractor, the matter shall be referred to the Engineer for clarification. No extra compensation shall be allowed for alterations or making good resulting from lack of verification.

Shop Drawings for Approval

Three copies of all shop drawings shall be submitted to the Engineer for approval.

Shop drawings are any drawings, diagrams, schedules, performance charts, and other such data, which are prepared by the Contractor, or his supplier, manufacturer or distributor, and which illustrate some portion of the sub-contract works.

Approval of shop drawings by the Engineer does not relieve the Contractor of his responsibility for compliance with the Specification, nor does it relieve him of his responsibility for errors or omissions in shop drawings.

As- Built Drawings

The Contractor shall ensure that any deviations from Construction drawings are noted on a set of drawings specially kept for that purpose and return those marked up to the Engineer for updating of originals.

Project Time Schedule

The entire project shall be completed within the construction time as specified for the Principal Contractor.

Critical Path Schedule

The successful Tenderer shall, within 14 days after having been informed of the acceptance of his tender, submit to the Engineer a critical path schedule (CPS) indicating the programme of his work in order to complete the work by the specified completion date.

Other Trades on Site

The Contractor shall note that other Contractors will occupy the site at the same time and the closest co-operation with any of these Contractors shall be maintained.

Visit to Site

It shall be assumed that the Contractor is familiar with all conditions on the site and no claims resulting from ignorance of the conditions of the site shall be entertained.

Inspection and Hand-Over Procedure

The Certificate of Compliance shall be handed over to the Engineer within 7 (seven) days of acceptance by the Local Supply Authority.

When the Works have passed the acceptance inspection, the Engineer shall issue an Acceptance Certificate. The Engineer and the Contractor shall sign the Acceptance Certificate. A punch list of outstanding item/s to be rectified shall be attached.

No retention monies shall be released before the Acceptance Certificate as well as the Certificate of Compliance signed by all parties has been submitted.

Should the Engineer, in his opinion, find that the Contractor did not check the Work himself before requesting the hand-over inspection, then the Engineer shall reject the inspection and claim any time and cost incurred from the Contractor.

The guarantee period of the installation shall commence on the date that the installation passes the final handing over inspection and the Certificate of Compliance has been handed over to the Engineer subject to the item/s listed in the punch list.

At the end of the guarantee period a final inspection shall be conducted by the Employer, Engineer and the Contractor to determine if any deficiencies, faults or defects had manifested itself during this period which are then to be rectified within 7 (seven) days by the Contractor.

Interchangeability

All parts of similar rating and/or function shall be made to gauge and shall be interchangeable through the contract work.

Tests and Inspections

The Contractor shall arrange for all necessary installation tests and inspections required by the relevant Authorities. The Contractor shall allow for fees and charges payable to these authorities for such tests and inspections excluding the electrical connection and consumption fees.

The Contractor shall inform the Engineer of all equipment inspections and shall advise the Engineer in good time (minimum of 7 days) of the proposed completion such that the equipment may be inspected prior to installation. All tests and inspections by the Engineer shall be to his satisfaction.

Existing Installation

Where the Works involves alterations and/or additions to existing works, these works, where operational shall be kept in full continuous operation throughout the period of the Contract. The Contractor shall make arrangements for all the necessary temporary connections. The Contractor is to make due allowances for this in his tender prices.

Should the Contract form part of an existing installation the Contractor shall visit the site to acquaint himself with all aspects of the installation prior to submitting a price.

Requests for Electrical Power

Where the Principal Contractor requests the Contractor to provide a temporary power supply other than that called for in the specification and any other such electrical work for the building operations, then all such work shall fall outside the Scope of this Contract. The cost of such work shall be a matter between the two parties involved.

Materials Tools and Equipment

All materials and equipment used in the electrical installation shall be of recent design and manufacture and of the best quality available and shall, wherever possible, carry the latest mark of the South African Bureau of Standards.

Where called for by the Engineer, samples shall be submitted of all materials to be used on the project.

The Contractor shall make all his own arrangements regarding the transport of labour and materials and shall provide his own plant and tools.

Materials and equipment on site shall be suitably stored to avoid any possible deterioration or damage through any cause whatsoever. Any replacement or rectification required, due to non-compliance in this regard, will be for the Contractor's account.

All conduits, outlet boxes, distribution board trays, etc., shall be fixed in position by the Contractor, and built in by the Builder. Where, in exceptional cases, this is not possible, chasing will be permitted.

The Contractor shall do chasing with power driven chasing machines or sharpened hand tools.

The Contractor shall seek written permission, from the Structural Engineer through the Principal Contractor, timeously of the requirements for all chases and openings in building work.

Chases for conduit installation shall be so executed that, after installation, outer face of conduit is not less than 12mm from finished plastered surface.

It will not be permitted to chase into walls where mortar and/or bricks have not properly cured. Chasing into sandstone, facebrick or plastered walls, as well as concrete structure, will not be permitted without prior consent. The Contractor shall be held responsible for any damage due to non-compliance in this regard.

Electricity Supply

Application

The Employer will make an application for the upgrading of the electrical supply. The Contractor shall do the co-ordination with the local Supply Authority at the date and time when the electrical supply will be required.

Connection of Supply

The Contractor shall allow for attendance on the Supply Authority when the supply is connected and ensuring that the service connection is not delayed.

Supply Authority's Metering

Unless otherwise specified, the Supply Authority's metering panel and equipment shall be incorporated in the Main Board, or other boards as applicable. The Contractor shall ascertain and establish the correct space and all other requirements from the Supply Authority for the accommodation of their meter panel or equipment. The Contractor shall provide the necessary links in busbars or any other requirements for metering CT's, and shall provide all necessary cables, jumpers and connections between such metering equipment.

Low Voltage Distribution Boards and Motor Control Centres (MCC's)**General**

All distribution boards shall be supplied by a specialist manufacturer who shall install and fit the switchgear and equipment and carry out all internal wiring. The boards shall be installed and connected by the Contractor in the positions as indicated on the drawings. Unless otherwise specified, all distribution boards shall be manufactured by the same company.

It shall be the responsibility of the Contractor to ensure that all distribution boards fit into and can be installed in the spaces set aside for them. The Contractor shall also ensure that the distribution boards can be moved through doors and access routes on the site.

All distribution boards shall be supplied complete with all internal wiring to terminal blocks, labels, earth bars, statutory notices, holding down bolts, fixing brackets, and everything necessary for satisfactory operation of the board.

Outer fittings of all boards shall be kept protected against damage and defacement, until immediately before final testing and commissioning. Any damage to paint work shall be made good by the Contractor.

General Construction and Finish

All distribution boards shall be of totally enclosed sheet steel construction, free of distortion, and, unless otherwise specified, fully front accessible and ventilated.

Sheet steel shall be bent and braced, as necessary, to provide a rigid square frame support for all components. All corners shall be suitably welded. All steelwork shall be ground smooth, shall be free of rust, scale, slag, burrs and grease, and shall be suitably rustproof, primed, and finished in powder coating, colour to approval. Interiors of boards shall be White, and plinths shall be Black.

Equipment shall be neatly and accessibly set out, and shall be adjustable chassis-mounted, flush behind readily removable rigid sheet steel panels of 1,6mm minimum thickness, with close-fitting cut-outs to toggle surrounds, push button surrounds, etc. Indicator lamps shall be similarly mounted, with coloured glass only fixed to the panel. Instruments shall be flush mounted on hinged panels. Time switches shall be mounted behind flat hinged doors, with catches and perspex windows, and meters shall be mounted behind 3mm thick, flat perspex windows. All reset buttons shall be accessible from the panel front.

Readily removable panels, with returned edges, shall be accurately fitted and secured to the frame by means of locating pins and indicating turn-catches, or with dome nuts and welded studs. Suitable chromed handles shall be provided to facilitate panel removal.

Doors, where called for, shall be readily removable, flush type of rigid construction, with concealed hinges, sliding bolts and flush-type lockable catches to approval, all locks being master-keyed. Two keys shall be provided for each lock. A single door width shall not exceed 700mm.

Where future equipment is pre-fitted for, this shall include pre-drilled chassis plates installed stalled, cut-outs in the panel, with suitable blanking plates, and adequate busbar extension.

Non-combustible barriers shall be provided to separate sections of boards which are fed from different transformers or sources of supply and to isolate each main incoming circuit breaker where the fault current exceeds 15kA.

A group of three phase and neutral busbars or conductors crossing a ferrous metal barrier shall do so through a common opening. Under no circumstances shall a single conductor be surrounded by a continuous ferrous metal.

On completion of the installation, the Contractor shall supply and mount, behind a suitable panel of each and every distribution board, the wiring diagram for that respective board.

All distribution boards with terminating cables shall be provided with suitably sized, rigid gland plates, top and or bottom. These gland plates shall be bonded to the framework or earth conductor.

Joints in busbars where necessary shall be by means of bolted fish plates. Bolts used for jointing or supporting busbars shall be of high tensile phosphor bronze or high tensile plated steel minimum 9,5mm diameter, and shall be used in conjunction with flat and spring washers.

Neutral bars shall have the same cross sectional area as the phase bars up to a maximum of 160 mm². The earth bars shall be effectively bonded to the metal framework of the board.

All busbars and any other un-insulated connecting links shall be taped or sleeved by the board manufacturer except at joints and take off's which shall be taped after the installation of boards and cables thereto. Correct colour coding shall be maintained.

Wiring

All distribution boards shall, unless otherwise specified, be fully wired internally by the board manufacturer, with colour coded, single core copper, PVC insulated cables, 600/1000-volt grade.

Wiring shall be neatly done, suitably laced, fixed clear of exposed terminals, and run square to the sides of the board.

Wiring shall be rated to suit the capacity of associated switchgear.

Where aluminium cables are to be terminated at circuit breakers, fuse switches, etc., suitable connecting studs shall be provided to facilitate connection.

Circuits on multiphase distribution boards shall be balanced over the phases.

Pre-fitted Space and Spare Fuses

Unless otherwise specified, space only and mounting facilities shall be provided for 30% future expansion of isolators, MCB's, CFS, time switches, and meters, and 60% future expansion for contactors and relays.

100% spare fuses shall be supplied, unless otherwise specified, and mounted behind a hinged panel, inside the distribution board, specially marked as such.

Labels

All labels shall be of the engraved, laminated plastic board type, black letters on white background, with 6mm minimum height letters, in sans-serif capitals. Labels shall be inserted into slotted holders and held in position by a soft glue.

Each distribution board shall be provided with a label stating name and size and origin of feeder cables e.g. "Sub Main Board. D – Fed from Main Board with 240mm² x 4 core copper SWAPVCSWA cable".

All distribution board sections, main switches, isolators, MCB's, meters, etc., shall be labelled with individual labels as per specification, e.g. circuit breaker labels shall state type of circuit, location, and number, and time switches shall be labelled as to times of operation, meters shall be labelled as to multiplication factor, etc. In addition, an index card shall be mounted inside the door behind clear plastic.

All equipment situated inside the board, e.g. contactors, relays, etc shall be clearly marked as to their function corresponding with circuit numbers on relevant drawings.

Shop Drawings

As soon as is practicable after the contract has been awarded, the Contractor shall submit dimensioned layout drawings of all distribution boards to the Engineer for approval; such approval to be obtained, in writing, prior to the commencement of distribution board manufacture. Approval by Engineer, of drawings, shall not relieve the Contractor of his responsibility for any deviation from the requirements of this Specification.

Drawings shall show elevations and sections and shall be fully dimensioned. Equipment layout, with labelling thereof, drawings shall be fully annotated to indicate compliance with the specification. Wiring diagrams shall be included.

Inspection and Approval

All distribution boards shall be inspected by the Engineer, on completion of manufacture, but only after inspection and acceptance by the Contractor and prior to despatch from the manufacturer's works. The Contractor shall advise the Engineer in good time of such completion and acceptance. Distribution boards shall only be delivered to site after inspection and approval by the Engineer. Such approval, however, shall not relieve the Contractor of his responsibility for any deviation from the requirements of this Specification.

All distribution boards shall be to the approval of, and shall comply with, the regulations of the Supply Authority, and it shall be the responsibility of the Contractor to establish and provide such requirements, and obtain approval where necessary.

Cables

Paper Insulated Cables

Paper insulated cables, unless otherwise specified, shall have high conductivity stranded copper conductors and shall be 600/1000-volt grade, paper-insulated, oil-impregnated and drained, lead covered, double steel tape armoured and served to SABS Specification 97.

Cables shall be terminated in approved compound filled end-boxes with glands, and screwed filler plugs. The lead sheath shall be effectively bonded to gland by means of a wiped solder joint. Conductors shall be cut inside the box and connected to outgoing tails by means of solid-centre ferrules or solid connection studs and/or rods. Tails shall be taped first with varnished cambric tape and finally with one layer of PVC tape in phase-distinguishing colours. Cable terminations shall generally be carried out only by qualified cable jointers, in accordance with best practice.

PVC Insulated Cables

PVC insulated cables, unless otherwise specified, shall have high conductivity stranded copper, or solid aluminium Conductors (if specified) shall be 600/1 000 Volt grade, PVC insulated and bedded, steel wire or aluminium strip armoured, and PVC sheathed to SABS Specification 150.

Cables shall be terminated in approved mechanical clamping glands with shrouds.

The armouring of PVC insulated cables shall not be acceptable as an earth conductor, and stranded copper earthwire shall be run with each cable in compliance with the Regulations for the Wiring of Premises, whether or not specific reference is made thereto in Part Two of the Specification. The earth

wire shall be neatly strapped to cable at 600mm intervals, shall be bonded to the armouring at both terminations, and shall be bolted to earth terminals of equipment at both ends.

Mineral Insulated Copper Covered Cable

Mineral insulated, copper covered cable (MICC or Pyrotenax) and accessories, where called for in the Specification, shall be 600 Volt grade, to BS 3207.

Cables shall be terminated in pot seal glands to manufacturer's recommendations and cable tails shall be served with maker's neoprene sleeving. The Contractor shall take all necessary precautions to prevent ingress of moisture into mineral insulating materials of the cable. MICC cable shall indicate a minimum insulation resistance of 1 megohm immediately prior to pot seal termination thereon.

Where MICC cable enters a motor, or any other appliance that is likely to move or vibrate, a 360o expansion loop shall be formed in the cable immediately prior to point of entry.

Installation of Cables

Cables shall be supplied by the Contractor, and shall be installed by him in positions as indicated in the Specification and/or the Drawings, in a workmanlike manner, and generally in accordance with accepted standards, and shall have a radius and fixed as prescribed in the Standard Regulations for the Wiring of Premises.

Where cables are installed side by side, there shall be a minimum spacing of 60mm between cables, unless otherwise specified. All cable routes shall be confirmed with the Engineer, prior to commencement of installation. No joints in cables will be permitted, unless approved by the Engineer. Jointing shall be done with acceptable jointing kits, by a qualified cable joiner.

Cables required to be fixed horizontally, shall be supported on suitable cable trays, installed level, and shall be strapped thereto in such a manner that any cable may readily be removed without interference with other cables.

Cables required to be fixed vertically, shall be clamped with approved clamping devices to adequate cable ladder or "Unistrut" supports, mounted against vertical surfaces.

Low and High voltage cable installed in ground shall be buried at 600mm and 1000mm respectively below finished ground level. Cables shall be bedded in river sand or sifted soil (free of clay), from 75mm below to 75mm above cable, prior to backfilling of trenches. 50mm thick pre-cast concrete slabs, measuring approximately 300mm x 600mm and engraved "Danger-Gevaar", shall be laid over 75mm soil bed covering HT cables along the entire route of such cables.

Suitable cable markers shall be installed above all underground cable routes. Such markers shall be positioned at each change in direction of cable, at both ends of sleeves crossing roads or tracks, at entry or exit from buildings, and at 30m intervals on straight runs.

M.I.C.C. cable shall be installed on surface only, unless otherwise specified, run square to finished surfaces, and neatly and adequately saddled thereto.

Cable Trays and Racks

Cable trays unless otherwise specified, shall be of 1,6mm minimum thickness, slotted, galvanised sheet steel construction, with 25mm minimum returned edges, supported by means of rigid "L" or "T" galvanised angle brackets, at intervals to suit width of tray and weight of cables to be supported, and at both ends of each length. Cable trays shall be installed straight and level and adequate supports shall be provided to avoid sagging of tray.

Cable racks shall be of ladder configuration, made up of galvanised angle iron, slotted angle or roll formed steel sections to approval. Rung spacings shall correspond to the shortest saddle fixing centres required for the supported cables. Cable racks shall be installed thereto with suitable clamp.

The racking cross rungs shall be provided with facilities for the application of U-clamps (Cabstrut) and cable ties for the purpose of securing the cable. The cable bearing surface shall be flat, minimum 50 mm, the cross section of the cable rung to extend the full width of the rack. The rung spacing shall be 375 mm.

The minimum structural length for straight lengths of cable racking shall be determined by the vertical displacement measured at mid-span (deflection) with a uniform load detailed below along a complete single span of 3 000 mm. The measured deflection shall not exceed 5 mm.

Width of Racking	Loading in kg
150 mm	150
300 mm	100
450 mm	150
600 mm	200
800 mm	270
1 000 mm	300

Accessories such as bends, tees, elbows and crosses shall have a minimum radius of 450 mm and shall have the same cross-sectional design as the straight sections and of the same material and finish.

The rung spacing for tees and crosses shall be the same as for the straight lengths.

The rung spacing for horizontal bends shall be as follows:

Width of Racking	No of Rungs
100 – 200 mm	3
300 – 600 mm	4
800 – 1 000 mm	7

Splice plates shall adapt to the contours of the side rails with a possible wrap around feature to permit mid-span splicing without weakening of the section. Splice plates shall be manufactured from the same material as the cable ladder. All splices shall use M6x16 bolts and nuts.

The cable racking and accessories shall be so constructed that the provisions of SABS 0142, in terms of earthing shall be complied with.

The support hangers and brackets shall be similar and equal to Cabstut P 1000.

Conduits

General

Unless otherwise specified, all conduits shall be black enamelled heavy gauge steel, welded or solid drawn with a minimum of 20mm external diameter and to the latest SABS Specification. All joints shall be screwed, and only steel couplings will be accepted. Where accepted by the Local Authorities, innovative systems, e.g. “Easilok” or “Bosal” may be used.

Conduit boxes and fittings shall be black enamelled, malleable iron, while switch boxes, plug boxes and draw boxes shall be galvanised heavy gauge pressed steel.

If specified in Part Two of the Specification, PVC tubing may be used. Such tubing and its accessories shall also comply with the latest SABS specification.

Where conduit and conduit fittings are installed in positions exposed to the weather or in moist surroundings, then they shall be galvanised. Exposed threads shall be suitably protected.

Flexible conduit may be used only when specified in Part Two and may be either plain hot-dip galvanised PVC. In all cases an earth wire shall be run internally with the flexible conduit and secured to the terminations at each end.

Conduit Installation

Conduits shall be carefully examined, before installation, to ensure that there are no defects or internal obstructions. Conduit shall be installed generally in accordance with the Standard Regulations for the Wiring of Premises, and outlet boxes securely bonded to earth, with joints, terminations, etc. internally bevelled, smooth and free of burs.

Conduit threads shall be cut clean, and of sufficient length to permit fitting entries being butted.

Where bending of conduits is necessitated, this shall be carried out with standard conduit bending tools, care being taken to ensure that conduit cross-section is not distorted, and that sufficient radius is allowed so as not to subject conductors to undue mechanical stress when drawing-in of wiring.

Termination of conduit shall be terminated by means of locknuts, on both ends of the termination boxes and bushing on inside of box or appliance, or press-fitted into the sockets in the case pre-socketed boxes. Alternatively, conduit may be terminated by means of a coupling and brass male bush. Solid brass bushes, only, shall be used.

Conduit crossing expansion joints shall do so at right angles to expansion joint, shall be cut and separated, and provided with an outer sleeve extending 150mm either side of the joint, and suitably taped to prevent ingress of cement/water. An earth wire shall be run across the expansion joint and shall be bonded to the first conduit box on either side of the joint.

Draw boxes or draw trays shall be installed only where necessary, and shall be positioned as inconspicuously, but accessibly, as possible, to the Engineer's approval.

Conduit in dividing walls between offices, floors, etc, and conduit to light switches on office floors, shall only be installed as vertical drops, via back-entry boxes flush with ceiling unless otherwise specified.

Conduit for future requirements shall be terminated in boxes with overlapping cover plates and fitted with stout galvanised draw-wire. Where such conduit is, however, required to project from wall or slab, it shall be galvanised, fitted with coupling and lugs, and sealed with waterproofing compound.

The Contractor shall ensure that all conduit work is timeously completed, so as not to delay building operations, and shall advise the Engineer, in good time, of such intended completion, that it may be inspected prior to being covered up. The Contractor shall attend on the Engineer during all such inspections.

Prior to building finishes being applied, such as plastering, screeding, painting, etc., the Contractor shall ensure that all conduit runs are continuous and clear of obstructions. Damage to building finishes, resulting from non-compliance in this regard, will be to the Contractor's account.

Flush and Surface Conduit Installation

All conduit and conduit fittings, unless otherwise specified, shall be installed flush, concealed in concrete, walls, ceiling spaces etc.

Conduit in concrete shall be timeously installed, spaced well apart, and firmly secured, with joints suitably sealed against ingress of cement/water, and outlet and draw boxes installed level, and adequately secured to shuttering. Installation of large diameter conduits or sleeves, or installation of large concentrations of conduits, shall be carried out to the Structural Engineer's approval; such approval to be obtained prior to commencement of work.

Conduit in concrete surface beds shall be installed well clear of any surface, by utilising suitable spacer pieces. Conduits installed below surface beds, or in ground, ash fill etc., shall be galvanised, and shall be encased by the Builder in 75mm concrete all round. It shall be the responsibility of the Contractor to advise the Builder timeously of this requirement, and to ensure that such requirement is duly executed. Any additional work resulting from non-compliance in this regard, will be for the Contractor's account.

Conduit in brick walls shall be timeously built in.

Conduit in roof spaces shall be run parallel and square to roof trusses. Conduit in roof/ceiling spaces shall be run in a horizontal plane, directly above ceiling support members, and shall be adequately supported, independently of ceiling support members, unless otherwise specified.

Conduit installed on surface, where specified, shall be installed generally in a neat and workmanlike manner, run square to finished surfaces, and shall be neatly and adequately saddled thereto.

Wire Trunking

Galvanised sheet metal or plastic wiring trunking, the types and sizes of which will be specified, shall be supplied and installed by the Contractor in the position indicated on the drawings.

The wiring channels shall generally be 2500mm long complete with junction pieces, end pieces, corners, T-pieces, brackets and supports and snap-in covers etc.

Wiring channels shall unless otherwise specified, be installed level and parallel to or perpendicular to finished surfaces. Covers shall be accurately cut to fit squarely and neatly at joints, corners, partitions, etc., and shall not be installed prematurely.

Conduit feeders to and links between wiring channels shall terminate directly into the channel at accessible outlets using screwed or bushed entries. Care shall be taken to ensure that wiring does not pass over any rough edges.

Unless otherwise specified, channels shall be installed with the open side facing upwards. Suitable supports shall be provided to support the wiring when channels are mounted open end downwards.

Suitable hangers shall be provided where channels are suspended. For concealed flush mounted channels, snap-in covers shall overlap the open face of the channel. Liaison with the Builder shall be maintained where channels are to be flush mounted in ceiling slabs or in suspended ceilings.

An earth wire shall be installed in each run of ceiling channel and bonded to each section of metallic channel. Crimped jumpers shall be taken from this main earthwire to whatever equipment is being installed on the channel.

Wiring

All wiring shall be carried out in accordance with the Standard Regulations for the Wiring of Premises SABS 0142 and using stranded PVC insulated stranded single core copper conductors bearing the SABS mark. Wiring shall be delivered to site in sealed coils with the labels intact.

No joints will be allowed in the wiring other than at junction boxes, outlet points and distribution boards and all wiring shall be carried out using the "loop-in loop-out" system. Where outlets are wired for future equipment, sufficient tail lengths or loops shall be provided.

Unless otherwise specified, the following, minimum standard PVC insulated conductors and earth wire sizes shall be used for various types of circuits.

Circuit Type/Three Single Phase	PVC Conductor phase size (mm ²)	Earthwire size (mm ²)
Lighting	2,5	2,5
16A switched sockets	4,0	2,5
Geysers	4,0	2,5
Console air-conditioners	6,0	4,0
Stoves	10	6
General connections up to 15A	2,5	2,5
Pylons & signage	2,5	2,5
Clocks & bells	1,5	-
Motors up to 1,5kW	2,5	2,5
Motors up to 3kW	2,5	2,5
General connections up to 4kW	2,5	2,5

For lighting circuits, an earth wire may be called for by the Supply Authority. For wiring in non-metallic conduit a separate 2,5mm earth wire shall be provided.

Luminaires

Outlets

Unless otherwise specified all lighting outlets for surface mounted fittings shall be terminated in standard round conduit boxes to which the fitting shall be screwed. Outlets shall be installed in the positions as indicated on the drawings and shall be accessible at all times for wiring.

Outlets for recessed luminaires shall, unless otherwise specified, be 100mm x 50mm heavy gauge pressed steel galvanised boxes fitted with 5A, 3 pin, single phase un-switched sockets with overlapping cover plates. These outlets shall generally be fixed hard up against the ceiling slab over or to roof truss members and in positions adjacent to the fittings. The fittings will be provided with flexible cords and plug tops.

Installation

The fittings shall be mounted in the positions as indicated on the drawings and, where surface-mounted, should be mounted asymmetrically in relation to ceiling panels and building features. Should it be that the fittings cannot be mounted in the positions as indicated for whatever reason, then the matter should be referred to the Engineer.

Surface-mounted fittings shall be installed with their mounting bases or hanging strips flat against the ceiling or wall fixed directly to the conduit box. Additional supports for heavier type fittings shall be to the approval of the Engineer.

Surface fluorescent fittings mounted directly to ceilings shall be mounted hard up against the ceiling and secured in the middle and near both ends. Fittings longer than 2400mm and wider than 200mm shall have double fixings at each point.

Fluorescent fittings installed in continuous rows shall be close coupled by means of lock-nuts and bushes or nipples. For fittings mounted on wiring channels, approved adapters shall be used.

Where fluorescent fittings are suspended on pendants these shall consist of 20mm diameter conduit pieces of the required length which may be used for wiring to the fitting. At least two pendants are required per fitting.

Recessed fluorescent fittings shall be dropped into the openings provided and plugged into the socket outlets.

Recessed down lighters shall be secured within openings in the ceilings with mounting brackets supplied with the fittings.

Light Switches

Light switches shall be supplied, installed and connected by the Contractor in the positions as indicated on the drawings. These switches shall be rated for 16A, 250V and shall comply with the latest SABS Specification. They shall be mounted at 1400mm above the finished floor level, measured to centre.

Where flush-mounted, the switches shall be installed in 100 x 50 x 50mm pressed steel, galvanised boxes with oversized cover plates, the colour of which shall be specified in Part 5. Where located in walls with dual finishes e.g. tiled, it shall be the responsibility of the Contractor to ensure that cover plates fall completely within one or the other finish, but not on the junction line. Special narrow units shall be provided where switches are mounted directly into partition mullions. Surface-mounted switches shall be of the metal clad type.

Where switches are exposed to the atmosphere or situated in damp, moist conditions, then watertight switches shall be used.

A maximum of 3 switches shall be allowed in a 100 x 50 x 50mm switch box.

Bell Pushes

Except that these shall be rated for 5A 250V, even where used for low voltage bell installations, the installation of bell pushes can be treated as for lighting switches above.

Switched Socket Outlets (SSO's)

All SSO's shall be supplied and installed by the Contractor in the positions and heights as indicated on the drawings and specified in Part Two.

Unless otherwise specified, single phase SSO's shall consist of 16A, 250V, 3-pin shuttered sockets to the latest SABS Standards.

Where flush-mounted, the switch sockets shall be installed in 100 x 100 x 50mm pressed steel, galvanised boxes with oversized cover plates, the colour of which will be specified in Part Two.

Surface-mounted SSO's shall be of the metal clad type.

Where SSO's are exposed to the atmosphere or situated in damp, moist conditions, then weather-proof sockets shall be used, e.g. "York" type or similar and approved.

Where not specified or indicated on the drawings, SSO's shall be mounted at 300mm above the finished floor level in offices, shops and bedrooms, at 1400mm in factories, workshops and garages and at 1200mm in kitchens and laundries, all measured from finished floor level, to centre of outlet.

Balancing of Loads

Once the total electrical has been completed and in full operation then the Contractor shall by means of suitable testers ensure the electrical loading of the 3 phase in each LV panel and distribution board is balanced to within 15 % of the maximum reading.

PROJECT SPECIFICATIONS**SPECIAL PARTICULARS RELATING TO THE MECHANICAL AND ELECTRICAL PLANT****Scope of Contract**

The scope of the Contract is described in general terms under the appropriate headings in Clause 1.1.3 of this Specification. Attention is drawn to the Note preceding Clause 1.1.3.

The prices tendered shall be deemed to cover everything necessary for the supply, erection and commissioning of the mechanical and electrical equipment for the Emanzana Wastewater Treatment Works extension.

The work shall include, inter alia, preparation of drawings of the proposed new mechanical and electrical plant and equipment showing full details of the required installations, delivery, handling and erection, testing in situ, commissioning and maintenance for a period of 12 months and everything necessary for the satisfactory operation of the installations and all control equipment to the satisfaction of the Engineer.

The new extension to the works shall essentially consist of the following major items of mechanical equipment: -

- Mechanical and Manually Screening Equipment ,
- Degritting Equipment and Grit Classifier
- Mechanical mixers in un-aerated zones of the bioreactor
- Mechanical surface aerators
- Mixed Liquor Recycle (MLR) Pumpsets,
- Bioreactor/Clarifier Drainage (RCD) Pumpsets
- Return Activated Sludge (RAS) Pumpsets
- Effluent discharge pumpsets
- Chlorine dosing equipment
- Clarifiers equipment, including;
 - Half Bridge Rotating Scraper Mechanism,
 - Overflow weirs plates
 - Stilling well and scum removal system,
 - Manually adjusted telescopic valve and outlet weir plates in
- Sludge Drying Beds (SDB) Pumpsets
- Manually adjustable tilting weirs for mixed liquor outlet and waste sludge outlet
- Electrical Controls

Mechanical Inlet Screen

This section of the Contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over in complete working order and upholding during the Defects Liability Period of a mechanical inlet screen and associated compactor and bagging equipment. Bidders shall however provide full details of any modifications required to the civil works for the equipment offered. Bidders should also provide MCC and Electrical Cables for mechanical screen(s).

The inlet works comprises two (2) no. screening channels; 900mm wide x 1100mm deep which will house two (2) No. electrically powered mechanical screens. The screens will be used on a standby/duty configuration.

In the event of a power outage, a hand-raked screen can be used with screened sewage directed through a 350mm diameter by-pass pipe to the outlet chamber of the inlet works.

Under this contract the successful contractor will be required to supply, install, commission and **operate and maintain for a period of fifteen (15) continuous weeks** the following equipment:

- Two (2) no. mechanical screens,
- One (1) manually operated screen

Description

At the proposed Emanzana WWTW, the raw sewage is directed to the inlet works where the raw sewage will be screened by the two (2) no. proposed mechanical inlet screens.

Each screen to be provided under this contract shall be of the self-cleaning reciprocating element or continuous type suitable for installation in a channel or chamber. The screen frame, base plate, side panels, shafts sprockets, rollers, chains and other components submerged or in contact with raw sewage shall be manufactured from stainless steel 304/316 or equivalent grade. Reciprocating elements or filter rakes shall be of similar material or ABS.

A suitably designed chute manufactured from stainless steel 304/316 shall direct screenings from the compactor into a wheelbarrow positioned adjacent to the screen chamber. The contractor's price for the chute will include the design, construction and operation and maintenance of the chute and all associated elements/components for its support and operation.

Duties

The screen shall be capable of removing all rags, paper, polythene, fibrous material and other solids present in the raw sewage and of size greater than 5 mm when the raw sewage solids concentration is as high as 5%. Each screen shall be capable of handling a peak flow of 50 l/s.

Screens

a) Screen Bars

The screen shall preferably consist of a vertical or inclined screen rack and suitable mechanism for cleaning through the rack from the downstream or upstream side. The rack shall be rigidly fixed at the bottom of the channel and shall consist of 50 mm by 10 mm stainless steel bars arranged so as to provide 10 mm clear openings between the bars. The top of the screen rack shall be about level with the top of the concrete walls of the channel in which the screen is to be mounted.

The bars shall be arranged in individual grids forming a rack which shall be mounted in the screen frame. The bars shall be manufactured from stainless steel Grade 304. The grids forming the rack shall be assembled and welded in a jig to ensure accurate alignment of the bars and openings. The base of the frame shall be located directly on the floor to allow effective removal of material transported along the floor of the channel. The side frames shall be mounted in recesses in the walls of the channel. Where necessary the rack shall be extended and provided with a supplementary support to accommodate screenings accumulation under maximum depth of flow.

Where intermediate supports or bracings are required, they shall be designed to prevent the accumulation of material that cannot be removed by the rake.

Provision shall be made in the design of the screen and engaging mechanism to ensure that entry of the rake tines into the bars is not prevented by grit and other debris on the floor of the channel.

b) Rake Mechanism

The removal of screenings shall be effected by not less than six rakes, situated upstream of the screen bars. Alternative arrangements will however be considered. The rake shall be mounted on a continuous chain incorporating balance weights which shall be guided into and positively engage with the screens and elevate screenings from the invert of the channel to discharge level. The rake mechanism shall be manufactured from stainless steel Grade 304. All bearings below water level shall be sealed from the ingress of grit. The rake tines shall be removable and be machine profiled to accommodate the material removed on the fine screens. The tines shall be manufactured from 3CR12 steel or equivalent abrasion and corrosion resistant material and be fitted onto the rake with countersunk “caphead” bolts.

The rakes and tines shall be formed from single continuous bars of sufficient depth to ensure complete stiffness across the full width of the bar. The rake shall have minimum thickness of 8 mm and shall have tines of the appropriate profile to suite the screen bar spacings and be laser or plasma-cut on the leading edge. The tines shall make an angle to the plane of the screenfield when engaged.

The rake arrangement shall be attached to the drive chains within the side members of the screen frame utilising purpose designed fabricated links. The rake shall be accurately aligned to ensure that for the full width of each bar, the tines penetrate the screen bars to the necessary amount for the full extent of travel of the tines whilst engaged, within the screen bars. Side plates will be required on either side of the rack to seal against the concrete channel.

An automatic wiper with robust “squeegee” blade shall remove all screenings from the rake at the top of its travel and deposit the screenings onto a chute which will effectively collect all material and deposit it into the compactor equipment. The action of the wiper shall be smooth and free of shock, back to its rest position.

c) Drive Units

The screen shall be driven through a geared speed reducer of the helical gearing type with housing of grey iron or spheroidal graphite iron. All bearings shall be individually designed for a life of 100 000 hours at an L10 rating. The power transmission rating shall be calculated in accordance with the method laid down by AGMA for continuous operation and shall be not less than 1,75 x absorbed power of 1,5 x installed power whichever is the greater. The drain from the gearbox and filling point shall be extended to a point outside the screen housing. A stainless-steel lever operated ball valve and plug shall be fitted to the drainpipe.

A facility shall be incorporated within the drive mechanism mounting arrangement to enable the scraping mechanism drive chains to be correctly tensioned and the raking bars to be accurately positioned across

the screen face. Such adjustments shall be possible without the dismantling of any part of the screen frame and without the necessity for any special tools.

d) Chains, Guides and Sprockets

The screen rake travel should be effected through direct drive, using horizontal shafting and sprockets, chain and chain wheels to suit the design. The chains shall be of the roller-type. The side-plates shall be with links of a stainless-steel Grade 304, with pins, bushes and rollers made of stainless steel 431 heat treated or equal long-lasting material. Chain guides shall be manufactured from polypropylene or approved equivalent material and shall be fixed to the side frames for the full length of travel of the chains. Cable operated systems will not be accepted. Top bearings for the drive shafts shall be of the pedestal or flanged heavy-duty roller type designed for a life of 100 000 hours at L10 rating and be fully sealed. Where access for lubrication is restricted or elevated above 1,75 m from slab level the lubrication points shall be extended to a common location outside the screen housing. A dedicated grease gun with one year's supply of grease shall be included in the Price Schedule for the screen.

Idler sprockets shall be located at the lower end of each side member of the screen frame and shall have a minimum thickness of 20 mm. The sprockets shall be mounted on stub axles utilising self-lubricating bush-bearings. The sprockets shall be retained on their stub axles by a suitable, easily removable, mechanism to ensure ease of replacement of the bearing should this be necessary. Full details of the bush material shall be submitted in the tender.

The raking mechanism shall be designed to ensure that any part of the screen field is cleaned with the required degree of regularity which is variable to suit site circumstances.

e) Screen Housing

The entire screen arrangement and drive shall be incorporated into a robust stainless-steel Grade 304 frame which shall be mounted on the channel walls and enclosed above the channel level with stiffened stainless steel 304 (polished finish) sheeting of thickness not less than 1,5 mm. Clear polycarbonate covers of thickness not less than 4,5 mm mounted in stainless steel 304 frames and fitted with robust stainless-steel quick release locking fasteners shall be provided to the front of the screen.

f) Materials

Wherever possible, items shall be manufactured in 304 stainless steel or non-corrodable materials, as the environment is highly corrosive.

g) Motors

All motors shall comply with the requirements of Standard Specification and the enclosure shall be IP55. All motors shall be fitted with anti-condensation heaters and wired for direct on line starting.

The motor shall be selected and rated to allow continuous operation at the full speed range.

The final finishing coat of polyurethane enamel on equipment shall be applied after completion of installation.

Corrosion Protection

Corrosion protection for Motors and speed reducers shall be based on System 1.

The final finishing coat of polyurethane enamel on equipment shall be applied after completion of installation.

Spare Tools and Lubricants

In addition to any gearbox lubricating oil to be provided for commissioning, an additional quantity adequate for a complete refill of all gearboxes shall be provided.

Provision to operate the screen physically

Provision to operate the screen physically should be provided in case of failure of the mechanical components.

Degritting Equipment

This section of the Contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over in complete working order and upholding during the Defects Liability Period of the following degritting and grit classifying equipment:

- Two positive displacement air compressors (one duty/one standby)
- Two progressing cavity positive displacement wash water pumps
- Air pipework and valves
- Wash water pipework and valves
- One grit classifier
- Two grit separator puddle drives

Two separate vortex grit separation chambers will be constructed in reinforced concrete under a separate civils contract and as per Drawing No. J079/002. Bidders shall however provide full details of any modifications required to the civil works for the equipment offered. Bidders should also provide MCC and Electrical Cables for degritting equipment and grit classifier.

Description

Screened sewage will be distributed equally to the two new vortex grit separation chambers. Each vortex separator will have an internal diameter of 2800mm and an overall depth 2825mm from invert of the inlet channel to nominal Top Water Level (TWL) of 2780 m.

Each vortex separator may be fitted with a revolving paddle, incorporating a 2:1 ratio variable speed drive, which is capable of maintaining an essentially constant velocity in the tank at the zone of grit deposition, irrespective of the rate of inflow into the tank.

Grit deposited in the collection sump at the bottom of the separator will be disturbed into slurry by the injection of air through a suitably sized cast iron pipe and water through a separate feed pipe. Thereafter the slurry will be removed by the use of an airlift pump through the same pipe and deposited either in the inlet chamber to the grit classifier or a drainage bed situated adjacent to the grit classifier.

Air for disturbing the grit deposited and for the air lift pump will be provided by two Rootes-type air compressors installed adjacent to the grit separators. Air pipework will be required to convey air between the compressors and the vortex grit separators.

Washwater will be pumped from a sump situated adjacent to the channel downstream of the grit separators using two progressive cavity positive displacement pumps. Washwater pipework is required between the pumps and the grit separators.

The grit classifier will be a free standing unit required to separate organics from the slurry and deposit the drained grit into a trailer or skip situated under the discharge chute.

Duties

The vortex grit separators will be required to remove all grit particles above 0,2mm in diameter and with a specific gravity greater than 2,5 from the inflow to the separators at flow rates not exceeding 50l/s. Two 2.8m nominal diameter separators have been selected to accommodate these requirements.

AIR COMPRESSOR (Refer also to Part W)

Compressors shall be of the Rootes air cooled positive displacement type. The compressor housing and rotor shall be of high-quality cast iron. The rotors shall be mounted on a high tensile steel shaft and the complete assembly shall be supported on ball and roller bearings located in housings in the end plates.

The compressors shall be driven through adequately rated V-belt drives at speeds up to a maximum of 2000 rpm.

WASHWATER PUMPS

The pumps shall be of the horizontal spindle progressing cavity positive displacement type suitable for installation on a concrete slab and foundation. The pump suction and discharge branches and drive head shall be of high grade cast iron. The stator shall be of durable resilient synthetic material and moulded to the pump casing. The helical rotor shall be manufactured from machine steel and be heavy chrome plated.

The shaft shall be equipped with adequately sized gland and stuffing box, lantern rings, and 'Teflon' impregnated gland packing. Gland leakage water shall be lead to waste to drainage sump through copper tubing fitted with rodding 'Teas' at change of direction.

Each pump and gearbox if required and its respective motor shall be mounted on a rigid mild steel bed or baseplate manufactured from channel section and shall be supported from the concrete foundation by foundation bolts. Pockets for these bolts will be provided by the Civil Contractor who will also be responsible for grouting up in position, under the supervision of the Mechanical Contractor after final adjustment and levelling.

Pressure relief valves shall be provided for progressing cavity positive displacement pumps and fitted between the pump discharge flange and delivery reflux valve. The pressure relief valve shall be adjustable between the pump discharge flange and delivery reflux valve. The pressure relief valve shall be adjustable between a pressure range of 50 and 300 kPa and capable of passing the maximum flow from each pump under blockage conditions. The discharge from the pressure relief valve shall be piped to the inlet channel.

AIR PIPEWORK AND VALVES

Gate and reflux valve shall be provided on the discharge side of each compressor.

All pipework from the compressor to the grit separator shall be in mild steel and of minimum diameter 50 mm, and shall be adequately supported using robust mild steel brackets.

WASHWATER PIPEWORK AND VALES

Gate and reflux valves shall be provided on the discharge side of each pump. Gate valves shall be provided on the suction side of each pump. The reflux valves shall be of the extended spindle type with

lever which shall actuate a weatherproof limit switch in the open position. The limit switch shall be supplied with a robust mounting plate.

SLURRY PIPEWORK AND VALVES

All pipework conveying slurry from the bottom of the grit separator to the classifier or to the drainage bed shall be in cast iron, and adequately supported using robust mild steel brackets.

Ball valves shall be provided on the discharge line to the classifier and drainage bed. The valves shall be suitable for the abrasive material conveyed and be provided with an electric actuator which shall operate in the open or closed position.

GRIT CLASSIFIER

The screw conveyor flights shall be manufactured from 3CR12 steel. The helices shall be 'ribbon' configuration for the first section of the conveyor which will permit free drainage of the liquid, and continuous for the balance of its length. The shaft shall be solid material complying with the requirements of BS 1449.

The inlet box, casing and conveyor trough shall be manufactured from 3CR12 steel. The trough shall be accurately formed with tolerance suitable for the correct operation of the conveyor.

GRIT SEPARATOR PADDLE DRIVE

The drive arrangement shall consist of a robust slewing ring arrangement geared motor and pinion, or geared motor, adequately designed to operate under the specified solids flux and float loading conditions and to accommodate the dead load of the underwater and other supported equipment. The gear reducers shall be of the mechanical type double or triple reduction with housing of best quality grey cast iron. All bearings shall be designated for a life of 100 000 hours with a B.10 rating. The power transmission rating shall be calculated in accordance with the method laid down by AGMA for continuous operation and shall not be less than 1,75 absorbed power or 1,5 x installed power whichever is greater. Provision shall be made for easy draining of the gearbox and slewing ring housing to a point outside the baseplate or housing. A drain valve and cap shall be fitted to the drain pipe.

SPARES, TOOLS AND LUBRICANTS (See also Clause E110)

A grease gun suitable for all the grease nipples on the equipment shall be provided together with at least 5kg of the appropriate grease to be used. If more than one type of grease to be used. If more than one type of grease is required, a separate grease gun shall be provided for each type of grease, but should not be needlessly supplied where one will serve several items of equipment with matching nipples taking the same grease.

The Tenderer will be required to list in the schedule of quantities the recommended spares for procurement and delivery at commissioning stage.

MECHANICAL MIXERS

Scope

This section of the Contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over in complete working order and upholding during the Defects

Liability Period of two (2) mechanical mixers in the un-aerated zones of the biological reactor: two in the Anoxic zone.

Description

The anoxic zone comprises of 2 tanks of 4m depth with an approximate volume of 600m³ per tank. Mixers are required in the anoxic basins of the biological reactor for keeping the solids in suspension and for gently mixing the contents of the basins without introducing oxygen through surface agitation. The design calls for an energy input of at least 8 watts per cubic meter of reactor volume. Preferably, the horizontal zones of maximum turbulence should be as close to the floor of the basin as possible. Scour velocities near the bottom shall be such that sludge which has settled during a power failure will be lifted and brought back into suspension. It is expected that the maximum concentration of the sludge will be 5 000 mg/l and the sludge will be flocculent having a SVI of between 50 and 150.

The impellers of the vertical shaft mixers must be selected such that good pumping action is obtained. They shall be mounted on concrete platforms within the biological reactor as shown on drawings.

The mixers shall require minimum maintenance and shall not be prone to the accumulation of rags. The stirrer shall not vibrate unduly or sway excessively under operating conditions. Full details of the complete installation shall be given in the tender.

It is expected that some sedimentation may take place between the mixers in the basins. This in itself will not be detrimental to the process provided that the stirrers will keep in suspension the solids which are closer to the impeller.

The location of the mixers and lay-out of the basins are shown on the Tender (as-built) drawings. Tenderers shall state in their proposals and provide thereof any additional baffles that may be required to avoid vortexing in the configuration of the reactor.

Duty

The installed motor sizes specified make allowance for speed reducer efficiencies of 95% and a 10% margin on motor power. Consequently, the actual power inputs required are less than the installed powers and the Tenderer shall select the size of impeller so as to provide the power input that is commensurate with the volume of the respective tank.

Location	No off	Required input to stirrer shaft	Installed motor power
Anoxic Basins (Volume 600m ³ , water depth 4.0 m)	2	8W/m ³	5.5kW

The Tenderer shall supply all relevant information for the proper adjudication of the units, giving information regarding the type of impeller, size and shape, the tip speed, the pattern of flow in the basin, shaft length if any and diameter as well as construction.

Mixers Details

The mixer blades shall be of robust construction and shall be fully braced and welded to the central support hub. They shall be of the "retreat blade" or back-curved design to promote a self-alignment action during operation. The central support hub shall be rigidly affixed to the solid steel drive shaft by means of a machined spigotted flange or keyway and locking retainer to ensure accurate installation on site. The blades and shaft should be manufactured in **3CR12 stainless steel of grade 304 stainless steel**. Particular attention shall be paid to alignment and balancing of the whole assembly. Preference will be given to curved blade self-cleaning mixers.

Gearboxes

Gearboxes shall be selected for continuous operation in exposed conditions at 95% humidity and direct sunlight with ambient air temperatures of between +5°C and 40°C.

The power transmission rating of the speed reducers shall be calculated in accordance with AGMA for continuous operation and shall not be less than 2,0 based on installed power:

$$\text{ie Power service factor} = \frac{\text{AGMA rating}}{\text{installed power}} = \frac{\text{AGMA rating}}{\text{CMR}}$$

Gearboxes shall be of the double or triple reduction type and all gearing is to be helical. Worm gears will not be accepted. All gears and pinions are to be machined and ground.

All bearings shall be designed for a life of at least 100 000 hours at a B.10 rating, and proof of such rating shall be submitted by Tenderers. In addition the bearings on the output shaft shall be capable of withstanding the resultant forces caused by a combination of radial and axial loads imposed by the stirrer. Selection shall be such that the following condition is complied with where the permissible loads are the manufacturers figures for 5 000 hours at B.10 rating.

$$\frac{\text{Actual radial load}}{\text{Permissible radial load}} + \frac{\text{Actual axial load}}{\text{Permissible axial load}} = \text{or} < 1$$

Tenderers shall indicate what these forces are and how they are calculated. Gearbox housings shall be of the best quality close-grained grey cast iron, and suitable breathers shall be supplied to prevent the ingress of moisture. Provision shall be made for easy draining of the gearbox by extending the drain to a point outside the baseplate at a minimum elevation of 200 mm above the concrete bridges. A drain valve and cap shall be fitted to the drain pipe.

An approved flexible coupling shall be fitted to the input shaft of the gearbox which shall be in a vertical configuration. A rigid coupling shall be fitted to the output shaft of the gearbox which shall be accurately machined to ensure the concentric alignment of the shaft and impeller assembly.

Baseplate

The mixer gearbox shall be mounted to a robust grade 304 stainless steel baseplate manufactured from plate of minimum thickness 20 mm. Suitable stiffening of the baseplate shall be provided where necessary. The baseplates shall be supported on the concrete bridge by jacking bolts.

Corrosion Protection

Corrosion protection shall be fit for purpose and carried out strictly in accordance with the specification. The coating system proposed shall be submitted to the Engineer for approval.

(Colours to conform with colour scheme selected by Engineer). Should existing paint on these items be not compatible with alkyd paints, the Contractor shall provide a suitable and approved paint instead.

Bolts

Holding down bolts which are to be built into concrete work for securing the plant shall be supplied and installed under this section of the Contract and shall be grade 304 stainless steel. Grouting up of these bolts will be done after completion of setting up of the plant by the Contractor under this Contract.

Electrical Requirements

The supply and installation of switchboards (including starters) and power cables will form part of this Contract.

Equipment Performance

The performance of the stirrers shall be tested on site in accordance with the specification. In addition, suspended solids tests shall be performed on the mixed liquor. The results of random samples throughout the tank shall be within 10% of each other.

MECHANICAL SURFACE AERATORS

Scope

This section of the Contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, **operation and maintenance for a period of fifteen (15) continuous weeks**, handing over in complete working order and upholding during the Defects Liability Period of:

- Four (4) fixed, low speed, bridge mounted mechanical aerators, complete with drive gearboxes and motors in the main aeration zone

Description

Four (4) vertical shaft aerators are required for the treatment of screened and degritted domestic raw sewage.

The aeration zones and the positions of the aerators in the basin will be as shown on the drawings. The volume and depth of the basins will be as follows:

Main Aerobic zone : 1, 282m³; water depth 4.5m max.

The aerators shall be of robust construction and shall be protected against corrosion as specified below.

Due to the variable oxygen demand in the plant, the oxygen transfer rate of the aerators shall be controlled by the switching on and off by means of timers supplied in the electrical section of the contract. A 4000mm long overflow tilting weir shall be provided under this contract, which shall be set at a level to give the optimum oxygen transfer efficiency of each aerator at peak loads. The Tenderer must provide full details of the variation in oxygenation capacity of the aerators offered over the full range of immersion depths for which the particular aerators are designed to operate. In addition, it is intended to operate aerators on a timer basis to further vary the oxygenation capacity.

It is essential that the aerators be capable of mixing the contents of the aeration basin at all times especially when the oxygen demand is low. Since the pumping capacity of an aerator varies inversely with the tip speed of the aerator, preference will be given to aerators having a low rotational velocity. The rotational speed shall not exceed **50 rpm**.

Preference will be given to aerators having a tip speed below 5 metres per second and which are essentially non-clogging in nature, as it is impossible to guarantee that this reactor will be free of rags and material of a fibrous nature.

The blades of each aerator shall be fully welded to the central supporting cone/structure. Welding shall be in accordance with SABS 044 and shall include for all testing of welds. Special care shall be taken for all testing to avoid crevice corrosion and mating flanges shall be sealed to prevent the ingress of moisture.

After assembly of the finished aerator cone, shaft and mounting flange (but before dispatch to site), the assembled unit shall be statically balanced in a jig fitted with anti friction type bearings to support each turbine and shaft. In addition, the unit shall be tested for centricity and correct angular attachment of

cone and flange to shaft, all in the presence of the Engineer or his representative. It is imperative therefore that each aerator cone, its attached shaft and the gearbox coupling are furnished with spigots with fine tolerances to avoid any misalignment during installation. Should any undue vibration occur during operation, the whole assembly shall be taken out of service and dynamically balanced at twice the operating speed of the turbine impeller. The Tenderer shall allow in his tender price for all equipment necessary to perform the work and this test.

Tenderers must submit a detailed description and a clearly detailed cross-sectional drawing of the aerators, together with submergence details with their tenders. **Failure to submit this drawing and description will render the tender incomplete and as such liable to rejection.**

Baffle walls and anti-vortexing baffles are not provided in the aeration basins. Should the Tenderer consider that anti-vortexing baffles are required to suit the equipment offered, these baffles shall be included as part of the aerator offer, including the installation complete. All baffles so required are to be manufactured in grade 304 stainless steel including holding down bolts.

Power Requirements

Five vertical shaft aerators of the following sizes are required:

Location	No. off	Installed motor power
Main Aerobic Zone (Volume 1282m ³ per tank, water depth 4.5m, max)	4	22kW

Speed Reducers

Speed reducers shall be selected for continuous operation 24 hours per day. Mechanical power ratings (according to AGMA) shall be not less than 2 x absorbed power or 1,75 x installed power, whichever is the greater. Thermal power ratings shall be based on an ambient temperature of 40°C.

Tenderers will be required to provide a catalogue of the make of speed reducer offered and to indicate how the selection was made.

All gears and pinions shall be cut from special alloy steels and shall be hardened and ground after machining.

Worm gears will not be considered suitable for the aerator duty.

All bearings shall be designed for a life of at least 100 000 hours at a B.10 rating, and proof of such rating shall be submitted by Tenderers. In addition the bearings on the output shaft shall be capable of withstanding the resultant forces caused by a combination of radial and axial loads imposed by the propeller (acting simultaneously) due consideration being given to out of balance loads on the propeller. Selection shall be such that the following condition is complied with where the permissible loads are the manufacturers figures for 5 000 hours at B.10 rating.

$$\frac{\text{Actual radial load}}{\text{Permissible radial load}} + \frac{\text{Actual axial load}}{\text{Permissible axial load}} \leq 1$$

Tenderers shall indicate what these forces are and how they are accommodated.

Casings shall be made of close grained cast iron and shall be designed such as to prevent moisture from entering. A dry well for the output shaft lower bearing is required to avoid total loss of oil in the event of a seal failure.

All speed reducers must be provided with jacking bolts of grade 304 stainless steel allowing at least 100 mm adjustment up and down.

Motors shall be fitted with flexible couplings driving the input shaft of the gearbox. Alignment of motor, gearbox and aerator shaft and cone shall be subject to witness inspection in the presence of the Engineer.

The motor shall be rigidly mounted on a fully machined lantern housing to ensure accurate alignment of motor, coupling and gearbox.

The gearbox shall be fitted with a suitable oil filler, oil level dipstick and suitable breather.

Oxygen Efficiency

Oxygenation efficiency, where called for in the Technical Data Sheets, shall be expressed as kilograms oxygenation capacity per kilowatt-hour i.e. as the mass of oxygen measured in kilograms which the aerator can introduce over a period into a body of completely de-oxygenated water divided by the power input to the motor over the same period, measured in kilowatt-hours, at Standard Conditions of 760 mm hg and 20°C. The aerators proposed by the Tenderer shall provide a minimum of **2.45 kg O₂/kW hour** under standard conditions, as wire to water efficiency.

Certification

Tenderers shall provide proof of sufficient evidence of oxygenation capacities and oxygenation efficiencies (for instance by submitting a report on performance by some recognised testing organisation) and must state clearly how aerator performance was assessed. Failure to submit this information will lead to the rejection of the tender on the grounds of it being incomplete.

In-situ Oxygenation Efficiency Determination

In-situ oxygenation efficiency tests may be conducted once the plant is operating effectively and Tenderers shall price the Provisional Item in the Schedule of Prices for conducting such tests.

The tests shall utilise the steady state method and shall be carried out as per the requirements of the specification.

Steady State Oxygenation Capacity Determination

In the aeration of activated sludge mixed liquor, at a temperature of T°C, the following relationship holds:

$$\frac{dC}{dt} = K(T) \times (C_s(T) - C) - r$$

$$\text{where } \frac{dC}{dt} = \text{rate of change of oxygenation concentration (mg/l/h)}$$

$$K(T) = \text{oxygen transfer co-efficient in mixed liquor at T°C (h}^{-1}\text{)}$$

$$C_s(T) = \text{saturation concentration of oxygen in mixed liquor at T°C and at the ambient barometric pressure (mg/l)}$$

$$C = \text{actual concentration of oxygen in the mixed liquor (mg/l)}$$

$$r = \text{oxygen update rate of the mixed liquor (mg/l/hr)}$$

If it is assumed that, under normal operating conditions, a state of equilibrium exists in the system, then

$$\frac{dC}{dt} = 0$$

$$\text{and } K(T) \times (C_s(T) - C) = r$$

$$\text{i.e. } K(T) = \frac{r}{(C_s(T) - C)} \quad (1)$$

The value of $C_s(T)$ to be used in equation (1) is calculated from the following relationship:

$$C_s(T) = \frac{(468 - 2,65S)}{(31,6 + T)} \times \frac{(P - P_w)}{(760 - P_w)} \quad (2)$$

where $C_s(T)$ = saturation concentration of oxygen in mixed liquor at $T^\circ\text{C}$ and P mm pressure (mg/l)

S = dissolved solids in mixed liquor (parts per 1 000)

T = temperature of mixed liquor ($^\circ\text{C}$)

P = barometric pressure (mm Hg) at site

P_w = saturation vapour pressure of water at $T^\circ\text{C}$ (mm Hg)

In equation (1), r and C can be determined, and $C_s(T)$ can be obtained from equation (2), so that the value of $K(T)$ can be calculated. It's value at 20°C can then be obtained by the use of the following relationship:

$$K(T) = K(20) \times 1,02^{(T-20)}$$

$$K(20) = K(T) \times 1,02^{(20-T)}$$

$$OC = K(20) \times C_{1s}(20) \times V \times 10^{-3} \text{ kg/hr}$$

where $C_{1s}(20)$ = saturation concentration of oxygen in mixed liquor containing 1 000 mg/l dissolved solids, at 20°C and 760 mm pressure (mg/l) = 9,02 mg/l

V = volume of mixed liquor in basin under consideration (m^3)

OC = oxygenation capacity.

Test Requirements

The actual test procedure shall be proposed by the Contractor but shall be approved by the Engineer before it is implemented.

Nevertheless, the following points shall be incorporated in the test procedure:

- the Contractor shall provide four dissolved oxygen meters of approved make, all standardized and calibrated in accordance with the instructions supplied by the manufacturers.

- the Contractor shall provide all meters, etc. required for conducting the oxygen uptake rate tests.
- the position of the DO probes shall be to the satisfaction of the Engineer.
- the Contractor shall provide all meters, etc. required to assess the power consumption of the aerators during the steady state oxygenation capacity test.
- at least three consecutive tests shall be conducted.
- the Contractor shall provide all meters, etc. required for assessing the alpha and beta factors to enable the in-situ oxygenation efficiencies to be related to Standard Conditions.

Corrosion Protection

Corrosion protection shall be fit for purpose and carried out strictly in accordance with the specification. The coating system proposed shall be submitted to the Engineer for approval. The aerator blades, cone and shaft shall be made from 3CR12 stainless steel or grade 304 stainless steel.

(Colours to conform with colour scheme selected by Engineer). Should existing paint on these items be not compatible with alkyd paints, the Contractor shall provide a suitable and approved paint instead.

Bolts

Holding down bolts and jacking bolts which are to be built into concrete work for securing the plant shall be supplied and installed under this section of the Contract. Grouting up of these bolts will be done by the construction contractor after completion of the setting up of the plant by the Contractor under this Contract. All bolts and nuts shall be as specified.

Electrical Installation

The supply and installation of switchboards (including starters) and power cables will form part of this contract.

CLARIFIER EQUIPMENT

Scope

This section of the Contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, ***operation and maintenance for a period of twenty (20) continuous weeks***, handing over in complete working order and upholding during the Defence Liability Period of plant for two (2) 18m nominal diameter clarifiers.

Description

The new clarifiers have been built in concrete and have an internal diameter of 18 m and a side water depth of 3,5 m. The floor of the tank will slope towards a sludge collection hopper in the centre of the clarifier. The sludge will be scraped towards the central sludge collecting hopper from where it will be withdrawn through the sludge draw-off pipe. Typical details are shown on the drawings. The Contractor will be required to check that the clarifier structures have been built to the tolerances required for the proper operation of the equipment offered.

The effluent launder has been built in concrete against the inner perimeter of the tank wall. The inlet structure has been built in concrete to the dimensions as shown on the drawings.

Duty

The secondary clarifier will be required to operate and remove mixed liquor, suspended solids under the following hydraulic parameters: -

	Max.	Mean	Min.
Mixed liquor inflow	60 ℓ/s	45 ℓ/s	30 ℓ/s
Sludge withdrawal	10 ℓ/s	10 ℓ/s	10 ℓ/s

Stilling and Flocculation Wells

A central Glass Reinforced Plastic stilling well shall be provided by means of an annular baffle plate which shall be proportioned so as to minimize turbulence in the inlet stream at all points of entry to the clarifier. The flow distribution arrangement shall ensure equal distribution of the flow radially under all conditions and shall have the following minimum dimensions:-

Diameter	:	3,250 mm
Depth below minimum water level	:	2,020 mm
Height above maximum water level	:	180 mm

The stilling chamber shall be supported from the inlet structure and shall be adequately braced to prevent deformation. Four slots shall be provided at water level to permit accumulated scum to flow or be flushed out of the chamber.

A secondary flocculation well of 6,750 mm diameter, extending 250 mm above and 1,750 mm below top water level shall be suspended from the bridge using Grade 304 stainless steel supports. This secondary well shall preferably be made in a lightweight material inert to sewage environments. Twelve slots shall be provided at water level to permit accumulated scum to flow or be flushed out of the chamber.

Access Bridge and Drive Arrangement

The rotating access bridge shall be supported by a hinged bearing on the inlet structure at the one end and by driving and supporting wheels at the other end.

The complete rotating bridge structure and scraper support system shall be manufactured from aluminium plate and section to Hulett's specification D65 STF beam construction. Welding shall comply with the requirements of SABS 44 Parts 1 - 4 (1983). The bridge shall extend across the full radius of the tank to provide access around the hinged bearing assembly. The access walkway to the centre bearing and slip ring assembly shall be designed for a uniformly distributed live load of 2,0 kN/m² and shall have a walkway of clear width not less than 750mm. The bridge shall be designed with a camber to cancel the deflection caused by the dead load of the complete bridge and other supported equipment. The walkway shall be provided with Grade 316 stainless steel hand and knee rails on both sides made out of 1.6mm thick tubes, together with 'hot dip' galvanised mild steel open flooring. A 150mm deep aluminium 'kick plate' shall be affixed to either side of the bridge structure. A fixed aluminium ladder shall be provided for access from ground level. Steps shall be provided with the same flooring as the bridge.

The kickplates and handrail stanchions shall not be secured to the flooring sections.

The flooring sections shall be mounted with a non-metallic spacer between the flooring and bearer bars and adequately secured to the support structure by means of quick release clips.

A SS 316 or uPVC cable conduit shall be provided from the slip ring assembly to the drive motor.

Centre Bearing and Support Assembly

The bridge shall be driven by an electric motor through a speed reducer giving a peripheral speed of between 1,0 and 1,5 metres per minute. The driving and supporting wheels shall have wearing surfaces consisting of tyres of an approved synthetic material with good wearing properties. The wheels must be accurately aligned so that the plane of rotation is normal to a line drawn through the pivot of the wheel and the centre point about which the bridge rotates, so as to minimise wear of the tyres. The supporting wheels shall be fitted with a protective cover and provided with a front-mounted adjustable guard that will push foreign objects off the wall and to the outside thereof.

The underside of the bridge and the underside of the backing plates for the squeegees shall have sufficient clearance to prevent any touching between metal and concrete when the tyres are worn down. The spacing of the wheels shall be such as to give adequate lateral stability to the bridge. All lubricating points on the driving mechanism and wheels shall be such that no grease is deposited on the concrete surface on which the wheels run.

Scraper Mechanism

The scraper mechanism shall scrape the entire floor area. The scrapers shall be fitted to an underwater support system suspended from the overhead rotating bridge. The scraper mechanism and bridge shall form one rigid unit. All bolts and nuts underwater or within 100 mm of the water surface shall be in grade 304 stainless steel. The scrapers shall consist of metal back plates fitted with synthetic rubber squeegees. The back plates shall have a minimum thickness of 6 mm if in mild steel and 4,5 mm if in stainless steel (grade 304). Care must be taken to minimise the wear on the squeegees but no supporting wheels will be considered. The rods suspending the scrapers from the bridge shall be sufficiently sturdy to keep the scrapers in their relative positions without the metal back plates coming into contact with the floor. Full details of the scraper system shall be given in the Tender.

Scum Baffle and Removal System

It is expected that all the scum will be removed from the bioreactor using the waste sludge tilting weir, therefore a scum baffle and scum removal system has not been incorporated in the clarifier design.

Overflow Weir

A circumferential V-notch weir shall be provided manufactured from 4,5 mm thick grade 304 stainless steel. The weir shall be to the dimensions shown on Drawings J079-D03. Suitable 'toggle' or similar clamps shall be used to fix the weir plate to the concrete weir and permit alignment. The joint between the weir and the wall shall be sealed with expanded neoprene, bitumen or wax impregnated material to prevent leakage. Once in operation the effluent shall discharge freely and evenly around the whole circumference of the tank.

Clarifier Desludging

The civil contractor will install 160mm diameter sludge withdrawal pipes to the discharge position shown.

Sludge withdrawal will be controlled by means of sluice gates (to be installed by others) at the RAS pump station.

Pipework

The inlet pipe under the floor and inside the inlet structure of the clarifier will be supplied and installed by others to a position as shown on the drawings. The 200 mm diameter sludge draw-off pipes under the floor of the tank have been supplied and installed by others and does not form part of this Contract.

The Contractor under this Contract must, supply and install the balance of the inlet pipe which shall be of Grade 304 stainless steel or similar approved.

Floor Screed

A temporary strut requires to be bolted onto the scraper truss to act as a template for the screeding of the finished floor. The floor screed must have a minimum thickness of 50mm. A Provisional Sum has been allowed in the bill of quantities for the appointment of an experienced Civil Contractor to carry out this operation. The mechanical contractor under this contract shall supervise this function so as to avoid any damage to the mechanism or scraper blades.

Corrosion Protection

Corrosion protection shall be fit for purpose and carried out in accordance with the specification. Should existing paint on these items be not compatible with alkyd paints, the Contractor shall provide a suitable and approved paint instead. The coating system proposed shall be submitted to the Engineer for approval.

Bolts

Holding down bolts which are to be built into concrete work for securing the plant shall be supplied and installed under this section of the Contract. Grouting up of these bolts will be done by the construction contractor after completing of setting up of the plant by the Contractor under this Contract.

All bolts and nuts shall be as specified.

Electrical Requirements

The power take-off arrangement at the centre of the tank must be completely weatherproof. Each driving motor must be provided with its own weatherproof starter with stop/start push buttons, mounted in close proximity to the motor served. The supply and installation of cables between the power take-off, starter and motor form part of this Contract.

The supply and installation of power cables between the point of supply and power take-offs in the tanks forms part of this Contract.

PUMPING PLANT**Mixed Liquor Recycle Pumps****Scope**

This section of the Contract covers the design, manufacture, supply, delivery, off-loading, storage, installation, testing, commissioning, **operation and maintenance for a period of twenty (20) continuous weeks**, and rectification of defects during the Defects Liability Period of mechanical equipment as follows:

- Four (4) Mixed Liquor Recycle (MLR) axial flow propeller pumps with a 3-speed arrangement (pulley system), one duty and one standby in the new bioreactor.

The Mixed Liquor Recycle pump chambers have been constructed of reinforced concrete under a separate contract, generally as shown on Drawing J079(07)-D04 and are an integral part of the bioreactor.

General Arrangement and Description

The liquid to be recycled consists of activated sludge mixed liquor, varying in concentration between 2 500- 10 000 mg VSS/l.

The four-MLR pumps are required to pump mixed liquor from the end of the aeration zone back to the anoxic zone.

One pump in each of the two modules will be required to operate simultaneously. One unit will normally be a stand-by.

Submersible pumps will not be acceptable for this application. Furthermore, the equipment offered shall have no moving parts under water that could not be withdrawn without lowering the water level in the bioreactor basin.

Preference shall be given to non-clogging pumps which are able to deliver a range of flows by moving drive belt from one pulley to the next. Consideration shall be given to variation of pump speed by VSD.

Tenderers must submit fully dimensioned drawings showing how the equipment offered will be incorporated into the bioreactors. **Failure to submit these drawings and description will render the tender incomplete and as such liable to rejection.**

Duties

The MLR pumps shall each be able to draw liquid from the end of the aeration zone and lift the flow from the aerobic zone into the anoxic zone. Each MLR pump shall be capable of lifting a maximum of 100 l/s against a low head ranging between 130 and 200 mm. Each pump must also be capable to lift a minimum of 50 l/s against a low head ranging between 130 and 200 mm. Tenderers shall supply details of the characteristics of each pump regarding speed versus capacity. The flow rate shall be optimised by means of manually changing the pulley drives.

Pump Impeller and Shaft

The propeller shall be cast from phosphor-bronze, hard gunmetal or stainless steel or other suitable corrosion and abrasion-resistant material, keyed and bolted to the shaft in such a manner that it shall be impossible for it to become accidentally detached while in operation. The castings shall be free from blow holes or other defects. Welding of defective castings will not be permitted.

The Tenderer shall supply all relevant information for the proper adjudication of the units, giving information regarding the type of impeller, size and shape, the tip speed, the pattern of flow in the basin, shaft length if any and diameter as well as construction. Motors shall be suitably rated for the variable speed duty.

All surfaces are to be polished to a smooth finish and those which cannot be machined are to be ground and hand filed to a template. Leading edges of the blades shall be ground or filed to give a rounded section and not a sharp pointed edge.

The pump shaft and coupling shall be of solid steel construction and capable of withstanding the full load imposed by the turbine.

After manufacture, the complete blade assembly and shaft shall be statically and dynamically balanced. A detailed description and arrangement drawing of the pumps shall be supplied with the tender

The pump volute shall be supplied in Grade 316SS and it shall be the Contractor's responsibility to install and fix this item and grouting in.

Pump Drive Unit

Preference will be given to belt-driven units suitably and adequately designed for the duties specified.

Gearboxes, where used, shall be of the double or triple reduction type and all gearing is to be helical. Worm gears will not be accepted. All gears and pinions are to be machined and ground.

All bearings shall be designed for a life of at least 100 000 hours at a L10 rating, and proof of such rating shall be submitted by Tenderers. In addition the bearings on the output shaft shall be capable of withstanding the resultant forces caused by a combination of radial and axial loads imposed by the propeller (acting simultaneously) due consideration being given to out of balance loads on the propeller. Selection shall be such that the following condition is complied with where the permissible loads are the manufacturers figures for 5 000 hours at L10 rating.

$$\frac{\text{Actual radial load}}{\text{Permissible radial load}} + \frac{\text{Actual axial load}}{\text{Permissible axial load}} = \text{or } < 1$$

Tenderers shall indicate what these forces are and how they are accommodated.

Gearbox housings shall be of the best quality close-grained grey cast iron, and suitable breathers shall be supplied to prevent the ingress of moisture. Provision shall be made for easy draining of the gearbox by extending the drain to a point outside the baseplate at a minimum elevation of 200 mm above the concrete bridges. A drain valve and cap shall be fitted to the drain pipe. On gearboxes with vertical output shafts a dry well for the output shaft lower bearing is required to avoid complete drainage of oil in the box in the event of an oil seal failure.

An approved flexible coupling shall be fitted to the input shaft of the gearbox which shall be in a vertical configuration.

Axial flow pumps, operated via V-belts and pulleys shall be amply sized to transmit the power required and to ensure long life on both belts and bearings used in the arrangement. Safety guards shall be provided for the belts and shall be of a corrosion resistant material, and securely fastened to the support frame.

Baseplate

The propeller pump gearbox shall be securely mounted to a rigid 3CR12 of Grade 304SS baseplate provided with suitable openings for pouring in grout and all necessary holding-down bolts for securing to the pump chamber walls or top slab, which have been constructed by the civil contractor to dimensions supplied by the mechanical equipment contractor.

Corrosion Protection and Materials of Construction

Corrosion protection shall be carried out in accordance with the requirements of Clause 1.6.4 of the Standard Specification, to the following systems

Pump shaft and turbine complete	:	316 SS
Motor & gearbox	:	Cast iron and System No.1
Guards, baseplate & bolts	:	3CR12 + System No.1

Motors

All motors shall comply with the requirements of the specification and the enclosures shall be rated IP55.

Electrical Installation

All electrical controls, cabling and electrical installation form part of this contract.

Pump Performance

Tenderers shall provide sufficient information to permit evaluation of the mixed liquor pumps under the specified conditions.

Performance tests may be conducted once the plant is operating and the Tenderer's rates for commissioning must include for conducting these tests.

The test procedure shall be approved by the Engineer and shall contain the following minimum requirements:

- a) Determination of the rate of discharge of each pump
- b) Two MLR anoxic zone pumps together
- c) Measurement of power absorbed

The pumps will be put into operation and run continuously until balanced flow conditions are achieved but, in any event, the test shall not be carried out until a period of 1 hour has expired.

The performance of the equipment shall be considered acceptable when the power absorbed does not deviate more than 5% from the value stated by the Contractor and the flow rate does not deviate by more than 10% of the specified requirements.

Reactor and Clarifier Drainage (RCD) Pumpsets

Scope

This part of the Contract covers the design, manufacture, supply, delivery, offloading, storage, installation, testing, pre-commissioning, commissioning, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over and rectification of defects during the Defects Liability Period of mechanical equipment as follows:

- Two Reactor and Clarifier Drainage (RCD) submersible pumpsets, to pump drained liquid from the bioreactor and clarifiers to an existing drainage manhole situated at the head of the works.

General Arrangement and Description

Two vortex type submersible pumps (one running and one standby) are required to pump liquids drained from the bioreactor and clarifiers to a manhole situated at the head of the works. The layout of the works, showing the positions of the RCD pump station and the receiving manhole (at the head of the works), the detail of the sumps and the pipework layouts is given on the drawings.

The submersible pumps shall be of the manufacturer's standard and approved design, capable of doing the duty required at a speed not exceeding 1 500 rpm and shall be provided with suitable heavy duty thrust bearings. The pump and motor casing is to be GG-25 cast iron. Impellers shall be cast iron or bronze, wear plates shall be bronze and shafts shall be Grade 316 stainless steel. The diameter being sufficient to withstand and transmit without whip and with ample margin of safety, all torsional and bedding stresses to which it may be subjected. They shall be supplied with duck foot bends, detachable couplings and guide-rails. A lifting davit will also be required, under this contract, to be installed at the RAS pump station to enable simple removal of the pumps within the bounds of the relevant Occupational Health and Safety Regulations.

Pipework which include isolating and non-return valves have been supplied and tenderers are to cater for delivery pipework from the pumps connecting to flanges to be installed though a separate contract (refer to the drawings for a detailed layout of the pipework required).

The seals on the rotating shaft shall be silicon-carbide or approved equivalent. Protection shall include a moisture detection sensor, seal condition monitoring probe and thermal sensors embedded in the motor windings. All fastenings shall be Grade 304 stainless steel. The power cable type shall be H07RN-F or approved equivalent.

It is estimated that the sludge that will be pumped has a solids concentration of up to 2%. The sludge will thus be relatively "thick" and therefore, the pump must have non-clogging characteristics and be capable of passing solids of 75 mm in diameter.

A suitable switch shall be supplied and installed to stop the pumps under no-flow conditions. Details of the switch offered must be included with the tender.

Duties

TWL in Pump Sump = 105.20m

Normal level in sump = 104.50m

Discharge level = 113.10m

Flow required per pump is **20l/s** through 160 mm diameter pipework approximately 105m long. Frictional losses amounts to approximately 4,5m, therefore total head is approximately **15 m**.

Control of Pumps

The basic operation of the pumps will be controlled by "Auto", "Off", "Manual" selector switches on the pump station MCC. Automatic operation of the pumps will be controlled by stainless steel electrodes to be fitted in the pumpstation sump arranged to operate at the levels stated above. ***The electrical controls of the pumps must also be arranged such that both the pumps can be manually run simultaneously***

Manually operated selector switches are to be provided to allow each pump to be selected for “Duty”, or “Standby” so that pump operation can be rotated amongst both pumps.

Testing and Pump Performance (Site)

Pump tests shall be carried out on the pumpset at the manufacturers works or alternative testing facility approved by the Engineer in accordance with the requirements of BS 5316 for Class C tests. The information inserted in the data sheets and characteristic curve submitted with the tender or subsequently approved by the Engineer shall be used as acceptance criteria for pump performance.

The pumpset will be considered acceptable, if under test, the quantity measured at the design head and the kW absorbed at the motor terminals are within plus 7,5% to minus 2,5% of those guaranteed at the time of tender.

Further pump tests shall be carried out on each pump and combinations of pumps, on completion of installation and commissioning. Not less than ten readings shall be carried out at different heads on each pump to permit verification of the characteristic, power and efficiency curves. The pump capacity will be measured using physical displacement in the adjacent sump. The pump discharge pressure shall be simulated and controlled using the discharge valves or similar approved method. The total pump head will be measured using calibrated gauges installed in the pump suction and discharge lines. Power absorbed during the test will be measured by a recording calibrated kWh meter.

Vibration analysis shall be carried out on each pump and motor after installation with portable calibrated instrumentation to ensure adequate balancing and alignment. The installation shall be considered acceptable when the horizontal and vertical levels obtained do not exceed those prescribed in BS 4675 for Class II machines with a vertical limit of 2mm/sec. and a horizontal limit of 4mm/sec.

All test methods and procedures shall be approved by the Engineer.

The Contractor shall be responsible for providing all test equipment.

The method of flow measurement shall be approved by the Engineer.

Return Activated Sludge (RAS) Pumpsets

Scope

This part of the Contract covers the design, manufacture, supply, delivery, offloading, storage, installation, testing, pre-commissioning, commissioning, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over and rectification of defects during the Defects Liability Period of mechanical equipment as follows:

- Two Return Activated Sludge (RAS) centrifugal drywell pumpsets, to return activated sludge collected from the clarifiers to the anoxic zone(s) of the two process streams of the bioreactor.

General Arrangement and Description

Two vortex type submersible pumps (one running and one standby) are required to return activated sludge from the clarifiers to the Anoxic zone of the new bioreactor. The layout of the works, showing the positions of the clarifiers and bioreactors, the detail of the sumps and the pipework layouts is given on the drawings.

The submersible pumps shall be of the manufacturer's standard and approved design, capable of doing the duty required at a speed not exceeding 1 500 rpm and shall be provided with suitable heavy duty thrust bearings. The pump and motor casing is to be GG-25 cast iron. Impellers shall be cast iron or bronze, wear plates shall be bronze and shafts shall be Grade 316 stainless steel. The diameter being sufficient to withstand and transmit without whip and with ample margin of safety, all torsional and bedding stresses to which it may be subjected. They shall be supplied with duck foot bends, detachable couplings and guide-rails. A lifting davit will also be required, under this contract, to be installed at the RAS pump station to enable simple removal of the pumps within the bounds of the relevant Occupational Health and Safety Regulations.

Pipework which include isolating and non-return valves have been supplied and tenderers are to cater for delivery pipework from the pumps connecting to flanges to be installed though a separate contract (refer to the drawings for a detailed layout of the pipework required).

The seals on the rotating shaft shall be silicon-carbide or approved equivalent. Protection shall include a moisture detection sensor, seal condition monitoring probe and thermal sensors embedded in the motor windings. All fastenings shall be Grade 304 stainless steel. The power cable type shall be H07RN-F or approved equivalent.

It is estimated that the sludge that will be pumped has a solids concentration of up to 2%. The sludge will thus be relatively "thick" and therefore, the pump must have non-clogging characteristics and be capable of passing solids of 75 mm in diameter.

A suitable switch shall be supplied and installed to stop the pumps under no-flow conditions. Details of the switch offered must be included with the tender.

Duties

TWL in Pump Sump	= 109.15m
Normal level in sump	= 107.75m
Discharge level	= 112.00m

Flow required per pump is **10l/s** through 250 mm diameter pipework approximately 105m long. Frictional losses amounts to approximately 2,5m, therefore total head is approximately **10m**.

Control of Pumps

The basic operation of the pumps will be controlled by "Auto", "Off", "Manual" selector switches on the pump station MCC. Automatic operation of the pumps will be controlled by stainless steel electrodes to be fitted in the pumpstation sump arranged to operate at the levels stated above. ***The electrical controls of the pumps must also be arranged such that both the pumps can be manually run simultaneously***

Manually operated selector switches are to be provided to allow each pump to be selected for "Duty", or "Standby" so that pump operation can be rotated amongst both pumps.

Testing and Pump Performance (Site)

Pump tests shall be carried out on the pumpset at the manufacturers works or alternative testing facility approved by the Engineer in accordance with the requirements of BS 5316 for Class C tests. The information inserted in the data sheets and characteristic curve submitted with the tender or subsequently approved by the Engineer shall be used as acceptance criteria for pump performance.

The pumpset will be considered acceptable, if under test, the quantity measured at the design head and the kW absorbed at the motor terminals are within plus 7,5% to minus 2,5% of those guaranteed at the time of tender.

Further pump tests shall be carried out on each pump and combinations of pumps, on completion of installation and commissioning. Not less than ten readings shall be carried out at different heads on each pump to permit verification of the characteristic, power and efficiency curves. The pump capacity will be measured using physical displacement in the adjacent sump. The pump discharge pressure shall be simulated and controlled using the discharge valves or similar approved method. The total pump head will be measured using calibrated gauges installed in the pump suction and discharge lines. Power absorbed during the test will be measured by a recording calibrated kWh meter.

Vibration analysis shall be carried out on each pump and motor after installation with portable calibrated instrumentation to ensure adequate balancing and alignment. The installation shall be considered acceptable when the horizontal and vertical levels obtained do not exceed those prescribed in BS 4675 for Class II machines with a vertical limit of 2mm/sec. and a horizontal limit of 4mm/sec.

All test methods and procedures shall be approved by the Engineer.

The Contractor shall be responsible for providing all test equipment.

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Electrical Requirements

The supply and installation of switchboards (including starters) and power cables will form part of this contract.

Electrical Requirements

The supply and installation of switchboards (including starters) and power cables will form part of this contract.

The method of flow measurement shall be approved by the Engineer.

Effluent Discharge Pumpsets

Scope

This part of the Contract covers the design, manufacture, supply, delivery, offloading, storage, installation, testing, pre-commissioning, commissioning, ***operation and maintenance for a period of fifteen (15) continuous weeks***, handing over and rectification of defects during the Defects Liability Period of mechanical equipment as follows:

- Two chlorine dry well pumpsets, to dose chlorine to clarified effluent prior to discharge to the natural river system.

General Arrangement and Description

One pump will be required to operate at one time while the other unit will normally be a stand-by.

Submersible pumps will not be acceptable for this application. Furthermore, the equipment offered shall have no moving parts under water that could not be withdrawn without lowering the water level in the bioreactor basin.

Preference shall be given to non-clogging pumps which are able to deliver a range of flows by moving drive belt from one pulley to the next. Consideration shall be given to variation of pump speed by VSD.

Tenderers must submit fully dimensioned drawings showing how the equipment offered will be incorporated into the bioreactors. **Failure to submit these drawings and description will render the tender incomplete and as such liable to rejection.**

Duties

Each pump shall be capable of lifting a maximum of 150 l/s against a low head ranging between 130 and 200 mm. Each pump must also be capable to lift a minimum of 75 l/s against a low head ranging between 130 and 200 mm. Tenderers shall supply details of the characteristics of each pump regarding speed versus capacity. The flow rate shall be optimised by means of manually changing the pulley drives.

Pump Impeller and Shaft

The propeller shall be cast from phosphor-bronze, hard gunmetal or stainless steel or other suitable corrosion and abrasion-resistant material, keyed and bolted to the shaft in such a manner that it shall be impossible for it to become accidentally detached while in operation. The castings shall be free from blow holes or other defects. Welding of defective castings will not be permitted.

The Tenderer shall supply all relevant information for the proper adjudication of the units, giving information regarding the type of impeller, size and shape, the tip speed, the pattern of flow in the basin, shaft length if any and diameter as well as construction. Motors shall be suitably rated for the variable speed duty.

All surfaces are to be polished to a smooth finish and those which cannot be machined are to be ground and hand filed to a template. Leading edges of the blades shall be ground or filed to give a rounded section and not a sharp pointed edge.

The pump shaft and coupling shall be of solid steel construction and capable of withstanding the full load imposed by the turbine.

After manufacture, the complete blade assembly and shaft shall be statically and dynamically balanced. A detailed description and arrangement drawing of the pumps shall be supplied with the tender

The pump volute shall be supplied in Grade 316SS and it shall be the Contractor's responsibility to install and fix this item and grouting in.

Pump Drive Unit

Preference will be given to belt-driven units suitably and adequately designed for the duties specified.

Gearboxes, where used, shall be of the double or triple reduction type and all gearing is to be helical. Worm gears will not be accepted. All gears and pinions are to be machined and ground.

All bearings shall be designed for a life of at least 100 000 hours at a L.10 rating, and proof of such rating shall be submitted by Tenderers. In addition, the bearings on the output shaft shall be capable of withstanding the resultant forces caused by a combination of radial and axial loads imposed by the propeller (acting simultaneously) due consideration being given to out of balance loads on the propeller. Selection shall be such that the following condition is complied with where the permissible loads are the manufacturers figures for 5 000 hours at L.10 rating.

$$\frac{\text{Actual radial load}}{\text{Permissible radial load}} + \frac{\text{Actual axial load}}{\text{Permissible axial load}} = \text{or } < 1$$

Tenderers shall indicate what these forces are and how they are accommodated.

Gearbox housings shall be of the best quality close-grained grey cast iron, and suitable breathers shall be supplied to prevent the ingress of moisture. Provision shall be made for easy draining of the gearbox by extending the drain to a point outside the baseplate at a minimum elevation of 200 mm above the concrete bridges. A drain valve and cap shall be fitted to the drain pipe. On gearboxes with vertical output shafts a dry well for the output shaft lower bearing is required to avoid complete drainage of oil in the box in the event of an oil seal failure.

An approved flexible coupling shall be fitted to the input shaft of the gearbox which shall be in a vertical configuration.

Axial flow pumps, operated via V-belts and pulleys shall be amply sized to transmit the power required and to ensure long life on both belts and bearings used in the arrangement. Safety guards shall be provided for the belts and shall be of a corrosion resistant material, and securely fastened to the support frame.

Baseplate

The propeller pump gearbox shall be securely mounted to a rigid 3CR12 of Grade 304SS baseplate provided with suitable openings for pouring in grout and all necessary holding-down bolts for securing to the pump chamber walls or top slab, which have been constructed by the civil contractor to dimensions supplied by the mechanical equipment contractor.

Corrosion Protection and Materials of Construction

Corrosion protection shall be carried out in accordance with the requirements of Clause 1.6.4 of the Standard Specification, to the following systems

Pump shaft and turbine complete	:	316 SS
Motor & gearbox	:	Cast iron and System No.1
Guards, baseplate & bolts	:	3CR12 + System No.1

Motors

All motors shall comply with the requirements of the specification and the enclosures shall be rated IP55.

Electrical Installation

All electrical controls, cabling and electrical installation form part of this contract.

Pump Performance

Tenderers shall provide sufficient information to permit evaluation of the mixed liquor pumps under the specified conditions.

Performance tests may be conducted once the plant is operating and the Tenderer's rates for commissioning must include for conducting these tests.

The test procedure shall be approved by the Engineer and shall contain the following minimum requirements:

- a) Determination of the rate of discharge of each pump
- b) Determination of the rate of discharge of both pumpsets pumping together
- c) Measurement of power absorbed

The pumps will be put into operation and run continuously until balanced flow conditions are achieved but, in any event, the test shall not be carried out until a period of 1 hour has expired.

The performance of the equipment shall be considered acceptable when the power absorbed does not deviate more than 5% from the value stated by the Contractor and the flow rate does not deviate by more than 10% of the specified requirements.

Sludge Drying Beds (SDB) Pumpsets and WAS Pumpsets

Scope

This part of the Contract covers the design, manufacture, supply, delivery, offloading, storage, installation, testing, pre-commissioning, commissioning, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over and rectification of defects during the Defects Liability Period of mechanical equipment as follows:

- Two Sludge Draining Beds (SDB) submersible pumpsets, to pump supernatant from sludge drying to the head of the works.
- Two Waste Activated Sludge (WAS) submersible pumpsets, to pump activated sludge to the sludge drying beds.

General Arrangement and Description

Two vortex type submersible pumps (one running and one standby) are required to pump supernatant from the drying beds to the head of the works. The layout of the works, showing the positions of the clarifiers and bioreactors, the detail of the sumps and the pipework layouts is given on the drawings.

The submersible pumps shall be of the manufacturer's standard and approved design, capable of doing the duty required at a speed not exceeding 1 500 rpm and shall be provided with suitable heavy duty thrust bearings. The pump and motor casing is to be GG-25 cast iron. Impellers shall be cast iron or bronze, wear plates shall be bronze and shafts shall be Grade 316 stainless steel. The diameter being sufficient to withstand and transmit without whip and with ample margin of safety, all torsional and bedding stresses to which it may be subjected. They shall be supplied with duck foot bends, detachable couplings and guide-rails. A lifting davit will also be required, under this contract, to be installed at the RAS pump station to enable simple removal of the pumps with+

n the bounds of the relevant Occupational Health and Safety Regulations.

Pipework which include isolating and non-return valves have been supplied and tenderers are to cater for delivery pipework from the pumps connecting to flanges to be installed though a separate contract (refer to the drawings for a detailed layout of the pipework required).

The seals on the rotating shaft shall be silicon-carbide or approved equivalent. Protection shall include a moisture detection sensor, seal condition monitoring probe and thermal sensors embedded in the motor windings. All fastenings shall be Grade 304 stainless steel. The power cable type shall be H07RN-F or approved equivalent.

It is estimated that the sludge that will be pumped has a solids concentration of up to 2%. The sludge will thus be relatively "thick" and therefore, the pump must have non-clogging characteristics and be capable of passing solids of 75 mm in diameter.

A suitable switch shall be supplied and installed to stop the pumps under no-flow conditions. Details of the switch offered must be included with the tender.

Duties

SLUDGE DRAINING BEDS (SDB) PUMPSETS

TWL in Pump Sump	≈ 105.5m
Normal level in sump	≈ 105.00m
Discharge level	= 113.10m

Flow required per pump is **5l/s** through 160 mm diameter pipework approximately 250m long. Frictional losses amounts to approximately 5,5m, therefore total head is approximately **15 m**.

WASTE ACTIVATED SLUDGE (WAS) PUMPSETS

TWL in Pump Sump	≈ 104.0m
Normal level in sump	≈ 104.0m
Discharge level	= 110.5m

Flow required per pump is **5l/s** through 160 mm diameter pipework approximately 50m long to discharge manhole. Frictional losses amounts to approximately 2,5m, therefore total head is approximately **10 m**.

Control of Pumps

The basic operation of the pumps will be controlled by "Auto", "Off", "Manual" selector switches on the pump station MCC. Automatic operation of the pumps will be controlled by stainless steel electrodes to be fitted in the pumpstation sump arranged to operate at the levels stated above. ***The electrical controls of the pumps must also be arranged such that both the pumps can be manually run simultaneously***

Manually operated selector switches are to be provided to allow each pump to be selected for “Duty”, or “Standby” so that pump operation can be rotated amongst both pumps.

Testing and Pump Performance (Site)

Pump tests shall be carried out on the pumpset at the manufacturers works or alternative testing facility approved by the Engineer in accordance with the requirements of BS 5316 for Class C tests. The information inserted in the data sheets and characteristic curve submitted with the tender or subsequently approved by the Engineer shall be used as acceptance criteria for pump performance.

The pumpset will be considered acceptable, if under test, the quantity measured at the design head and the kW absorbed at the motor terminals are within plus 7,5% to minus 2,5% of those guaranteed at the time of tender.

Further pump tests shall be carried out on each pump and combinations of pumps, on completion of installation and commissioning. Not less than ten readings shall be carried out at different heads on each pump to permit verification of the characteristic, power and efficiency curves. The pump capacity will be measured using physical displacement in the adjacent sump. The pump discharge pressure shall be simulated and controlled using the discharge valves or similar approved method. The total pump head will be measured using calibrated gauges installed in the pump suction and discharge lines. Power absorbed during the test will be measured by a recording calibrated kWh meter.

Vibration analysis shall be carried out on each pump and motor after installation with portable calibrated instrumentation to ensure adequate balancing and alignment. The installation shall be considered acceptable when the horizontal and vertical levels obtained do not exceed those prescribed in BS 4675 for Class II machines with a vertical limit of 2mm/sec. and a horizontal limit of 4mm/sec.

All test methods and procedures shall be approved by the Engineer.

The Contractor shall be responsible for providing all test equipment.

Electrical Requirements

The supply and installation of switchboards (including starters) and power cables will form part of this contract.

MANUALLY ADJUSTABLE OVERFLOW WEIRS

Scope

This section of the Contract covers the design, manufacture, supply, delivery, offloading, storage, installation, testing, pre-commissioning, commissioning, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over and rectification of defects during the Defects Liability Period of of mechanical equipment as follows:

- One (1), 4000mm long manually adjustable overflow weir to the bioreactor outlet for mixed liquor outlet to clarifier
- One (1), 4000mm long manually adjustable overflow weir to the bioreactor outlet for waste sludge outlet

The variable weirs will be controlled manually to maintain the optimum submergence level of the aerators.

General Arrangement and Description

The overflow weir frame side baseplate and linkages shall be manufactured from stainless steel grade 304 of minimum thickness 4,5mm. Hinge pins below liquid level or in the splash area shall be manufactured from stainless steel 316 and shall locate in machine stainless steel 316 housings fitted with self-lubricating bushes. Provision shall be made for maintaining the alignment of the weir assembly during installation.

Sealing between the weir and side baseplates shall be accommodated using ultra violet resistant neoprene rubber of thickness not less than 6mm which shall be affixed to the weir using backing strips of stainless steel grade 304 and stud fasteners.

The spindle/spindles shall be 304/316 stainless steel with square ACAAE thread in bronze spindle nuts.

Robust supports manufactured from stainless steel grade 304 shall be provided to affix the weirs to the end wall of the aerator basin using wedged or chemical anchors.

The performance of the weirs shall be considered acceptable when the equipment operates smoothly throughout the range within the vertical and horizontal tolerances specified.

SCREENS

Scope

This part of the Specification covers the design, manufacture, supply, delivery, offloading, storage, installation, testing, pre-commissioning, commissioning, ***operation and maintenance for a period of twenty (20) continuous weeks***, handing over and rectification of defects during the Defects Liability Period of mechanical equipment as follows

- a) One fine screen for raw primary sludge
- b) One fine screen for waste activated sludge

The screen chambers, channels and associated civil structures will be constructed under a separate contract as shown on Drawing J079(07)-D09. Bidders shall however provide full details of any modifications required to the civil works for the equipment offered.

GENERAL ARRANGEMENTS AND DESCRIPTION

Raw Sludge Screen

Raw primary sludge will be pumped from the two new primary sedimentation tanks to a screening chamber situated on the equalisation basin terrace. Screenings shall be automatically removed from the flow and deposited onto a horizontal chute which shall deposit material into a wheelbarrow positioned on a slab adjacent to the chamber.

DUTIES

The fine screens shall be capable of removing all rags, paper, polythene, fibrous material and other solids present in the sludge of size greater than 5 mm when the sludge dry solids concentration is as high as 5%. To achieve this requirement a screen with nominal aperture size 3 mm shall be provided.

The raw primary sludge screen shall be capable of handling a peak flow of 30 m³ /h. the waste activated sludge screen shall be capable of handling a peak flow of 50 m³/h.

FINE SCREENS

The screens shall be of the self-cleaning reciprocating element or continuous type suitable for installation in a channel or chamber. The screen frame, side panels, shafts sprockets, rollers, chains and other components submerged or in contact with the sludge shall be manufactured from stainless steel 304/316 or equivalent grade and reciprocating elements or filter rakes shall be similar material or ABS. The screen frame and baseplate for the drive shall be manufactured from mild steel.

Where necessary for the efficient operation of the screen and removal of screening a spray bar and rotating brush shall be provided.

The screen shall be driven through a geared speed reducer of the helical gearing type with housing of best quality close grained cast iron. All bearings shall be designated for a life 100 000 hours at a B.10 rating. The power transmission rating shall be calculated in accordance with method laid down by AGMA for continuous operation and shall not be less than 1,75 x absorbed power or 1,5 x installed power whichever is the greater. Provision shall be made for easy draining of the gearbox by extending the drain to a point outside the baseplate. A drain valve and cap shall be fitted to the drain pipe.

HOLDING DOWN.FIXING BOLTS

All fasteners shall comply with the requirements of Clause E114 of the Specification.
Fasteners above water for mild steel or cast iron components shall 'hot dip' galvanised.

CORROSION PROTECTION

Corrosion protection shall be carried out in accordance with Part E and to the following system:

Motors and speed reducers : System E

The fine screen frame shall be 'hot dip' galvanised in accordance with Clause E111.4 of the Specification.

A grease gun suitable for all the grease nipples on the equipment shall be provided together with at least 5 kg of the appropriate grease to be used. If more than one type of grease is required, a separate grease gun shall be provided for each type of grease, but should not be needlessly supplied where one will serve several items of equipment with matching nipples taking the same grease.

General Arrangement and Description

The overflow weir frame side baseplate and linkages shall be manufactured from stainless steel grade 304 of minimum thickness 4,5mm. Hinge pins below liquid level or in the splash area shall be manufactured from stainless steel 316 and shall locate in machine stainless steel 316 housings fitted with self-lubricating bushes. Provision shall be made for maintaining the alignment of the weir assembly during installation.

Sealing between the weir and side baseplates shall be accommodated using ultra violet resistant neoprene rubber of thickness not less than 6mm which shall be affixed to the weir using backing strips of stainless steel grade 304 and stud fasteners.

The spindle/spindles shall be 304/316 stainless steel with square ACAAE thread in bronze spindle nuts.

DETAILED ELECTRICAL SPECIFICATION

General

The Electrical Project Specification shall take preference should there be any discrepancies with the rest of the document.

Scope of Work

The Contract involves the design, manufacture, supply, delivery, offloading, storage, installation, testing, pre-commissioning, commissioning, **operation and maintenance for a period of twenty (20) continuous weeks**, handing over and rectification of defects during the Defects Liability Period of the electrical installation work for the extension of Emanzana WWTW

The work to be carried out includes the following:

- Liaison with the local supply authority
- The supply and installation of all the LV cables.
- The supply and installation of the distribution kiosks and MCC's.
- The supply and installation of all luminaires.
- The supply and installation of area lighting poles and luminaires.
- The commissioning and issuing of Certificates of Compliance.

This section of the Contract covers the following:

Supply, installation, testing, and commissioning of:

- MCC for the additions located in the existing switch room
- LV Electrical cabling.
- Cabling for the Magflow waste sludge measuring equipment.
- Cabling for mimic panel in existing switch room

Review of the Existing Electrical Installations

The existing electrical installation at the works will be shown to Tenderers at the compulsory site inspection. In order to assist with the on-site management of the project and to ensure that the Employer's power supplies to the various components of the installation are not interrupted unnecessarily, the Contractor under this Contract, will be required to carry out a detailed inspection of the existing electrical facilities within 2 weeks of the commencement of the contract and produce an LV

Single Line Diagram that purports to show the configuration of the existing and proposed electrical installations. An item has been provided in the Bill of Quantities for carrying out this work.

Motor Control Centre (MCC)

The contractor shall supply and install an MCC for the extensions in the existing control room.

Each one of the drives shall be installed in a separate cubicle in the MCC

The schedule of equipment to be installed in the MCC is as follows:

Type: Indoor floor standing with front access only

Colour: Electric orange

Fault level: 15kA

Equipment will be the following:

Q'ty	DESCRIPTION	IDENTIFICATION
1	500 Amp TP door interlocked MCCB set at 400 A	Main
1	500V Voltmeter plus 7 position switch plus fuses	
3	Current transformers 500/5A	Load
3	500A face plates Ammeters with over scale	
1	Power monitor relay	
1	Enermax energy meter	
4	500 Amp copper bus bars:	3 Phase + N
1	400 Amp copper bus bar:	Earth
4	Lightning arrestors: plus, fuses	protection
1	100 A 3 phase MCCB to local DB	Feeder to local DB
QUANTITY	DESCRIPTION	IDENTIFICATION
	Variable speed panels each comprising the following	
	Aerators	
4	4 No. Aerators	55 kW
1	1 No. Aerator	11kW
5	Door interlocked motor protection MCCB:	
1	Ammeter scaled 0 – 150. 100, 50 amps:	
1	150, 100, 50 /5 Amp current transformers:	
	Running hour meter: plus	
	Varispeed Solcon RVS-DX72 Soft starter complete with ventilation fans on the unit as well as on the compartment door. The bypass circuit shall be connected to only bypass the semi-	

1	conductor section of the soft starter and maintain the integral motor protection of the soft starter:	Heater + control
1	Set Stop/Start push buttons	Thermister
4	Auto-off manual selector switch:	
2	Indication lights as specified: plus	
1	5 Amp SP MCCB: plus	
All	Thermister relay: plus	
	<ul style="list-style-type: none"> Relays, auxiliary contacts, indicating lights and reset buttons 	
QUANTITY	DESCRIPTION	IDENTIFICATION
	DOL panels each comprising the following. Each drive shall have O/L protection	
8	such as O/L, etc for the following motors:	5 kW each
2	Mixers	7.5 kW
2	RAS pumpsets	4 kW
2	A recycle pumpsets	1 kW each
2	Clarifier	

All the drives will have the following equipment installed:

- Local/Off/On switch
- Run/stop/trip indicating lamps

The contractor shall provide a single line diagram according to the process requirements

Main LV Feeder Cables

The Contractor supply, install and connect all low voltage cables as specified in this document. All cables shall have the SABS mark.

The required lengths of cable shall be measured on site before the cables are ordered.

Sleeves have been installed within concrete structures for cables and the contractor will be responsible for drawing the cables through the sleeves.

Area lighting

The contractor shall supply and install the area lighting poles as well as the luminaires. The area lighting cable shall run in parallel with the power cables wherever possible

As Built Drawings

The contractor is to prepare the As-Built paper prints in strict accordance with this specification. These drawings are to be kept in the site office. Retention monies normally due before commencement of the maintenance period will not be released until As-Built drawings have been prepared to the satisfaction of the Engineer.

ENVIRONMENTAL SPECIFICATION

EMPLOYER'S ENVIRONMENTAL MANAGEMENT SPECIFICATION FOR ENVIRONMENTAL MANAGEMENT OF CONSTRUCTION PROJECTS

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**PZ EMPLOYER'S ENVIRONMENTAL MANAGEMENT SPECIFICATION FOR
ENVIRONMENTAL MANAGEMENT OF CONSTRUCTION PROJECTS**

PZ1 INTRODUCTION**PZ1.1 SCOPE**

This specification is additional to the South African Bureau of Standards Standardised Specification for Civil Engineering Contracts and must be read in conjunction with the said specification.

This specification covers the principles, responsibilities and requirements generally applicable to implement effective environmental management during the execution of any construction contract. The aim of this specification is to ensure that construction activities are conducted in an environmentally and socially responsible manner.

PZ1.2 INTERPRETATIONS

This specification contains clauses that are generally applicable to the implementation of effective environmental management on construction contracts. Interpretations of, and variations to, this specification are set out in the project specification.

PZ1.2.1 Supporting specifications:

Reference is made to the SABS 1200 standards which are to be read in conjunction with this specification. All aspects of these SABS requirements which are relevant to environmental management during construction contracts will apply.

PZ1.2.2 Principles

The following principles should be considered at all times during construction phase activities:

- The Environment is considered to be composed of both biophysical and social components.
- Construction is a disruptive activity and all due consideration must be given to the environment, particularly the social environment, during the execution of a project to minimise the impact on affected parties.
- Minimisation of areas disturbed by construction activities will minimise many of the construction related environmental impacts of the project and reduce rehabilitation requirements and costs.
- As minimum requirements, all relevant standards relating to international, national, provincial and local legislation, as applicable, shall be adhered to. This includes requirements relating to waste emissions (e.g. hazardous, airborne, liquid and solid), waste disposal practices, noise regulations, road traffic ordinance etc.
- All effort should be made to minimise, reclaim or recycle 'waste' material.

PZ1.3 DEFINITIONS

For the purpose of this specification, the definitions given in SABS 1200 shall apply.

Additional definitions which shall apply to this specification are as follows:

Environmental Control Officer: Either an Employer's staff member or an Environmental Consultant assigned to the project on a part or full-time basis. The Environmental Control Officer will be part of the Project staff and will advise the Engineer on all environmental

matters relating to the works, in terms of this specification and the project specification, if applicable.

Environmental Officer: Either an Employer's employee (e.g. Quality Assurance Inspector) or Consultant designated to monitor the implementation and compliance with the environmental specifications and environmental management plan on a daily basis.

Cleared surface: "surface vegetation" as referred to in SABS 1200 C 2.3 will be deemed to be any woody or herbaceous vegetation but exclude grasses, sedges, rushes and reeds. Clearing and grubbing shall for the purpose of this specification mean the removal of all woody and herbaceous vegetation including stumps, but excluding grass and groundcover vegetation.

Engineer: Is to read Engineer or Supervisor (in the case of the NEC contract), whichever is applicable to the Contract.

Interested and Affected Parties (IAP): All persons who may be affected by the project either directly or indirectly, or who have an interest or stake in the area to be affected by the project. IAPs include landowners, tribal or local authorities, public interest groups etc.

Liquid Waste Stream: Any reagent solutions, fuels, oils, greases, contaminated run-off, sewerage and wash water, etc.

Open Trench: Open trench will, for the purpose of this specification, be deemed to include: clearing and grubbing; stripping of topsoil; trenching; placing of bedding; pipe-laying; placing of selected fill; backfilling to ground level; removing excess material; construction of cross berms to channel water (if required); and replacement of topsoil to final finished level (refer to Figure 1: Appendix A).

Progressive Reinstatement: Reinstatement of disturbed areas to topsoil profile on an ongoing basis, immediately after selected construction activities (e.g. backfilling of a trench) are completed. This allows for passive rehabilitation (i.e. natural recolonisation by vegetation) to commence. See also 'Open Trench' and 'Rehabilitation'.

Project Manager: The person responsible for co-ordinating and integrating activities across multiple, functional lines.

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement revegetation of a disturbed area and the ensurance of a stable land surface. Revegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Riparian vegetation: Vegetation occurring on the banks of a river or stream (i.e. vegetation fringing a water body). In this specification, riparian vegetation in terms of removal, storage and replacement (see PZ3 17.1 and PZ3 17.2), is only applied to sedge, grass, ground-cover, reed, bulrush, or herbaceous component of riparian vegetation and excludes the woody component.

Sedges: Grass-like plants growing in wetland/ marshy areas or adjacent to water.

Subsoil: Subsoil is the soil horizons between the topsoil horizon and the underlying parent rock. Subsoil often has more clay-like material than the topsoil. Subsoil is of less value to plants, in terms of nutrient (food) and oxygen supply, than topsoil. When subsoil is exposed it tends to erode fairly easily.

Timeous: At least 5 working days prior to an activity.

Topsoil: This is defined as the A horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic (humic) fraction. Topsoil is deemed for the purposes of this specification as the layer of soil from the surface to the specified depth required for excavation (see PZ3 5.3, relevant SABS 1200 clause and project specification). Where topsoil is referred to, it is deemed to be both the soil and grass / ground cover fraction. (see 'Cleared Surface')

Veld: This is defined for the purpose of this specification as unimproved natural vegetation areas (e.g. grasslands).

Water body: Any open body of water including streams, dams, rivers, lakes, and the sea.


Wetland: A seasonally, temporally, or permanently wet area which also may exhibit a specific vegetation community. It is often marshy in character.

Wetland Vegetation: Vegetation which is indicative of a wetland environment - for example, sedges, rushes, reeds, hydrophilic grasses and ground-covers, but for the purposes of this specification excludes woody species.

Xeriscaping: Landscaping with vegetation which has a low water usage. The objective is to conserve as much water as possible, whilst still beautifying an area (i.e. conservation and aesthetics). Concept embraces utilising indigenous as opposed to exotic plants.

PZ1.4 ABBREVIATIONS

DWAF : Department of Water Affairs and Forestry
 ECO : Environmental Control Officer
 EMP : Environmental Management Plan
 EMPR : Environmental Management Programme Report
 EO : Environmental Officer
 IAPs : Interested and Affected Parties
 IEM : Integrated Environmental Management
 MSDS : Material Safety Data Sheet
 NEC : New Engineer Contract or The Engineering and Construction Contract

 : Indicates the project specification must be referred to, to clarify the clause.

PZ1.5 DRAWINGS

Drawings referred to in this specification are included in Section C5 Drawings.

PZ1.6 FORMS

Forms referred to in this specification are included in Part T2 or attached to this environmental specification.

PZ1.7 CONDITIONS OF CONTRACT

PZ1.7.1 Duties and Powers of the Project Manager

The Project Manager is ultimately responsible for ensuring compliance with the environmental specification and upholding the Employer's Environmental Policy on a project.

The Project Manager:

- arranges information meetings for or consults with IAPs about the impending construction activities;
- may on the recommendation of the Engineer and /or Environmental Officer order the Contractor to suspend any or all works on site if the Contractor or his SubContractor/ supplier fails to comply with the said specifications;
- maintains a register of complaints and queries by members of the public at the site office as per attached pro-forma. This register is forwarded to the Environmental Control Officer on a monthly basis.

PZ1.7.2 Duties and Powers of the Engineer / Supervisor (NEC)

The Engineer or Supervisor is responsible for:

- enforcing the environmental specification on site;
- monitoring compliance with the requirements of the specification;
- assessing the Contractor's environmental performance in consultation with the Environmental Officer from which a brief monthly statement of environmental performance is drawn up for record purposes;
- documenting, in conjunction with the Contractor, the state of the site prior to construction activities commencing. This documentation will be in the form of photographs or video record.

PZ1.7.3 Duties and Powers of the Environmental Control Officer

The Environmental Control Officer:

- briefs the Contractor about the requirements of the Environmental Specification and/ or Environmental Management Plan, as applicable;
- advises the Project Manager and Engineer/ Supervisor about the interpretation, implementation and enforcement of the Environmental Specification and other related environmental matters;
- attends site meetings, as necessary;
- monitors the Constructor's compliance with this specification and the project environmental specification as applicable;
- undertakes periodic audits of the effectiveness of the environmental specifications on the site;
- communicates environmental policy issues to the Project Manager;
- provides technical advice relating to environmental issues to the Engineer/ Supervisor and Project Manager;

-
- reports on the performance of the project, in terms of environmental compliance.

PZ1.7.4 Duties and Powers of the Environmental Officer

The Environmental Officer:

- attends site meetings;
- monitors the site for compliance with the Environmental Specification and EMP;
- reports on the performance of the project in terms of environmental compliance to the ECO and Project Manager as per the pro-forma attached;
- liaises with the ECO on matters of policy and those requiring clarity and advice.

PZ1.7.5 Extent of the Contractor's Obligations

The Contractor is required to:

- provide information on previous environmental management experience and company environmental policy;
- supply method statements for all activities requiring special attention as specified and/or requested by the Project Manager, Environmental (Control) Officer and/or Engineer during the duration of the Contract;
- be conversant with the requirements of this environmental specification and the project specification as applicable;
- brief his staff about the requirements of the environmental specification;
- comply with requirements of the Environmental (Control) Officer in terms of this specification and the project specification, as applicable, within the time period specified;
- ensure any sub-Contractors/ suppliers who are utilised within the context of the contract comply with the environmental requirements of the Employer, in terms of the specifications. The Contractor will be held responsible for non-compliance on their behalf;
- bear the cost of any delays, with no extension of time granted, should he or his Sub-Contractors/ Suppliers contravene the said specifications such that the Engineer orders a suspension of work. The suspension will be enforced until such time as the offending party(ies), procedure, or equipment is corrected;
- bear the costs of any damages/ compensation resulting from non-adherence to the said specifications or written site instructions;
- comply with all applicable legislation in terms of 7.6 below;
- ensure that he informs the engineer timeously of any foreseeable activities which will require input from the Environmental (Control) Officer.

The Contractor will conduct all activities in a manner that minimises disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment.

PZ1.7.6 Compliance with Applicable Laws

The supreme law of the land is "The Constitution of the Republic of South Africa", which states:

“Every person shall have the right to an environment which is not detrimental to his or her health or well being”

Laws applicable to protection of the environment in terms of Environmental Management (and relating to construction activities) include but are not restricted to:

Animals Protection Act, Act No 71 of 1962
 Atmospheric Pollution Prevention Act, No 45 of 1965
 Conservation of Agricultural Resources Act, No 43 of 1983
 Environmental Conservation Act, No 73 of 1989
 Environmental Planning Act, Act No 88 of 1967
 Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, No 36 of 1947
 Forest Act, No 122 of 1984
 Forest and Veld Conservation Act, Act No 13 of 1941
 Hazardous Substances Act, No 15 of 1973
 Lake Areas Development Act No 34 of 1975
 Land Survey Act, No 9 of 1921
 Minerals Act, No 50 of 1991
 Mountain Catchment Act, No 63 of 1970
 National Monuments Act, No 28 of 1969
 National Parks Act, No 57 of 1976
 National Resources Development Act, Act no 51 of 1947
 Occupational Health and Safety Act, No 85 of 1993
 Provincial and Local Government Ordinances and Bylaws
 Soil Conservation Act, Act No 76 of 1969
 Water Act, No 54 of 1956
 Water Services Act No 108 of 1997
 and all regulations framed thereunder and amendments there to.

PZ1.7.7 Compliance with the Environmental Specification

The Contractor is deemed not to have complied with the Environmental Specification if:

- within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses;
- if environmental damage ensues due to negligence;
- the Contractor fails to comply with corrective or other instructions issued by the Project Manager or Engineer within a specified time,
- the Contractor fails to respond adequately to complaints from the public.

Application of a penalty clause will apply for incidents of non-compliance. The penalty imposed will be per incident. Unless stated otherwise in the project specification, the penalties imposed per incident or violation will be:

Failure to demarcate working servitudes	R1000
Working outside of the demarcated servitude	R2000
Failure to strip topsoil with intact vegetation	R1000
Failure to stockpile topsoil correctly	R500
Failure to stockpile materials in designated areas	R500
Pollution of water bodies (including increased suspended solid loads)	R1000
Failure to control stormwater runoff	R1000

Failure to provide adequate sanitation	R500
Unauthorised removal of woody vegetation	R2000
Failure to erect temporary fences	R500
Failure to provide adequate waste disposal facilities and services	R500
Failure to reinstate disturbed areas within the specified time-frame	R3000
Failure to rehabilitate disturbed areas within the specified time-frame	R3000
Any other contravention of the project specific specification	R400
Any other contravention of the particular (general) environmental specification	R300

PZ2 SITE ESTABLISHMENT AND HOUSEKEEPING

PZ2.1 LAYOUT

The Contractor will take into account any of the limitations identified in the project specification with regard to establishment of site, in particular the location of access routes, and establishment layout.

Notwithstanding the provision of a project specification, the Contractor will provide the Project Manager and Environmental Control Officer with a layout design of the site indicating the position of all of the following, as applicable: offices, ablution facilities, storage areas, workshops, laboratories, batching plant, particulate matter stockpile area (i.e. soil/ granular chemicals/ cement fines etc), waste disposal facilities, hazardous substances storage area, access routes, etc. This layout plan is to be submitted prior to site establishment for acceptance. Any changes to this plan require review by the Project Manager in conjunction with the ECO.

The Contractor will take into account prevailing wind directions when designing the site layout to minimise impacts due to dust, unpleasant odours etc.

The Contractor will take into account the positions of residences when designing the site layout in order to minimise noise impacts on the residents.

Site security lighting is to be positioned such that the direct beam is focused away from residential properties and does not pose a nuisance or danger to road users.

No site establishment will be allowed within 100 m of a water body or drainage channel or on a flood plain unless approved by the Environmental (Control) Officer or specified in the project specification.

PZ2.2 SITE CLEARANCE

No trees or shrubs may be removed without the prior permission of the Environmental Officer, unless in keeping with the final site reinstatement and rehabilitation plan. Topsoil is to be stripped from all areas where permanent or temporary structures and access roads are to be constructed. Topsoil conservation is to be in terms of clause PZ3 5.3 of this document.

PZ2.3 SERVICES

PZ2.3.1 Sanitation

Portable chemical toilets are to be utilised at site unless a connection to sewer is possible or a proper septic tank system is installed. In the case of the septic tank, the installation will require the relevant approvals from the local authority and will require removal upon completion of the contract, unless otherwise directed.

Sanitation facilities will be located within 100 m from any point of work, but not closer than 50 m to a water body.

PZ2.3.2 Solid Waste Facilities

Facilities for solid waste collection are to be provided. These are to be at least a 200 l drum and clearly identified as the point for waste disposal.

Waste is to be separated into paper, glass and metal with separate collection points for each. The Contractor will ensure that the appropriate recycling Contractors receive this waste.

The Contractor is to institute a daily litter collection programme. The collected waste is to be disposed of regularly and proportionately to its generation at a site designated for waste disposal.

No burning will be permitted on any site unless by approved incineration methods and in a low risk fire area. In the case of incineration, ash is to be co-disposed with spoil in a designated spoil dump.

No burying of waste will be allowed on any site.

PZ2.3.3 Cooking and Heating Facilities

No open fires will be allowed anywhere on site.

Contained fires (i.e. in a fire drum) will be allowed for heating and cooking only in designated areas, in other cases cooking is restricted to gas or electrical equipment.

PZ2.4 FUELS, HAZARDOUS SUBSTANCES AND OTHER LIQUID POLLUTANTS

PZ2.4.1 Storage and handling

All potentially hazardous raw and waste materials are to be handled by trained staff and stored on site in accordance with manufacturer's instructions and relevant legal requirements. The product MSDS is to be lodged with the Engineer.

Storage and handling areas for fuels, lubricants, chemicals and other hazardous substances are to be paved with concrete to prevent accidental contamination of the soil. Alternatively, an impermeable liner may be placed beneath above-ground storage tanks. The integrity of the liner is to remain intact for the duration of the contract, until removal.

Open storage vessels, for example shutter lubricant drums, are to be stored under cover to prevent 'splash' contamination.

All storage areas are to be bunded (with at least sandbags) and have a peripheral collection drain, with oil interceptors (if required).

The bunded area is to be sufficiently large to contain a spillage equivalent to the volume of one container of the substances stored.

All products to be dispensed from 200 litre drums will be done so with appropriate equipment, and not dispensed by tipping of the drum.

Daily checks are to be conducted on the dispensing mechanism of above-ground storage tanks to ensure the timeous identification of faults.

Collection containers (e.g. drip trays) are to be placed under all dispensing mechanisms of hydrocarbon or hazardous liquid substances to ensure contamination from leaks and dispensing is contained.

The dispensing mechanism of diesel and petrol storage tanks is to be stored in a container when not in use.

PZ2.4.2 Control of pollutants

A drainage diversion system is to be installed to divert runoff from areas of potential pollution, e.g. batching area, vehicle maintenance area, workshops, chemical and fuel stores, etc if applicable.

Contaminated runoff and waste water is to be directed into a collection system (e.g. sump, attenuation dam, PVC porta-ponds etc.) for treatment or collection and disposal. The final collection point (e.g. sump) is to be PVC lined.

Collected contaminated runoff/ wastewater is to be pumped out of the final collection point and disposed of at an appropriate landfill site. Sump liners are to be treated in the same manner.

The treated waste water, effluent and contaminated runoff may require analysis prior to discharge as detailed in the project specification or instructed by the Environmental Officer. Details regarding proposed methods for treatment of pollutants are to be submitted to the Environmental (Control) Officer for acceptance upon award of the Contract.

Any spillages, irrespective of their size, are to be contained and cleaned up immediately. The Pollution Control section may provide technical assistance for clean-up, if required. No spills may be hosed down into a stormwater drain or sewer.

Use of specialised clean-up techniques and/ or products may be required depending on the spill. This will be instructed by the Environmental Control Officer. These will be to the Contractor's cost.

PZ2.5 GENERAL

Site staff are not permitted to use any open water body or other natural water source (e.g. springs) for purposes of bathing, or the washing of clothes, machinery or vehicles. Nor draw water from a spring without the permission of the community utilising that spring.

PZ2.6 MEASUREMENT AND PAYMENT

Measurement and payment for compliance with clauses PZ2.1 to 5 of the specification are deemed to be fully included in the Contractor's rates for fixed and time related Preliminary and General Items scheduled under SABS 1200 A or AA.

PZ3 CONSTRUCTION

PZ3.1 CONSTRUCTION METHODS AND PROGRAMME

PZ3.1.1 Construction Method

The Contractor will provide method statements for construction activities (14 working days prior to the activity commencing) relating to the following environments and those listed in the project environmental specification, unless methods have been prescribed in this or the project environmental specification:

- rivers, streams, or any other open water body;
- wetlands;
- access roads (see PZ3.13 below);
- steep slopes (i.e. steeper than 1:4) or less if friable material is present;
- indigenous bush/ forest;
- close proximity (i.e. 50 m or less) to a residential dwelling;
- drilling and/or blasting of rock.

If a construction method employed by the Contractor is not environmentally acceptable to the Employer, the Contractor may be instructed to cease the utilisation of that method in favour of a more environmentally acceptable one, proposed either by himself or the Employer.

PZ3.1.2 Construction Programme

The Contractor will programme construction so as to minimise the impact on the environment and provide this programme to the Environmental Control Officer for perusal and acceptance at the onset of the contract period. The Environmental Control Officer is to be made aware of any amendments to the construction programme or alterations to the scope of work in order that their impacts on the environment can be assessed.

The Contractor (through the Project Manager) will ensure that all affected landowners/ authorities are advised of the proposed programme at the beginning of the contract period.

PZ3.2 AREAS OCCUPIED / DEMARCATION OF SITE

Routes for temporary access and haul roads are to be located within the approved demarcated areas and vehicle movement is to be confined to these roads. Movement of vehicles outside the designated working areas is not permitted without authorisation from the Engineer.

All construction activities are restricted to working areas designated on the drawings and/or demarcated and approved by the Engineer. Materials including spoil are stockpiled at designated areas.

Any areas disturbed outside of the demarcated areas or without permission of the Environmental (Control) Officer or Engineer will be subject to reinstatement and rehabilitation (as per PZ4 below) to the Contractor's cost.

In terms of pipeline projects, a general maximum working servitude width of 15 m will apply for machine excavation unless otherwise indicated in the project specification. A maximum width of 6 m will apply for manual excavation. These maximum working servitude widths may vary depending on the sensitivity of the environment, as detailed in the project specification.

In sensitive biophysical environments, for example wetlands, indigenous forest / bush, pristine natural grasslands, and sensitive social environments, as defined in the project specification or by the Environmental Control Officer, the working servitude is reduced as indicated in the project specification.

The working servitude shall contain all construction related activities, including, stockpiling of materials, placing of toilets, vehicle movement areas, etc.

Demarcation of linear projects (executed with machine excavation) and features (e.g. pipelines, access roads, etc.) will be by means of wooden stakes. These stakes will be at least 1 m high, painted white and placed at least every 15 m, on either side of the linear feature, in all areas where works are occurring. Progressive movement of stakes is required as linear projects progress.

In the case of a fenced site, the boundary fences will be denoted as the outermost limit of the site, but internal areas may be demarcated with stakes as above. The site boundaries of non-fenced, but 'contained' projects are to be delineated using stakes or temporary fencing, depending on the hazard which that site poses.

PZ3.3 SUPPLY OF WORKS FACILITIES

No water may be abstracted from water bodies for the purposes of construction, without approval of the Engineer in consultation with the Environmental Control Officer.

PZ3.4 CLEANLINESS

SABS 1200 AD, clause 5.2.4, second sentence, is to read: "No rubbish or debris shall be deposited below the full supply level (FSL)."

PZ3.5 SITE CLEARANCE

PZ3.5.1 Clearance

Spoil sites will require clearing and grubbing in addition to those areas in terms of SABS 1200 C 5.1.

The site shall only be cleared immediately prior to construction activities commencing i.e. at the last practicable stage.

No trees or indigenous shrubs may be removed without the prior permission of the Environmental (Control) Officer, unless in keeping with the final site reinstatement and rehabilitation plan.

PZ3.5.2 Disposal of materials

Material obtained from clearing and grubbing operations shall be disposed of at appropriate municipal disposal facilities. They are not to be disposed of as per Paragraph 1 of Sub-clause 3.1 of SABS 1200 C.

Wood obtained from clearing and grubbing operation remains the property of the landowner/ community and must be stacked at sites designated by relevant person. The Contractor will be required to remove and dispose of any wood from site at a designated site for vegetation disposal, should the landowner/ community not require it.

All tree trunks and branches of diameter greater than 50mm are to be cut into lengths not exceeding 2400mm.

Brush wood (i.e. < 50mm diameter) is to be disposed of, or utilised as specified in the project specification or upon instruction of the Engineer.

PZ3.5.3 Conservation of topsoil

The Contractor is required to strip topsoil (as defined in this specification) together with grass, groundcover and sedges from all areas where permanent or temporary structures are located, construction related activities occur, and access roads are to be constructed, etc. The depth to which topsoil will be stripped shall be 200mm unless stated otherwise in the project specification.

Topsoil is to be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify.

Topsoil is to be replaced along the contour.

Topsoil is to be replaced by direct return (i.e. replaced immediately on the area where construction is complete), rather than stockpiling it for extended periods. This is feasible for progressive construction (e.g. pipelines), but not necessarily so for reservoirs, site establishments, dams, etc.

Topsoil stockpiles are not to exceed 2 m in height.

Topsoil stockpiles are to be maintained in a weed free condition (i.e. no 'broad-leafed' plants regarded as weeds in terms of the Conservation of Agricultural Resources Act No 43 of 1989, or those plants regarded as a 'general nuisance in the area' are to be growing on the stockpiles). The Environmental Control Officer will provide guidance as to which plants are weeds and require removal.

The stockpiles are not to be contaminated with sub-soil, or any other waste material.

Topsoil may not be compacted in any way, nor may any object be placed or stockpiled on it.

Topsoil may not be compacted in any way, nor may any object be placed or stockpiled on it.

Topsoil which is to be stockpiled for periods exceeding 4 months is to be vegetated. In summer a mixture of *Eragrostis tef* (Teff) and *Eragrostis curvula* (Weeping Lovegrass) (ratio 1:2) is to be applied at an application rate of 6 kg/ha, unless otherwise instructed in the project specification.

In winter, a mixture of *Lolium multiflorum* (Annual/Italian Rye grass) and *Eragrostis curvula* (Weeping Lovegrass) (ratio 1:1) is to be applied at an application rate of 6kg/ha (see PZ4 5.3 for sowing times), unless otherwise instructed in the project specification. Fertiliser is to be applied as per PZ4 5.2.

PZ3.5.4 Cutting of trees

Any tree branches which require removal are to be properly pruned and sealant applied to the cut surface, if required.

The Contractor's attention is drawn to Sub-clause 5.2.3.3 of SABS 1200 C with respect to work in indigenous forests.

Any indigenous trees or bush which require removal in terms of the project, and which have not been identified in the project specification or EMP, are to be timeously indicated to the Environmental Officer prior to work affecting them.

PZ3.5.5 Landscape Preservation and Conservation of Flora

Notwithstanding Clause 5.7 of SABS 1200 C, the Contractor will be required to transplant designated plants to alternative locations as specified in the project specification or identified by the Environmental Control Officer, upon the instruction of the Engineer.

Transplanting shall be undertaken by employing the following method:

Removal

- Mark the orientation of the tree/shrub (for example, the north-facing side of the trunk indicated by a small arrow made with indelible ink) trunk. Do not scratch a mark on the surface of the trunk;
- Delineate a circle from the trunk with a radius equivalent to the drip-line of the tree, or as indicated by the Environmental Control Officer on site;
- Excavate the tree with an intact rootball.

Replanting

- A hole 500mm larger in diameter than the anticipated rootball must be prepared in advance of the tree removal in order that the tree can be replanted immediately;
- The tree must be positioned as per its original orientation;
- A planting method known as 'puddling' must be employed. This method involves the addition of soil and water simultaneously to expels air from the planting hole. Place the tree in its new hole, making sure the top surface of the rootball is level with the ground level. Place a hose pipe in the hole and leave it running whilst extra soil is added around the rootball;
- 'Compact' the tree in the hole and attach tree stays for stabilisation.

Compensatory planting of species may be required should transplantation not be feasible, as indicated in the project specification or upon instruction of the Engineer.

PZ3.6 EARTHWORKS

PSZ3.6.1 Backfill material

With reference to SABS 1200 DB sub-clause 3.5, no material stripped or excavated which is classed, in terms of this specification, as topsoil, may be used as backfill in any excavation.

PZ3.6.2 Excavation and backfilling

During excavation 'conservation of topsoil', as specified in PZ3 5.3 above will apply.

Excavated material is to be stockpiled along a pipeline trench within the working servitude, unless otherwise authorised.

Surplus excavated soft, intermediate and hard rock material shall not be disposed of along the pipeline trench as indicated in SABS 1200 DB sub-clause 5.6.3 and 5.6.4, but shall be removed to a spoil site (see PZ3.15 below) designated during the project if applicable, or agreed by the Engineer in conjunction with the Environmental Control Officer and Project Manager.

In certain cases, for example to help stabilise the disturbed area or to reinstate the natural aesthetics of an area, excess excavated intermediate and hard material may be disposed of in a designated manner along a pipeline trench, as indicated by the Environmental Control Officer and Project Manager, or in the project specification. In this case, rock material shall not exceed 250mm in maximum dimension (see PZ4 2.1).

In terms of SABS 1200 DB 5.6.5 and SABS 1200 LB 3.4.2, deficiency of backfill material shall not be made up by excavation within the free haul distance of 0.5km of site, without the prior approval of the Engineer of the source of the material. Where backfill material is deficient, it should ideally be made up by importation from an approved borrow pit (i.e. one which operates within the ambient of an EMPR.) (See also PZ3 14 below).

The Contractor will backfill in accordance with the requirements of progressive reinstatement.

The maximum length of open trench shall be specified in the project specification.

PZ3.7

SAFETY

All works which may pose a hazard to humans and animals are to be adequately protected and appropriate warning signs erected. The Contractor's attention is drawn to SABS 1200 D section 5.1 in this regard.

With reference to SABS 1200 D 5.1.1.3, where blasting is required in terms of the project, the Contractor will ensure that all structures in the vicinity that could be affected by the activity will be inspected and their condition photographically recorded (as necessary), prior to blasting.

Notice of intent to blast is to be provided to landowners timeously.

Speed limits, appropriate to the vehicle driven, are to be observed at all times on access roads. Operators and drivers are to ensure that they limit their potential to endanger humans and animals at all times, by observing strict safety precautions.

PZ3.8

PLANT

PZ3.8.1

Silencing of plant

With reference to SABS 1200 A amend: "built up areas": to read as "all areas within audible distance of residents (albeit urban, peri-urban or rural areas)."

Appropriate directional and intensity settings are to be maintained on all hooters and sirens.

Silencer units on equipment and vehicles are to be maintained in good working order.

Construction activities are to be confined to normal working hours (07h30 - 17h00) Mondays to Saturdays, except for the activities designated to be carried out at night.

PZ3.8.2 Appropriate use of plant

The Contractor will at all times use plant which is appropriate to the task in order to minimise the extent of damage to the environment.

PZ3.9 DEALING WITH WATER ON WORKS

PZ3.9.1 Disinfection of Potable Water Infrastructure

Disinfection water is to be neutralised before release of this water to the environment.

PZ3.9.2 Discharge of water from site

Any water which is discharged from site is to comply with the relevant Water Quality Guidelines implemented by DWAF.

Water discharged to the stormwater / sewer system may only be done so with the permission of the relevant local authority.

PZ3.10 CONTROL OF EROSION

Surface erosion protection measures will be required to prevent erosion where slopes are steeper than 1:8 on all soil types.

Erosion protection measures required may include all or some of the below, as specified in the project specification or upon instruction of the Engineer in conjunction with the Environmental (Control) Officer:

- use of groundcover or grass
- construction of cut off berms (earth and/or rock pack) - these are to be angled across the contour and normally would approximate an angle of 30o from the bisector of the contour.
- placing of brush wood on bare surface;
- pegging of wattle trunks or branches along the contour;
- hard landscaping, e.g. use of Loffelstein walls, ground anchors, gabions etc.

Scour chambers are to be fitted with energy dissipaters, or the jet of water directed onto a protected (i.e. grouted stone pitching/ rock pack/ Reno mattress) area to dissipate water velocity and to control and prevent erosion.

Storm water drainage measures might be required on site to control runoff and prevent erosion.

PZ3.11 CONTROL OF POLLUTION

No waste in a solid, liquid or gaseous state shall be emitted from or spilled on the site without the approval of the Engineer.

No mixed concrete shall be deposited directly onto the ground prior to placing. A board or other suitable platform is to be provided onto which the mixed concrete can be deposited whilst it awaits placing.

Excess concrete from mixing shall be deposited in a designated area awaiting removal to an approved landfill site.

The Contractor will contain wash water from cement mixing operations, by directing the water into a sump for collection. The material contained in the sump will be removed to an appropriate landfill site.

No concrete rubble shall be present at the site.

Liquid wastes will not be disposed of to storm water drains. They may be disposed of to sewer only if permitted by (local council) legislation.

In the event of pollution of a water body (including sediment loading), the Contractor will provide alternative water supply to users of that water body until the quality of the water body is restored to its previous unpolluted state. For the sake of this clause, pollution is deemed to be a state which is substandard to the normal quality of the water body, but is not necessarily in contravention of the South African Water Quality guideline standards for a prescribed activity.

Any ancillary damages resulting from pollution of a water body will be repaired / remediated at the Contractor's cost.

Where, due to construction requirements, pollution of a water body may potentially occur, the Contractor is to ensure adequate measures (e.g. attenuation/ settlement dams / oil absorbent products) are in place to prevent pollution. A method statement is to be provided to this effect (see PZ3 1).

PZ3.12 CONTROL OF FIRE

The Contractor will ensure he has the necessary firefighting equipment on site in terms of SABS 1200. This will include at least rubber beaters when working in 'veld' areas, and at least one fire extinguisher of the appropriate type when welding activities are undertaken, irrespective of the site.

PZ3.13 USE AND MAINTENANCE OF ACCESS FACILITIES

PZ3.13.1 Responsibility

The Project Manager [not the Contractor (SABS 1200 AD 5.3.1)] will be responsible for obtaining permission for temporary and permanent rights of way over all private property affected by project activities.

The Project Manager will ensure that the Contractor has kept a photographic record of all access facilities and that these are reinstated to a state not worse than upon commencement of the project and to the satisfaction of the landowner (notwithstanding that the project's objective is not to upgrade landowners' access roads).

PZ3.13.2 Fencing

Temporary fencing is to consist of 1.2 m bonnox fencing, or similar, suitably tensioned and supported on 1.8 m fencing standards at 3 m intervals, with all necessary straining posts and stays.

All temporary fencing as indicated by the Engineer is removed on completion of the contract.

PZ3.13.3 New Access Roads

Any construction roads created for execution of the project are to be designed to incorporate adequate drainage and water attenuation structures.

Any access roads which incorporate 'cut and fill' aspects and/or which are to be surfaced during construction are to be authorised by the Environmental Control Officer and Project Manager. Prior to construction of the road, the Contractor will be required to provide a sketch plan of the road layout (referenced to local topographic, natural and man-made structures). Slope steepness, road width, drainage structures and their frequency will need to be documented and accompany the sketch layout.

Construction access roads may not be wider than that necessary (maximum width 4 m) for movement of vehicles in one direction only. Should two-way traffic be required, points people are to control vehicle movement on the 'single lane' road or passing bays are to be used where specified in the project specification or as identified by the Engineer in conjunction with the Environmental Control Officer, unless otherwise stated in the project specification.

The cut and fill slopes of permanent roads will require grassing, as specified in the project specification or by the Environmental Control Officer, to increase stability and reduce aesthetic impacts. Hard landscaping may be required as per the project specification.

Temporary construction roads will require rehabilitation on completion of construction activities for which they were required. These roads will require rehabilitation as per PZ4 4 or as specified in the project specification. In the case of access 'tracks', only ripping to loosen compaction will be required unless otherwise stated by the Environmental Control Officer or project specification.

Access roads created by the project may only remain unrehabilitated on written request of the landowner, with his acceptance of the state of the road and a clause that the landowner accepts all responsibility for the road and its state.

PZ3.13.4 Maintenance of Existing Access Roads

The Contractor will record, photographically, the state of existing roads which are to be used for access, prior to plant utilising these roads.

During the contract period, the Contractor will ensure that all existing water attenuation and drainage structures are maintained in a state in which they can optimally perform their function.

Upon completion of the construction period, the Contractor will ensure that the access roads are returned to a state not worse than prior to construction commencing.

PZ3.14 BORROW PITS

Where the Contractor is required to import material this shall be from commercial sources or borrow areas specified in the project specification.

The Contractor may source material from alternative borrow pits provided: the site location; method of winning material and reinstatement and rehabilitation are environmentally acceptable and approved by the Environmental Control Officer.

In this regard, the Contractor shall give the Environmental Control Officer in writing, 30 days prior to opening up alternative borrow pits the following information for acceptance:

- quantities of borrow material required;

- method statement for excavation of material including depth and extent of excavation;
- anticipated 'active life' of the borrow area;
- proposal for reinstatement and rehabilitation of borrow area, including final profile;
- written approval from the landowner/ relevant authority that material may be removed from their land subject to their stated conditions, requirements, and royalties, and if the proposal is acceptable to the Environmental Control Officer.

Development and rehabilitation of borrow pit areas are likely to include the following activities (but these must not be regarded as exhaustive):

- Stripping and stockpiling of topsoil as per PZ3 5.3 of this specification;
- Removal (to nominal depth of 500mm) and stockpiling of sub-soil;
- Infill of borrow pit with spoil material;
- Contouring of borrow pit to approximate natural topography and/ or reduce erosion impacts on the site;
- Placement of excavated subsoil over spoil material;
- Placement of stripped topsoil on subsoil;
- Grassing of topsoil in terms of clause PZ4 4 of this specification.

The Contractor is to familiarise himself with the requirements of the Minerals Act No 50 of 1991 in terms of borrow pit development, and the requirements of the EMPR, as applicable.

PZ3.15 SPOIL SITES

Where the Contractor is required to spoil material, spoil sites must be identified which are environmentally acceptable and approved by the ECO, unless spoil site areas have been identified in the project specification, in which case these will be the designated spoil sites.

If no spoil sites have been previously identified together with reinstatement and rehabilitation criteria, the Contractor is to provide the following information to the ECO at least 30 days prior to requiring sites to spoil material:

- the location, description of and access to alternative sites identified in order that they may be assessed;
- the quantity of material to be spoiled;
- the type of material to be spoiled (i.e. blast rock/ excavated rock/ soft shale/ subsoil etc.);
- the proposed method of spoiling;
- the proposed reinstatement and rehabilitation plan including final profile;
- written approval from the landowner/ relevant authority that material may be spoilt on land subject to their stated conditions and requirements and if the proposal is acceptable to the ECO.

Development and rehabilitation of spoil areas are likely to include the following activities (but these must not be regarded as exhaustive):

- Stripping and stockpiling of topsoil as per PZ3 5.3 of this specification;

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- Removal (to nominal depth of 500mm) and stockpiling of sub-soil;
 - Placement of spoil material;
 - Contouring of spoil site to approximate natural topography and/ or reduce erosion impacts on the site;
 - Placement of excavated subsoil over spoil material;
 - Placement of stripped topsoil on subsoil;

Grassing of topsoil in terms of clause PZ4 4 of this specification.

PZ3.16 NUISANCE

PZ3.16.1 Dust

At all times the Contractor shall control dust on the site, access roads, borrow pits and spoil dumps with water, chemical soil stabilisers or temporary surfacing as specified in the project specification or upon instruction of the Engineer.

Dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments. These impacts include visual pollution, decreased safety due to reduced visibility, health aspects, and ecological impacts due to dust particle accumulation.

On gravel or earth roads, vehicle speeds may not exceed 30km per hour.

PZ3.16.2 Noise

The operational layout of the construction site is to be designed to control and reduce noise from source (see clause PZ2 1).

Machinery and vehicle silencer units are to be maintained in good working order. Offending machinery and /or vehicles will be banned from use on site until they have been repaired.

Construction activities generating output levels of 85 dB(A) or more (excessively noisy), in residential areas, are to be confined to working hours (08h00 - 17h00) Mondays to Fridays only.

'Normal' or 'noisy' working hours may only be extended with the prior written approval of the Project Manager, who has been notified, at least 7 days in advance, of the impending work requiring extension.

The Project Manager will ensure that the neighbours are timeously forewarned of imminent noisy activities.

Should community complaints be received with regard to noise generation, the Contractor will, at the discretion of the Project Manager and Environmental Control Officer, provide an independent and registered noise monitor to undertake a survey of noise output levels from site, and implement measures to reduce noise to legislated levels.

PZ3.16.3 Visual

All site establishment components, as well as equipment, will be positioned to limit visual intrusion to neighbours (see clause PZ2 1 above).

The type and colour of roofing and cladding materials are to be selected to reduce reflection.

Security lighting (both temporary and permanent) and lighting required for specific works activities must be placed such that it is not a nuisance to residents and the general public.

PZ3.16.4 Interference with neighbours and public

No construction staff may approach site neighbours, for whatever reason, without the knowledge and permission of the Project Manager.

Complaints from neighbours and public with regard to interference from contract staff will be regarded in a serious light, and the offender(s) may be subject to disciplinary action.

PZ3.16.5 Disruption of Services

Disruption of services, e.g. road access, water and electricity, must be kept to a minimum at all times.

Where service disruption is unavoidable, the Contractor is to advise the Project Manager (at least 7 days in advance), who in turn will timeously warn the affected parties.

PZ3.17 SPECIAL ENVIRONMENTS

PZ3.17.1 Wetlands

Pipeline trenches which traverse wetlands shall be constructed as specified in the project specification. The Contractor will submit a method statement for work in wetland areas as per PZ3 1.1

Construction may not permanently alter the surface or subsurface flow of water through the wetland.

The Contractor shall submit a method statement for review at least 14 days prior to commencing construction in a wetland.

The Contractor will remove all wetland vegetation with their root ball intact. This vegetation is to be kept moist at all times. It is to be placed in the shade and covered with moistened hessian cloth until replanting, which is to be undertaken immediately surface reinstatement is complete.

No construction materials may be stockpiled in any wetland areas.

The pre-construction profile of the wetland shall be returned to one similar as before construction, with no created "ridge or channel" features present.

PZ3.17.2 River/ stream courses

The Contractor shall submit a method statement for review 14 days prior to commencing construction. The method statement should highlight (but not be confined to) the following issues:

- detailed plan of crossing including pipe protection works;
- how water flow will be diverted during construction (if applicable);
- containment of contaminated runoff and waste water;
- width of working servitude (if not already detailed in project specification);

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- final expected profile of river/ stream banks;
 - reinstatement and rehabilitation of river/ stream banks.

The Contractor will remove herbaceous riparian vegetation as indicated in the project specification or by the Environmental Control Officer, with their root ball intact. This vegetation is to be kept moist by means of placing it in the shade, covered with moistened hessian cloth until it is replanted.

The Contractor shall not modify the banks or bed of a water course unless as specified in the project specification.

Rocks for use in gabion baskets/reno mattresses may not be obtained from a water course.

The Contractor will not pollute any water body as a result of construction activities (see also PZ3 11).

The Contractor shall not cause any physical damage to any aspects of a water course, other than those necessary to complete the works as specified and in accordance with the accepted method statement

Where a stream or river-crossing requires the diversion of water, a method statement is to be provided to the Environmental Control Officer in this regard for review.

PZ4 REINSTATEMENT AND REHABILITATION

Scope: The intention of this section is to ensure that the condition of the areas disturbed by the project are returned to a state that approximates what they were before the project or better, within reason. The concept of progressive reinstatement is fundamental to cost effective (both financial and environmental) rehabilitation of a site. This concept must be followed at all times. Where landscaping is utilised, the concept is to utilise and restore indigenous plants to the site, in terms of the concept of xeriscaping.

Reinstatement will be required for all areas disturbed by the project. For pipeline projects, this will include the full working servitude, not just the top of actual excavation as per SABS 1200 DB (subclause 5.9.1.1)

Reinstatement and rehabilitation will ensure that all areas disturbed by the project are returned, within reason, to a state not worse than before the project commenced.

The Contractor will reinstate and rehabilitate all disturbed areas outside of the demarcated working area (as defined in terms of clause PZ3 2 or the project specification) at his own cost and to the satisfaction of the Environmental Control Officer and Project Manager.

PZ4.1 HOUSEKEEPING

All areas are to be cleared of rubble associated with construction. This includes the removal of surplus materials, excavation and disposal of consolidated waste concrete and concrete wash water, litter, etc.

All soil contaminated by hydrocarbons, for example from leaking machines, refuelling spills etc., is to be excavated to the depth of contaminant penetration, placed in 200 litre drums and removed to an appropriate landfill site.

PZ4.2 FINISHING

PZ4.2.1 Final Grading

Final levels of all disturbed areas are, where feasible in terms of the project requirement, to be consistent with the natural topography of the area.

In certain instances, it will be acceptable to reinstate rock onto a works area (e.g. pipeline servitude), provided that that rock does not exceed 250mm in maximum dimension and is placed in a manner consistent with the natural surrounds as indicated by the Environmental Control Officer and Project Manager.

All drainage lines affected by construction are to be reinstated to approximate their original profile. Where this is not feasible due to technical constraints, the profile is to be agreed upon by the Environmental Control Officer and Project Manager.

All compacted (disturbed) areas (including stockpile areas) are to be ripped (along contour) to a depth of 150mm prior to the replacement of topsoil.

PZ4.2.2 Topsoiling

Topsoil is to be replaced to a minimum depth of 100mm.

Topsoil is not to be compacted, but once replaced is to be scarified (to a depth of 50mm) consistent with the natural contour.

If insufficient topsoil is available, subsoil or similar material may be used that may be a suitable substrate after addition of soil improving substances e.g. compost, pH rectifiers (lime or gypsum) etc. Soil testing may be required at an approved facility.

PZ4.3 REINSTATEMENT OF WATER COURSES AND WETLAND AREAS

The Contractor will ensure that water course banks are returned to their original profile unless the project specification states otherwise.

The surface reinstatement of wetland areas is to ensure that no depressions remain which could act as channels for preferential water flow thereby affecting the hydrological regime of the wetland.

The Contractor will preserve all riparian and wetland vegetation for use in rehabilitation of those environments. This vegetation is to be kept moist at all times. It is to be placed in the shade and covered with moistened hessian cloth until replanting, which is to be undertaken immediately surface reinstatement is complete.

Plants are to be, as nearly as possible, replanted in areas from which they were removed.

PZ4.4 VEGETATION RE-ESTABLISHMENT

The Contractor will ensure that all areas disturbed by contract activities are revegetated to the specified standard.

This standard is deemed to be an 85 % cover with no areas in excess of 0.04 m² / m² remaining unvegetated.

Revegetation shall match the vegetation type which previously existed (e.g. kikuyu pastures are to be returned to kikuyu pasture; 'veld' grass to 'veld' grass, etc.), unless stated otherwise in the project specification.

Prior to re-grassing, and if required:

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- the area is to be scarified or ripped (along contour) to a depth of 50mm to loosen compaction.
 - weeds present on site are to be removed.

Re-grassing, where required, will be either by means of seeding, instant turf (sods), sprigs or plugs as specified in the project specification or as specified by the ECO.

Where sprigs or plugs are utilised, they are to be planted at 200mm centres. The fertiliser shall be applied as per PZ4 5.2. During summer, 25mm of irrigation shall be applied each week until reasonable (60%) ground cover has been obtained. During winter 15mm of irrigation shall be applied each week until reasonable (60%) ground cover has been obtained. The amount of irrigation to be applied will make up the difference between rainfall recorded on site and minimum requirement.

Where instant turf is utilised, it shall be laid as specified in the project specification. The fertiliser shall be applied as per PZ4 5.2. During summer, 25mm of irrigation shall be applied each week until all the turf is visibly growing. During winter 15mm of irrigation shall be applied each week until all the turf is visibly growing. The amount of irrigation to be applied will make up the difference between rainfall recorded on site and minimum requirement.

Grassing shall be undertaken by a specialist grassing Sub-Contractor, unless permission is granted otherwise by the Engineer upon receipt of a written motivation from the Contractor.

The Contractor shall state in writing when the regassing operation will commence and its expected duration (dates).

Grassing in 'veld' areas is to be undertaken as per PZ4 5 below. *Cynodon dactylon* species may be excluded or substituted from this mixture at the discretion of the Environmental Control Officer, or as specified in the project specification. The seed bulk may be made up with the *Eragrostis tef*.

PZ4.5 “VELD GRASS” GRASSING SPECIFICATION

The area to be grassed should be estimated and converted to hectares, e.g. 100m X 100m = 10 000m² = 1ha. All fertilizer and seeding rates used in this specification are with respect to hectares.

PZ4.5.1 Regional areas

For re-grassing three distinctive areas exist. These are defined as:

- the Coastal area (a narrow band running from the coast to ≈15km inland of the coast)
- the Coastal hinterland (a broad band (≈50km wide), generally defined as westwards of the coastal belt, and below 800m a.s.l.)
- the area above ≈ 800m a.s.l. (also called Midlands area).

PZ4.5.2 Fertiliser

Standard 2:3:2 (N:P:K) fertiliser shall be used on all sites.

The rate of application will be:

- 200 kg/ha in the Coastal Hinterland areas, and

- 300 kg/ha in the Midlands and Coastal areas.

PZ4.5.3 Planting times

Summer (includes Spring) is considered to be between the 1 September and 28 (29) February.

Winter (includes Autumn) is considered to be between 1 March and 31 August.

Re-grassing will be undertaken (as far as possible) in summer as germination and establishment of grasses is most effective, assuming reasonable spring rains.

Vegetation re-establishment is likely in many cases to be held off until this suitable growing season.

Hydroseeding with a winter mix will only be specified where regrassing is urgently required and cannot wait until the summer season. In this case irrigation will be required as per PZ4 5.4 below.

PZ4.5.4 Establishment and maintenance

During summer, 25mm of irrigation shall be applied each week until reasonable (60%) ground cover has been obtained.

During winter (where annual rye grass is specified) 15mm of irrigation shall be applied each week until reasonable (60%) ground cover has been obtained.

If rapid establishment is required, additional watering may be necessary as specified in the project specification

The amount of irrigation to be applied will make up the difference between rainfall recorded on site and the minimum requirement.

PZ4.5.5 Grass Seed Selection and Application Rates

The specific seed selection and application rates for each of the defined areas are covered separately, as follows.

PZ4.5.5.1 Coastal area

Summer mix (1 September - 28 February)

Grass species	Common name	General application rate (kg/ha)
Eragrostis tef	Teff	5
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	10
Digitaria eriantha	Smuts' fingergrass	5
Total		30

Winter mix (1 March - 31 August)

Grass species	Common name	General application rate (kg/ha)
Lolium multiflorum cultivar - Midmar	Annual/Italian rye grass	10
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	5
Total		25

PZ4.5.5.2 Coastal hinterland.

Summer mix (1 September - 28 February)

Grass species	Common name	General application rate (kg/ha)
Eragrostis tef	Teff	5
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	10
Cenchrus ciliarus	Blue buffalo grass	2
Cynodon dactylon	Couch/KWeek/Star grass	10
Total		37

Winter mix (1 March - 31 August)

Grass species	Common name	General application rate (kg/ha)
Lolium multiflorum cultivar – Midmar	Annual/Italian rye grass	10
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	5
Cenchrus ciliarus	Blue buffalo grass	2
Cynodon dactylon	Couch/KWeek/Star grass	3
Total		30

PZ4.5.5.3 Midlands area**Summer mix (1 September - 28 February)**

Grass species	Common name	General application rate (kg/ha)
Eragrostis tef	Teff	4
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	10
Digitaria eriantha	Smuts' fingergrass	2
Cynodon dactylon	Couch/KWeek/Star grass	2
Paspalum notatum	Lawn paspalum	2
Total		30

Winter mix (1 March - 31 August)

Grass species	Common name	General application rate (kg/ha)
Lolium multiflorum cultivar - Midmar	Annual/Italian rye grass	10
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	5
Paspalum notatum	Lawn paspalum	2.5
Total		27.5

PZ4.5.6 Seeding methods

Two methods are recommended, namely hydroseeding and hand-broadcasting. The required method shall be as specified in the project specification.

All seed supplied should be labelled in accordance with the Government Seed Act No. 20 of 1961 and the Contractor shall be required to produce such certification, if requested by the Engineer.

PZ4.5.6.1 Hydroseeding

The Grassing Contractor shall be conversant with this method.

Cellulose pulp (consisting of either wood shavings, shredded straw, shredded paper or cotton waste) shall be added to the mix to be applied at a rate of 250 kg/ha.

In addition to the cellulose pulp, compost (consisting of either chicken litter, kraal manure, sugar cane filter cake or mushroom compost) shall be incorporated at a rate of 5m³/ha ($\approx 100 \times 50\text{kg}$ fertiliser bags/ha).

PZ4.5.6.2 Hand-broadcasting

Fertiliser, at the appropriate rate, is to be distributed by hand in a manner to ensure that there is an even spread of fertiliser over the site. This is to be done prior to seeding.

The seed mix is to be weighed and made up in an appropriately large container which shall be stirred to ensure no settling out of the grass seed, and a uniform distribution of the different types of seed.

The seed is to be distributed by hand in a regular grid broadcasting manner to ensure that there is an even spread of grass over the entire site.

The area seeded is to be raked over once the seed and fertiliser have been applied to incorporate these elements into the topsoil.

PZ4.5.7 General

Where there is a possibility of neighbourhood livestock grazing a rehabilitated site these should, as far as is practicable, be excluded for the first 3 months of re-grassing.

PZ4.6 LANDSCAPING

Landscaping of the site may be required as indicated in the project specification.

Compensatory planting of trees or shrubs may be required should the transplantation of such not be successful in terms of PZ3 5.5 or due to plants removed in terms of PZ3 5.4

Planting of trees will be in accordance with the following method:

- All tree holes shall be square in plan;
- Tree holes shall be a minimum of 600mm by 600mm square by 700mm deep;
- Holes are to be backfilled with excavated soil in a ratio of 3:1 with compost. The compost is to be weed free and have been composted at temperatures in the order of 65°C. Where possible, any available topsoil should be placed in the hole at the level where the tree rootball will rest. A handful (half-a-cup) of each Superphosphate and 2.3.2 should be mixed into the soil-compost mix;
- The tree holes are to be backfilled to the point where the tree and its rootball are in the desired position. The tree is to be removed temporarily and the hole filled with water and allowed to drain away. This operation of watering and draining should be repeated at least four times in order that the surrounding ground and hole are thoroughly moist. The tree is then to be replaced and the remaining soil replaced;
- All trees shall be tied (using a tree tie) to a suitable timber stake planted in the ground to a depth of at least 500mm. The stake shall have a minimum diameter of 35mm and shall be at least 300mm higher than the planted tree;
- Water retaining basins of at least 500mm diameters are to be formed around each tree;
- The Contractor is to apply at least 10 litres of water per tree per fortnight for a period of at least 3 months.

The planting of shrubs will be in accordance with the tree planting method with the exception that the holes are to be a minimum of 400mm by 400mm square by 500mm deep, and that the tree stakes and ties are not required.

PZ4.7 ALIEN PLANT CONTROL

All sites disturbed by construction activities will be monitored for colonisation by invasive alien plant species.

The Environmental Control Officer will identify those plants which require removal during both the construction and maintenance period, for the Contractor's action.

The Environmental Control Officer will provide advice as to effective methods of removal and control of alien plant species.

PUBLIC COMPLAINTS REGISTER

DATE	COMPLAINANT S NAME	DESIGNATION/ AFFILIATION	REASON FOR COMPLAINT	ACTION TAKEN	ACTION BY	ACTION BY DATE	ACHIEVED BY DATE	DATE REFERRED TO NW environmenta l control officer

MONITORING OF COMPLIANCE WITH ENVIRONMENTAL SPECIFICATIONS

PROJECT NAME:

CONTRACT NUMBER:

PROJECT MANAGER:

ENGINEER'S REPRESENTATIVE / SUPERVISOR:

CONTRACTOR:

CONTRACT PERIOD:
(including start and completion dates):

PERIOD COVERED:

REPORT PREPARED BY:

Signature

PART C3: SCOPE OF WORK
BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

ENVIRONMENTAL CONTROL OFFICER REPORT

PROJECT NAME: EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

CONTRACT N° ALMT10/2023

DATE OF SITE INSPECTIONS DURING REPORTING PERIOD:

Specification Breach	Spec. No.	Remedial Action Recommended	Due Date	Authority Responsible	Action Taken

PUBLIC COMPLAINTS

Complainant	Designation/ Affiliation	Date of complaint	Reason for Complaint	Action taken and date

GOOD PERFORMANCE REPORT

List any aspects of the Contract in which the Contractor is performing well and beyond that which is required in terms of the specification.

PART C3: SCOPE OF WORK
BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE

Photographs

Include photographs which illustrate aspects of non-compliance and good performance.

Photograph 1	Photograph 2
Caption	Caption

THE CONTRACT PART C3: SCOPE OF WORKS

Particular Specifications Occupational Health and Safety Specification for Principal Contractors and Contractors for Construction Work

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7	Application of the Construction Regulations 2014 [CR]
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7.1	Management & Supervision of Construction	[CR 8]
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7.3	Fall Protection	[CR 10]
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8 Site-specific and Design Risks

- 8.1 HRA Methodology
- 8.2 Site-specific risks
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9 Fines and Penalties

- 9.1 Minor H&S transgressions
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- 9.3 Major H&S transgressions
- 9.4 Repeat offences

Appendices

- | | | |
|-----------|---|--|
| Annexure: | A | Notification of Construction Work |
| | B | Appointment Form [Example] |
| | C | Recording and Investigation of Incidents |
| | D | Agreement with Mandatories |

1. Introduction

In terms of Construction Regulation 7 this document describes the health and safety specifications required for any principal contractor whom is making a bid for or whom has been appointed to perform construction work on behalf of the client. [Ref. CR 5(1)(a)]

- A principal contractor is required to compile their Health and Safety Plans based on these specifications detailed and referred to, in this document.
- In other words, the Health and Safety Plan must specify how the Principal Contractor will control and manage all health and safety aspects on the construction site.
- The Health and Safety Plan must be relevant to the construction work being carried out and if possible refer to the numbering system of this document.
- A principal contractor is to ensure that these specifications are communicated to all contractors under his/her agreement.

2. Reference Documents

The following documents are referred to:

- 2.1. Occupational Health and Safety Act, (Act No. 85 of 1993) - [OHSA] and Regulations.
- 2.2. Civil, Mechanical, Structural and Electrical Drawings [CME]
 - 2.2.1 Drawing References:
 - 2.2.2 Drawing No:
 - 2.2.3 Drawing No:
 - 2.2.4 Drawing No:
 - 2.2.5 Drawing No:
 - 2.2.6 Drawing No:
- 2.3. Compensation for Occupational Injury and Diseases Act – [COIDA]

3. Scope of Work

Detailed Description of work to be carried out

- Earthworks
- Excavations
- Work @ Height
- Pressure Testing
- Vehicle & Mobile Plant
- Concrete Works
- Support and Formwork
- Structures
- Electrical Works

List of plant, machinery and tools to be used during the project:

- Construction & Mobile Plants
- Hand Tools
- Portable Electrical Tools
- Ladders

- Further Information to be provided by contractor

List of Major hazards identified in the design risk assessments:

- Working at Heights
- Earth Works & Excavation
- Construction vehicles and Mobile plants
- Pouring Concrete
- Use of Power Tool
- Structures / False Work
- Shuttering
- Steel work

4. Definitions

The following definitions apply. (Abbreviations and legal references in brackets where applicable):

Construction Work

Means any work in connection with –

- a) The erection, maintenance, alteration, renovation, repair, demolition or dismantling of or an addition to a building or any similar structure;
- b) The installation, erection, dismantling or maintenance of a fixed plant where such work includes the risk of a person falling;
- c) The construction, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or
- d) The moving of earth, clearing of land or making of an excavation or work on any similar type of work.

Hazard Identification, Risk Assessment and Risk Control (HIRA)

Means a documented plan, which identifies hazards, assesses the risks and detailing the control measures and safe working procedures, which are to be used to mitigate and control the occurrence of hazards and risks during construction or operation phases.

Site

Means the area in the possession of the Contractor for the construction of the works. Where there is no demarcated boundary it will include all adjacent areas, which are reasonably required for the activities for the Contractor, and approved for such use by the client.

Hazard

Means a source of or exposure to danger (source which may cause injury or damage to persons, or property)

Risk

Means the probability or likelihood that a hazard can result in injury or damage.

Construction Supervisor [CR 8(7)]

Means a full time, competent employee appointed in writing by the Contractor to supervise construction work. The appointment, as required by the OHSA, shall stipulate health and safety responsibilities, area of responsibility and the proposed duration of the project.

Construction Plant

Encompasses all types of plant including but not limiting to, cranes, piling frames, boring machines, and excavators, dewatering equipment and road vehicles with or without lifting equipment

Contractor

Means an employer who performs construction work and includes principal contractors and sub- contractors.

Health and Safety Plan (HSP)

Means a documented plan, which addresses hazards identified and includes safe work procedures to mitigate, reduce or control the hazards identified.

The plan shall be applied from the date of commencement of and for the duration of construction work.

Health and Safety File (HSF)

The file holding all documentation and records on health and safety for the project, which shall be available at all, times for evaluation, and a copy of which will be forwarded to the client upon completion of the project.

Disabling Injury Frequency Rate (DIFR)

The number of disabling injuries (DI"s) multiplied by a constant (man hours relative to period worked) divided by total man hours worked over a rolling period (usually 12 months, but can be less)

Disabling Injury Severity Rate (DISR)

The number of days lost due to DI"s multiplied by a constant (man hours relative to period worked) divided by total man hours worked over a rolling period (usually 12 months, but can be less)

Confined Space

An enclosed, restricted or limited space in which, because of it's construction, location or contents, or any work carried on therein, a hazardous substance may accumulate or an oxygen deficient atmosphere may occur, and includes any chamber, tunnel, pipe, pit, sewer, container, valve, machinery or object in which a dangerous liquid or dangerous concentration of gas, vapour, dust or fumes may be present

5. Responsibilities of Contractors for Construction Work

5.1. Notification of Intention to Commence with Construction Work

The principal contractor shall notify the Provincial Director of the Department of Labour before any work commences, in accordance with the following requirements:

- The demolition of a structure exceeding a height of 3 meters; or
- The use of explosives to perform construction work; or
- The dismantling of fixed plant at a height greater than 3 meters; or
- The work exceeds 30 days or will involve more than 300 person days of construction work; and
- Includes excavation work deeper than 1 meter; or
- Includes working at a height greater than 3 meters above ground or a landing.

The notification must be completed in the **Annexure 2** form and a copy of the proof of fax or delivery to the Department of Labour to be kept in the Health and Safety File for inspection by an inspector, the client or an employee.

5.2. Principal Contractor's Responsibilities

Compile a Health and Safety Plan

Ensure co-operation between all contractors to comply to the Act

- Ensure compliance to the Act in terms of:
 - a) Provide relevant sections of these specifications to contractors as required
 - b) Appoint each contractor in (a) above in writing. Only contractors who have the necessary competencies and resources may be appointed
 - c) Ensure each contractor's Health and Safety Plan is implemented and maintained on site
 - d) Stop any contractor from work which is not in accordance with Health and Safety Plan's or which pose a threat to health and safety of persons
 - e) Sufficient information is provided to contractors where there are changes to design and construction
 - f) Ensure every contractor is registered and in good standing with the Compensation Commissioner
 - g) Ensure potential contractors have made provision for the cost of health and safety measures. Negotiate and approve the Health and Safety Plan of each contractor.
- All Health and Safety File's including the principal contractor's to be available on site.
- A consolidated Health and Safety File to be handed over to the client on completion of construction including records of drawings, designs etc.
- Health and Safety File to include updated list of all contractors, the agreements and their type of work.

□

5.3 Contractor's Responsibilities (including sub-contractors)

- Provide their Health and Safety Plan to the principal contractor.
- Where a contractor appoints another contractor (sub-contractor) it is the responsibility of that contractor to apply 4.2 above as if he were the principal contractor.
- No contractor to appoint another contractor (sub-contractor) unless the latter has the necessary competency and resources to perform the required work.
- To provide any information which affects the health and safety of any persons at work to the principal contractor.

5.4 Legal Appointments

The principal contractor shall ensure copies of the appointment letters of all responsible persons appointed on site will be kept in the Health and Safety File. All legal appointments shall be conducted in accordance with the requirements set out in the OHS Act and as per this specification. The tables below set out the appointment protocols for CR and OHS Act. It should be noted that these represent a complete list and not all these appointments may be required:

Construction Regulations

Reg.	Appointment	Appointee	Competency Required
CR 7 (1)	Principal Contractor	16(2) for the company	Curriculum Vita on file and Supervisor tr (legal liability)

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CR 5 (3b)	Contractor	Competent person	Proof of induction
CR 8 (1)	Contracts Manager	Competent Person	Certificate & CV
CR 8 (2)	Ass Construction Manager	Competent Person	Certificate & CV
CR 8 (7)	Construction Supervisor	Competent person	Curriculum Vita on file and Supervisor tr (legal liability)
CR 8 (8)	Assistant Construction Supervisor	Competent person	Curriculum Vita on file and Supervisor tr (legal liability)
CR 8 (5)	Safety Officer	Competent person	Curriculum Vita on file and SAMTRA or similar
CR 9 (1)	Risk Assessor	Competent person	Curriculum Vita on file and HIRA or similar
CR 10 (1)	Fall Protection Planner	Competent person	Curriculum Vita on file and Fall Plan Developer
CR 12 (1)	Temporal Works	Competent person	Curriculum Vitae
CR 13 (1)	Excavation Work Inspector	Competent person	Curriculum Vita on file and Supervisor tr (legal liability)
CR 23 (1j)	Construction Vehicle Inspector	Competent person	
CR 23 (1d)	Construction Vehicle Operator	Competent person	Certificate of Competency for relevant construction vehicle
CR 28 (a)	Stacking and Storage Supervisor	Competent person	
CR 29 (h)	Fire Equipment Inspector	Competent person	
CR 29 (i)	Fire Team Members	Competent person	Fire Fighting Certificate

OHS Act

Reg.	Appointment	Appointee	Competency Required
OHSA 17 (1)	Health & Safety Rep	Nominated employee	Health and Safety Representative Certificate
OHSA 19 (1)	Health & Safety Committee Member	Management representative	Curriculum Vita on file and Supervisor tr (legal liability) and IRCON or similar
GAR 9 (2)	Incident Investigator	Competent person	Curriculum Vita on file and RCAT or similar
GSR 3 (4)	First Aider	Competent person	First Aid Certificate
GSR 13	Ladder Inspector	Competent person	In house Training
DMR 18 (11)	Lifting Equipment Operator	Competent person	Code 1, 2, 3, 32, 33, 35 or 46
DMR 18 (5)	Lifting Equipment Inspector	Competent person	
	Hand Tools Inspector	Competent person	In house Training

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	Pneumatic Tools Inspector	Competent person	In house Training
EMR 9(4)	Portable Electrical Equipment Inspector	Competent person	

The responsibilities of each appointment are detailed in the relevant form, which are signed by both the authorised person and the appointee and kept in the Health and Safety file. An example of an appointment form for a Construction Supervisor can be found under **Annexure B**.

5. Documentation and Procedures

All required documentation for the construction work, shall be kept in the Health and Safety File, which shall be available on site. The Construction Supervisor shall be responsible for the file on site and the Project Manager shall ensure that documentation is valid and up to date. It is required that the documentation is filed in an orderly fashion for easy access. The following sections are suggested:

1. Company insurances and information

- Letter of good standing
- Public liability
- Emergency contact numbers
- Notification of construction work
- Company organogram
- Health and Safety policy
- HIV & Aids Policy
- Drug & Alcohol policy
- Personal Protective Equipment Policy

2. Health and safety plan and specifications

3. Appointments

4. Inspection registers and checklists

5. Risk assessments

- Risk matrix
- Risk assessments
- Method statements
- Record of internal training
- Review of risk assessments

6. Safe work procedures

- Safe Working procedure training
- Planned task observations
- Emergency procedures
- Fall protection plan
- Permits to work

7. Incident management

- WCL2 forms
- Annexure 1 forms
- Injury on duty reporting and investigation procedure
- Resumption reports

8. Training records and medical fitness certificates

- Certificates of formal training
- Induction training records

- Medical fitness certificates for all employees
- 9. Audits**
 - Client's Health and Safety audits
 - Site inspection reports
 - Site safety instructions

10. Contractor control

- List of contractor's and type of work
- Contractor appointments
- 37 (2) agreements

11. Health and safety communication

- Toolbox talks to be held weekly
- Health and Safety notice board □ Schedule D
- Memo's to employees

12. OHS Act and Regulations

6. Application of COIDA and OHSA to Construction Work

6.1 Compensation of Occupational Injuries and Diseases Act, Act No. 130 of 1993 (COIDA)

Every contractor shall provide proof of registration and an updated letter of good standing with the Compensation Commissioner or a licensed compensation insurer.

6.2 Occupational Health and Safety Policy

- Every contractor's Occupational Health and Safety Policy statement should be available for scrutiny and as evidence of their commitment their employees' occupational health and safety and the environment.
- Every contractor's Occupational Health and Safety Policy statement is to be signed off by the Chief Executive Officer.
- Proof of communication to all is to be available on requests.

6.3 Health and Safety Training and Competency

Training of personnel is a necessity and a legal requirement when required. A record of all training shall be kept and provided on request.

6.3.1 Induction Training

- The principal contractor shall be responsible to co-ordinate all inductions on site to ensure that no contractor allows or permits any employee/s or person/s to enter any construction site , unless such employee, visitor or person has undergone induction training which is pertinent to the hazards prevalent on the site at the time of entry.
- Every employee, visitor or person on site shall be in possession of proof of the Health and Safety induction.
- Records of attendance shall be kept on the Health and Safety file for the duration of the contract.

6.3.2 Awareness Training

- Awareness training to be carried out weekly in the form of Toolbox Talks on relevant topics
e.g. manual lifting, wearing PPE, safe use of portable electric tools etc.
- All attendees are to be made to sign an attendance register and such register is to be held on the Health and Safety file for the duration of the project.

6.3.3 Competency and CV's

- All supervisors and where applicable, valid copies of certificates of competency of appointed personnel to be provided and kept in the Health and Safety file. (Reference can be made to pages 10, 11 and 12 of this document).
- Other training requirements such as those identified through the High-risk Assessment process, to be completed and proof of that training also kept in the Health and Safety File.
- Where competency is achieved through experience, a brief CV will be required.

6.3.4 Specific OH&S training

- Valid certificates of training from registered service providers preferably accredited by the appropriate SETA are required for First Aiders, H&S reps, Fire Fighters etc.

6.3.5 Medical Fitness

- All work in elevated positions [tower crane operators, workers on elevated structures requiring fall protection, suspended platform workers and;
- Operators of construction vehicles and mobile plant require certificates of physical and psychological fitness carried out by an occupational medical practitioner.
- All employees who are employed in a construction site must have medical Fitness done by an Occupational Health & safety Practitioner before commencement of work.
- No employee will be allowed to perform any duties except deemed to be medical fit to do so.

6.4 Health and Safety Reps [OHSA 17 and 18]

- Where 20 or more employees are employed at a workplace, one health and safety representative shall be appointed in writing.
- The Principal Contractor shall ensure that a minimum of one health and safety representative is appointed for ratio of each 50 employees employed.
- Each health and safety representative shall be in possession of a certificate of competency.
- The employer is to ensure that a delegation process has been followed and recorded in term of the requirement of General Administrative Regulation 6
- Monthly checks are to be conducted by the appointed representatives in their designated areas and all finding are to be recorded in a register. Such register is to be held on the health and safety file for the duration of the project.
- Health and Safety Representative are to investigate any staff complaints and ensure that documented feedback is forwarded to the respective managers.

6.5 Health and Safety Committee [OHSA 19 and 20]

- Where two or more representatives have been appointed the employer shall ensure that a health and safety committee is formed.
- The number of management representatives shall not outweigh the number of representatives.
- Meetings shall be held at a minimum of three monthly.
- Minutes of such meeting shall be kept and place on the health and safety file for the duration of the project.
- A register of attendance is to be kept of attendees at such meetings; such a register is to be attached to the minutes.

6.6 General Record Keeping

All contractors shall ensure that all Health and Safety records, required by OHSA and Regulations are kept up to date for reference purposes and auditing.

6.6.1 Inspections

- All contractors shall keep all records of inspections undertaken during the duration of the project.
- An example of the total list of minimum legally required inspections can be found under **Annexure C**.
- An assessment list must be draft of what inspections are required and their frequency.
- The principal contractor is responsible to ensure compliance to this requirement by all contractors.

6.6.2 Audits

- The client's agent shall carry out regular audits on the principal contractor at least once per month.
- Principal contractors shall be responsible for carrying out regular audits on their contractors at least once per month
- The Principal contractor is to draft a table which reflects contractors company name, description of work, dates of audits and scores achieved.
- The results shall be tabled for action and discussed at the Health and Safety Committee meetings or the site meetings, as appropriate.

6.7 Incident management and emergency plans

- The principal contractor shall create an Emergency Plan for the construction site.
- The plan is to be clearly displayed in conspicuous locations around the site.
- The plan shall be clearly laid out for all types of emergencies including responsibilities, evacuation routes, siren, emergency no."s etc.
- The plan shall be fully explained to all personnel during the induction training.
- All contractors will become completely familiar with the requirements of the plan and will participate in any evacuation drills that may take place

6.7.1 First Aid [GSR 3]

- Where an employer has 5 or more employees in his employment, he/she shall ensure that at least one first aid box is made available in the workplace.
- Such first aid box is to be stocked covering the 18 items addressed in the Annexure attached to the General Safety Regulations as a minimum requirement.
- Where an employer has 10 employees or more in his/her employment, he/she shall ensure the at least one person readily available at the workplace whom is in possession of a valid first aid certificate.
- Every employer shall ensure that a minimum of one trained persons is made available for every 50 person in the workplace.
- All identified hazardous chemical are to have a material safety data sheet which is to be kept for first aid emergencies in the first aid box.
- All special needs addressed in the Material Safety Data Sheets are to be made available in addition to stock required in the Annexure.

6.7.2 Incidents and Injuries

Incidents

- A record of all incidents which have occurred shall be opened and held open until the handover of the project.
- All incidents such as near misses, unsafe situations, first aid injuries, etc shall be investigated fully and the result of such investigation shared with the Health and Safety Committee.
- The employer shall ensure that an investigation team is formulated which will consist of management representative, safety representative and an employee representative as a minimum requirement.
- All incidents that occur shall be filtered into a statistic format which is to determine the sites Incident Rate. Such rate is to be shared with all employees and all contractors on a monthly basis.
- Exclusion of incidents in record keeping shall result in fines being issued.

Injuries

- A first aid register is to be held in the first aid box as to record all first aid injuries that may occur.
- An injury on duty procedure is to be created which detail the process of treating an injured and methodology which may be use in order to ensure their safe arrival at a local hospital. □ All injuries are to be recorded in an Annexure 1

6.7.3 Accident and Incident Reporting and Investigation

Should an incident or accident investigation need to be conducted, the appointed incident investigator (competent person with a valid certificate of training on file) shall conduct the said investigation. The procedure to be followed will be in accordance with Annexure 1 of GAR 9 – “Recording and Investigation of incidents”. A copy of this annexure can be found under **Annexure D** in this document.

Particular attention is also drawn to OHSA 24, the reporting of certain incidents to an inspector of the Department of Labour.

The principal contractor shall ensure that the investigations are kept for record purposes and he shall ensure that the outcome of the investigation is communicated to all affected parties as required i.e. the client and contractors.

The client reserves the right to participate in all investigations into accidents or incidents and to conduct their own investigation if required.

6.8 Contractors and suppliers [OHSA 37(2)]

The client shall enter into an “Agreement with Mandatory” in terms of Section 37(2) of the Occupational Health and Safety Act, 85 of 1993, with all appointed principal contractors, a copy of which can be found under **Annexure E**. Likewise all principal contractors shall enter into a similar agreement with all contractors, subcontracted to them for any period of the contract. Please note that if contractors hire any construction vehicles or mobile plant, the companies from which the equipment is hired must provide any maintenance and test certification as required. In addition, if operators are hired with the equipment, proof of competence and medical certification must be provided.

The principal contractor shall ensure that all contractors are issued with this safety specification where reasonably practicable including any contractor pack for the project, should they not be contained in the safety specification.

The principal contractor shall assist and ensure that contractors engaged comply with all of these requirements and adhere to the requirements set out in the OHSA. Contractors will be stopped from working in the event of unsafe conditions and activities being observed.

All contractors shall be subject to the requirements specified in the HSP and will be issued with a copy of the plan. If the contractor is not able to comply with the requirements set out in the plan, he shall not be appointed as contractor.

6.9 Personal Protective Equipment, Intoxication, Signage and Access Control [GSR 2]

6.9.1 Personal Protective Equipment (PPE) [GSR 2]

- The principal contractor shall through the Risk Assessment process identify all specific PPE needs per each activity. Such identified PPE shall be captured in the form of a PPE matrix and displayed in the site office. Such matrix is to make reference to the task and the specific PPE requirements required to do the task.
- All Contractors will be responsible for the issuing of the required PPE as identified by the matrix.
- Should PPE be lost or stolen, then the employee will be issued with new PPE.
- No person/s shall be permitted entry into the site unless they are properly equipped with the required PPE as identified in the matrix.
- Should PPE be worn out or damaged, the user shall return the worn or damaged PPE and will be issued with a replacement.
- Training in the use, care and limitation of such PPE is to be provided and proof of such training is to be held in the health and safety file.
- Visitors shall be informed of PPE requirements **prior** to their visit so that they may make necessary arrangements to ensure their arrival well equipped with the correct PPE.

6.9.2 Intoxication [GSR 2A]

The principal contractor shall be responsible to ensure that no persons may enter or remain at the construction site if under or apparently under the influence of intoxicating liquor or drugs. It may become necessary from time to time for contractors and their workers could be required to do a breathalyser test before entering the site.

6.9.3 Display of signs [GSR 2B]

The principal contractor should make use of signage to assist in enforcing compliance to any requirement specified in this document or as required by law. Standard symbolic signs are acceptable for conveying these requirements where applicable.

6.9.4 Access control [GSR 2C]

The principal contractor shall be responsible to ensure control of access to all persons entering the construction site. The reasons for this are as follows:

- The principal contractor is the „employer“ on the site and for all intents and purposes is responsible for section 8 of OHS Act for employees and contractors and section 9 for any other person on site such as visitors and inspectors
- All persons entering the site must undergo induction training to inform them of the hazards present on the site. This includes contractors, visitors, inspectors etc
- The construction supervisor will be aware of who is on site and their function
- The construction supervisor will be able to control tasks that may impact on other work being carried out on the site by a permit to work system
- The number of people and their purpose on the site must be known in case of emergency and evacuation security reasons

The principal contractor shall post conspicuous notices at the site informing all those entering the site of these requirements

6.10 Ladders [GSR 13A]

The following requirements shall be complied with regarding Ladders and Ladder work:

- A competent person shall be identified and appointed as the ladder inspector.
- Where aluminium ladders cannot be used, then wooden ladders shall be straight grained, unpainted to allow for proper inspection of the grain for cracking.
- Ladders shall be secured at the top and chocked at the base to prevent slipping.
- Where chocking of the base is not possible, then the user shall ensure that the ladder is held in position by another employee when ascending the ladder.
- No person is permitted to work longer than 15 minutes on a ladder. Should work take longer than 15 minutes to complete then alternative means of elevation is to be used.
- Ladders shall be inspected a minimum once per month and results recorded in a register by the person appointed as the ladder inspector.
- Proper storage shall be provided for all ladders when not in use.

6.11 Portable Electrical Tools [EMR 9]

This regulation shall be complied to as a minimum requirement. Regular inspections of all Portable Electrical Tools such as drills, angle grinders etc, shall be carried out. In particular:

- Only trained personnel shall operate such equipment.
- The Construction Supervisor shall ensure operation of the equipment is in accordance the HRA requirements and Safe Working Procedure (SWP).with
- All users shall undergo regular awareness training (toolbox talk) to ensure compliance.

- The Construction Supervisor shall ensure the required PPE is used.

6.12 Permit to work

The permit holder shall be responsible to ensure that:

- All work being carried out on the site has been approved through the necessary project control system
- All work is being done in compliance with the issued permits.
- Permits required from third parties such as town councils for utility and sewage services are in place
- A permit system is operational so that work consisting of many tasks related to the construction on site, can be carried out without endangering the health and safety of personnel on site, neighbours and the public surrounding the site and/or causing damage to property.
- In particular, attention is drawn to GSR 9, which details the requirements for welding, flame cutting, soldering and similar operations (hot work)

6.13 Work in confined spaces

The permit holder shall be responsible to ensure that:

- All work being carried out on the site has been approved the necessary project control system
- All work is being done in compliance with the issued permits.
- Permits required from third parties such as town councils for utility and sewage services are in place

7. Application of the Construction Regulations [CR]

[Please note: this is the complete list. Item 7.1 is compulsory and the rest are applicable if relevant to the work being carried out]

7.1 Hazard Identification, Risk Assessment and Risk Control (HIRA) [CR 9]

- The contractor shall prior to the commencement of any construction work perform a HIRA exercise, which will form part of the HSP for the project.
- A copy of the HIRA shall be made available for viewing to the client's agent and shall be kept in the Health and Safety File.
- The contractor shall ensure that the outcome of all HIRA exercises will be conveyed to all relevant employees with respect to the hazards and the related control measures before any work commences.

The control of several of these risks may be specified in the OHSA does not mean that the HIRA exercise does not have to be carried out.

5.2 Fall Protection [CR 10]

Section 1 (a) of this regulation states that a contractor shall cause the designation of a competent person, responsible for the preparation of a fall protection plan. The control of several of these risks may be specified in the OHSA or the CR but this does not mean that the HIRA exercise does not have to be carried out.

5.3 Structures [CR 11]

The appointed civil contractor shall meet the requirements of this regulation. Attention is drawn, which requires the designer to inspect the structure at appropriate times and the record of these inspections to be available on site.

5.4 Excavations [CR 13]

Section 1 of this regulation states that this work must be carried out under the supervision of a competent person who has been appointed in writing. All the requirements of CR 13 shall be met. For inspection of excavations, attention is drawn to section 3 (h), the records of which must be available on site.

5.5 Construction vehicles and mobile plant [CR 23]

It will be the responsibility of each contractor on site to ensure compliance of their vehicles and mobile plant to these regulations. This includes vehicles to be used for transporting personnel to and from site, which will be subject to relevant requirements such as licensing and roadworthiness checks. In addition the following will apply:

- Safe transport for personnel working on the project to and from the workplace, which shall include proper seating, side restraints and cover.
- Road safety principles shall be adhered to on and off staff.

If a mobile crane or other mobile plant is hired, only approved hire companies shall be contracted to provide such equipment. The Construction Supervisor shall ensure compliance of the provider to these regulations. In particular, attention is drawn to the competence and fitness of the operator [section 1 (d)] and the inspection of the equipment [section 1 (j)]

5.6 Temporal Electrical installations[CR 24], including [EIR] and [EMR]

The requirements of these regulations shall be met as required, by the appointed electrical contractor. A competent person will be appointed for inspection and control of all temporary electrical installations as per CR 24 (d) and (e) respectively.

5.7 Water Environments [CR 26]

The requirements of this regulation shall be met.

5.8 Housekeeping [CR 27] including [ERW(6)]

All contractors shall ensure that housekeeping standards as per these regulations shall be maintained at all times.

5.9 Stacking of Materials [CR 28] including [GSR (8)]

All contractors shall ensure that materials are only stored in defined and allocated storage areas and that materials being stored are stacked in accordance with sound stacking principles as per these regulations.

5.10 Fire Precautions [CR 29]

All contractors on site will comply fully with the requirements of this regulation. In particular, the principal contractor will be responsible for the evacuation plan (section (I)) the details of which will be imparted to contractors, visitors etc through the site induction.

5.11 Construction welfare facilities [CR 230]

The principal contractors shall be responsible for implementing this regulation and shall ensure that adequate facilities are provided for the personnel on site in terms of the following:

- Change room facilities
- Sheltered eating area
- Adequate toilets
- Hand wash facility □ Potable water.

No food preparation shall be conducted on site. Eating and drinking will only be permitted in the designated eating areas, which must be provided with adequate seating. Waste bins shall be strategically placed and clearly regularly.

8 Site-specific and Design Risks

Please note: this is not a complete or exhaustive list. The principal contractor is expected to assess all risks to which his employees may be exposed during the construction and/or demolition process, as well as the hazards identified and listed below.

The following jobs or activities are classified as High

- Confined Space Entry
- Excavation
- Construction vehicles and mobile plant
- Traffic accommodation
- Pouring Concrete
- Working at Heights

8.1 Hazard Identification and Risk Assessment Methodology

8.1.1 Baseline Risk Assessment

A Baseline Hazard Identification and Risk Assessment must be carried out during the preliminary stages of the construction/demolition project for the purposes of attempting to reduce the possibility of accidents or ill health occurring.

Taking into account the constraints of time and resources, every effort must be made to identify the hazards and recommend possible solutions. It is not reasonably practicable to expect the baseline risk assessment to identify all hazards, which is why task risk assessments are carried out on site.

8.1.2 Task risk assessment

Once on site, every contractor shall perform task risk assessments, using the baseline risk assessment as a guide.

The Risk Assessment should be reviewed once on site and thereafter after any incident or every one-year period, whichever occurs first. Additional hazards highlighted or a change in the risk factor should have a separate risk assessment carried out and filed.

The Risk Assessment is based on the combination of the CONSEQUENCE and PROBABILITY associated with each hazard.

8.1.3 Definitions

<i>Term</i>	<i>Meaning</i>
HAZARD:	Anything that can cause harm
RISK:	The chance, great or small, that someone will be harmed by the hazard

Consequence (Impact)	(3) Critical (Fatal/Permanent Disabling Injury)	(3) Medium risk	(6) High risk	(9) CRITICAL
	(2) Major (Temporary Disabling Injury)	(2) Low risk	(4) Medium risk	(6) High risk
	(1) Manageable (Minor/first aid)	(1) Low risk	(2) Low risk	(3) Medium risk
		(1) Remote (<10%)	(2) Possible (10-50%)	(3) Likely (>50%)
		Probability (Likelihood)		
CONSEQUENCE:		The possible outcome of an accident / incident, e.g. broken leg, explosion		
PROBABILITY:		The possibility of the accident / incident occurring		

8.1.4 Risk assessment

The following evaluation must be used to determine risk:
Probability X Consequence = RISK

Risk Matrix:

RED = High Risk (6 – 9)
ORANGE = Medium Risk (3 – 4)
GREEN = Low Risk (1 – 2)

Activity	Hazard	Risk Eval.	Precautions and Control Measures
			<ol style="list-style-type: none"> 1. Eliminate the risk 2. Control the risk at its source 3. Follow a safe working procedure 4. Provide PPE
1. describe task	Hazard 1	9, 6, 4, 3, 2, or 1	<ul style="list-style-type: none"> • Precaution 1 • Precaution 2 □ Etc.

	Hazard 2		<ul style="list-style-type: none"> • Precaution 1 • Precaution 2 □ Etc.
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8.2 Site-specific risks

The following site-specific risks have been identified for this project. These must be catered for in the contractor's health and safety plan (that which is applicable to their scope of work), and included in the sitespecific risk assessment:

8.2.1 Traffic – restrictions, existing systems, site traffic Traffic accommodation must be arranged with the principal agent.

8.2.2 Site security and access –
 This is controlled by the individual contractor responsible.

8.3 Design risks

The following design risks have been identified by the designer for this project. These must be catered for in the contractor's health and safety plan (that which is applicable to their scope of work), and included in the site-specific risk assessment:

- 8.3.1** Excavations
- 8.3.2** Traffic Accommodation
- 8.3.3** Vehicle and mobile plants

9 Fines and Penalties

9.1 Minor Health or Safety Transgression

Not wearing PPE; e.g. safety helmet, eye protection, high visibility vests or foot protection. Fine: R1000-00 will be issued to the contractor.

9.2 Serious Health or Safety Transgression

Not contributing to good housekeeping practices, improper stacking and storage, lack of supervision on site, failure to carry out risk assessments for tasks or activities, failure to carry out toolbox talks, failure to train employees in risk assessments and/or safe work procedures, failure to issue PPE to employees. Fine: R200000 will be issued to the contractor

9.3 Major Health or Safety Transgression

A life-threatening activity, condition, act or contribution by an employee in creating an unsafe working environment for himself or herself or other persons, failure to wear critical PPE (safety harness, eye protection, respiratory equipment, or as stipulated in the risk assessment). Fine: Up to R3000.00 will be issued to the contractor

9.4 Repeat Offences

A contractor that receives more than three (3) major transgressions for the same offence and may, at the discretion of the project manager, be required to leave site

ANNEXURE A (Notification of Intention to Commence Construction Work)

ANNEXURE 2

NOTIFICATION OF CONSTRUCTION WORK
Regulation 4 of the Construction Regulations, 2014

1. (a) Name and postal address of principal contractor: (b) Name and telephone number of principal contractor's contact person:
2. Principal contractor's compensation registration number:
3. (a) Name and postal address of client: (b) Name and telephone number of client's contact person or agent:
4. (a) Name and postal address of designer(s) for the project: (b) Name and telephone number of designer's contact person:
5. Name and telephone number of principal contractor's construction manager on site appointed in terms of regulation 8(1):
6. Name/s of principal contractor's sub-ordinate manager on site appointed in terms of regulation 8(2):
7. Exact physical address of the construction site or site office:
8. Nature of the construction work:
9. Expected commencement date:
10. Expected completion date:
 1. Estimated maximum number of persons on the construction site:
☐ Total _____ Male _____ Female _____
☐
12. Planned number of contractors on the construction site accountable to principle contractor:
13. Name(s) of contractors already chosen:

Principal contractor

Date

Client

Date

ANNEXURE B (Example: Appointment - Construction Supervisor)

APPOINTMENT OF A CONSTRUCTION MANAGER

CONSTRUCTION REGULATION 8 (1)

8(1) The contractor shall appoint a full time, competent employee in writing as the construction supervisor with the duty of supervising construction work

APPOINTMENT

I, _____ (contractor's name), having been appointed in terms of section 16 (2) of the Occupational Health and Safety Act (85 of 1993) to ensure full compliance with the Act, do hereby appoint:

_____ (name of appointee), being a full-time employee, as the **Construction Manager** responsible for:

_____ (site address)
,to supervise construction work for the duration of the project/ contract or until you are relocated to another site/ project or leave the employ of the company.

You are reminded that you are required to be conversant with all relevant statutory provisions and regulations of the Occupational Health and Safety Act (85 of 1993) in the regard to carrying out of construction work.

Signature _____ Date _____

Designation _____

ACCEPTANCE

I, _____ (name of appointee) hereby accept and understand the requirements of this appointment as **Construction Manager** and confirm that I have the necessary competence required and that I am conversant with all the relevant statutory provisions of the Occupational Health and Safety Act (85 of 1993).

Signature _____ Date _____

Designation _____

Certificate(s) Training&CV _____

ANNEXURE C Inspection List

Inspections Required

PART C4: SITE INFORMATION
 BID No: ALMT10/2023 - EMANZANA WASTEWATER TREATMENT PLANT UPGRADE – CIVIL
 ENGINEERING WORKS

No.	Inspection	By who	Frequency	Record
1	Excavations	Appointed Person	Daily before shift, plus other	Checklist
2	Construction Vehicles and Mobile Plant	Appointed Person	Daily	Inventory/ checklist
3	Electrical Installations (temporary)	Appointed Person	Weekly	Inventory/ checklist
4	Fire Equipment	Appointed Person	Manufacturer's spec	Inventory/ checklist
5	First Aid Box Contents	First Aider	Monthly	Inventory
6	Ladders	Competent Person	Monthly	Inventory/ checklist
7	Lifting Tackle	Appointed Person	3- monthly	Inventory/ checklist
8	Hand Tools	Appointed Person	Monthly	Inventory/ checklist
9	Portable Electrical Equipment	Appointed Person	Monthly	Inventory/ checklist
10	Health & Safety Rep	H&S Rep/ Safety Officer	Monthly	Checklist
11	Good Housekeeping	H&S Rep/ Safety Officer	Monthly	Report
12	Stacking and Storage	Appointed Person	Monthly	Report
13	Change Rooms and Toilets	H&S Rep/ Safety Officer	Monthly	Inventory/ checklist
14	Pneumatic Tools	Appointed Person	Monthly	Inventory/ checklist

PART C4: SITE INFORMATION
BID No: ALMT10/2023: EMANZANA WASTEWATER TREATMENT PLANT UPGRADE – CIVIL
ENGINEERING WORKS

ANNEXURE D (Recording and Investigation of Incidents)

CONTRACT t	OCCUPATIONAL HEALTH AND SAFETY ACT, 1993 (ACT NO 85 OF 1993) REGULATION 9 OF THE GENERAL ADMINISTRATIVE REGULATIONS Site Information RECORDING AND INVESTIGATION OF INCIDENTS A. RECORDING OF INCIDENT
	<div style="display: flex; justify-content: space-between;"><div>1. Name of Employer _____</div><div>2. Name of affected person _____</div></div>
	B. INVESTIGATION OF THE ABOVE INCIDENT BY A PERSON DESIGNATED THERETO
	<div style="display: flex; justify-content: space-between;"><div>1 Name of investigator _____</div><div>2 Date of investigation _____</div></div> <div>3 Designation of investigator _____</div>
C Pa	<div style="display: flex; justify-content: space-between;"><div>INTRA C4-68 r t C4: Site Information</div><div>CT</div></div> <div>4 Short Description of incident _____</div>

ANNEXURE E (Section 37(2) – Agreement with Mandatory)

AGREEMENT WITH MANDATORY

OCCUPATIONAL HEALTH AND SAFETY ACT, (Act No 85 of 1993)

AGREEMENT WITH MANDATORY In terms of Section 37(1) and (2)

WRITTEN AGREEMENT ENTERED INTO AND BETWEEN

(Hereinafter referred to as the Company) AND

CONTRACTOR

(Hereinafter referred to as The Contractor) Compensation Fund Number:

AGREEMENT WITH MANDATORY TO BE COMPLETED IN BLACK INK. INITIAL EACH PAGE AND ANY CHANGES.

Definition of MANDATORY

Includes an agent, a contractor or sub-contractor for work, but without derogating from his status in his own right as an employer or user.

Occupational Health and Safety Act (No. 85 of 1993)

1. You are requested to, as far as you reasonably can, comply with the requirements of the OHS ACT and Regulations.
2. Your attention is drawn to “**General Duties of Employers to their Employees**” as required by Sect 8 of the Act.
3. You are required to:
 - 3.1 Sign a written “**Agreement with Mandatory**” as required by Sect 37(1)(2) of the Act with us before you commence any work on my / our premises / site.
 - 3.2 Provide the **client / principal contractor** with a documented health and safety plan.
 - 3.3 Provide the **client / principal contractor** with written appointment of the person who is going to supervise the construction work as per Construction Regulation 6(1).

Note: Electrician to provide copy of certificate of registration as per Elect. Install Reg. 9(3).

PART C4: SITE INFORMATION
BID No: ALMT10/2023: EMANZANA WASTEWATER TREATMENT PLANT UPGRADE – CIVIL
ENGINEERING WORKS

- 3.4 Provide the **client / principal contractor** with written designation of your nominated Health and Safety Representative as per Sect 17(1).
- 3.5 If you employ more than five (5) persons, you are required to provide your own First Aid Box. (General Safety Regulation 3 (2).)
- 3.6 If you employ more than ten (10) persons, you are required to provide your own qualified First Aider as per General Safety Regulation 3(4).
- 3.7 When working with hazardous chemical substances, comply with Hazardous Chemical Substances Regulation
3. *Note: Asbestos and Lead regulations are separate.*
- 3.8 When using a Materials Hoist , comply with Construction Regulation 17.
- 3.9 When using Lifting Machines and Lifting Tackle, comply with Driven Machinery Regulation 18.
- 3.10 When using Explosive Powered Tools, comply with Construction Regulation 19.
- 3.11 When using Scaffolding, Formwork and support work, comply with Construction Regulation 10 and 14.
- 3.12 When Excavating or Demolishing, comply with Construction Regulation 11 and 12.
- 3.13 When Welding, Flame Cutting, Soldering, comply with General Safety Regulation 9.
- 3.14 When working in confined spaces, comply with General Safety Regulation 5.
4. You are responsible for providing your own **legal safety documents and registers** to comply with the Act's requirements. *A copy of the OHS Act of 1993 should be available in the main contractors office.*
5. You are required to comply with General Safety Regulation 2(1) to (7) and provide employees with: personal protective equipment which will allow them to carry out their work in a safe manner, e.g. hard hats, safety belts, gloves, safe footwear, eye protection, ear protection, waterproof clothing etc.
5. Reporting of Incidents and Occupational Diseases shall be done as per General Admin. Regulation 6. (Also see Sect 24 of the Act.)

□

Compensation for Occupational Injuries and Diseases Act (No 130 of 1993)

You are required to provide the **client** proof of registration with the Compensation Commissioner/Federated Employer's Mutual within seven (7) days after signing this agreement. Failure to do so would result in the **client** notifying the agent of the Commissioner to investigate and make an assessment of your wage return and the applicable levy you have to pay, which will be liable for a deduction from your monthly progress payments and paid over to the Commissioner. (Copies of proof of payment will be provided to the contractor)
See Section 89(1) of the COID

THE CONTRACT
PART C3: SCOPE OF WORKS
Particular Specifications
Portion 2

PROJECT SPECIFICATIONS PORTION 2: VARIATIONS AND ADDITIONS TO THE SPECIFICATIONS

The following variations and additions to the SANS 1200 and other Standardised Specifications referred to in the last clause of Portion 1 apply to this Contract. The prefix PS indicates an amendment to the referred specification. **This section relates to proposed Mechanical and Electrical Installation to be undertaken by a nominated sub-contractor approved by the Employer and the Employers Agent.**

STATUS

Should any requirement of the Project Specification conflict with any requirement of the standardized and particular specifications, the requirements of the Project Specifications shall prevail.

PSA GENERAL

PSA1 SPECIFICATION DRAWINGS (Clause 2.7)

Specification Drawings may be included in this document as annexure to the Project and Particular Specifications. Where such Specification Drawings depict items and standard structures according to layouts and details differing from those shown in the Standardised Specifications, the layouts and details shown in the annexure to the Project and Particular Specifications shall be adopted.

PSA2 QUALITY (Clause 3.1)

All material used in the Works shall, where such mark has been awarded for a specific type of material, bear the SABS mark. Alternatively, the Contractor shall furnish the Engineer with certificates of compliance of materials, which bear the official mark of the appropriate standard.

PSA2.1 DEFINITIONS

PSA2.1 Definitions

Add the following:

Task	- a quantified activity or operation.
Daily task	- a task that is required to be completed within a working day.
Task remuneration	- remuneration as paid for a completed task or job.
Daily rate	- the remuneration of a day's work.
Daily wage	- see daily rate.

Daily task remuneration - the remuneration for a completed daily task.

Labour-intensive construction - the economically efficient employment of as great a portion of labour as is technically feasible to produce as high a standard of construction as demanded by the specifications and allowed by the funding available, thus the effective substitution of labour for equipment.

(Note: This definition is not Contract specific but applies to the project as a whole. This Contract is a part of such a project).

PSA3 BEACONS AND PEGS (Sub-Clause 5.1.2)

The Contractor shall be responsible for the safeguarding of all survey reference marks and erf boundary pegs.

PSA4 WATCHING BARRICADING, LIGHTING, SIGNAGE AND TRAFFIC CROSSINGS

While the responsibility for the efficient barricading, signage, lighting and watching of all trenches and stacks of material shall rest upon the Contractor, he shall be required to make the following minimum provisions in this respect.

Where a vehicular or pedestrian crossing is required over an open trench, it shall be protected on each side by a stout two-rail fence, at least 1m high, consisting of 150 x 75mm deal vertical set 0.6m into the ground, with 75 x 50 mm rails securely nailed to them. Where deals or board are used as bridges, they must be battened underneath to prevent tipping.

The Contractor shall make available on the site at all times a sufficient number of steel plates at least 2m by 1m by 81mm thick, complete with approved suitably sized barriers at spacing which will accommodate the most likely traffic loading for this area, which may be laid across open excavated trenches to provide bridges for vehicles along the trafficked route of the work as and where this may be considered necessary by the Engineer.

Appropriate signage in accordance with the Local Traffic Authority and at least four lamps must be provided at each trafficked crossing. The spacing between lamps along an open trench running longitudinally in a road shall be not greater than 20 meters, lamps shall be kept in good order and continuously lit from dusk to dawn.

PSA5 SERVICES (Sub-Clause 5.4)

Protection: Where, in the course of excavation, the Contractor shall lay bare any water mains, pipes, cables, telegraph or telephone poles, or any existing structures, these shall be securely shored, shuttered or slung and sufficiently protected to ensure that no damage shall be done to them until filling has been placed around them. In the case of electric and telephone cables, if these shall be exposed in the course of excavation, the Contractor shall not refill the excavation around such cables until the cables have been inspected and passed as intact by their respective owners. (Also refer to Project Specifications PS 10.2 and PSDB3.)

PSA6 GROUND AND ACCESS TO WORKS (Sub-Clause 5.8)

While the accompanying plan shows the routes of the services and generally indicates the roads available, it does not purport to give full information with regard to the most suitable means of access to the Site. At all times during the execution of the Contract, the Contractor shall be responsible for the closing of all gates and for the proper protection of property of every description which may have been entered upon or interfered with in any way by him in carrying out the Works. All fences and other structures that have been damaged or interfered with by the Contractor shall be restored to a condition at least equivalent to their original condition.

PSA7 SITE CORRESPONDENCE

PSA7.1 Instructions by the Engineer

Site instructions by the Engineer, addressed to the Contractor at his office on the Site, will be numbered consecutively and will be deemed to have been received by the Contractor's Representative unless a break in the sequence of numbers is brought to the notice of the Engineer in writing immediately.

PSA7.2 Site Diary

A site diary, which will be supplied by the Engineer, must be filled in on a daily basis and submitted to the Engineer on a monthly basis. No claims will be considered without the site diary's schedule properly completed (on a daily basis) and submitted.

PSA8 SITE MEETINGS

The Contractor and his authorised representative shall attend all meetings held on the Site with the Employer and the professional team at dates and times to be determined by the Engineer. Such meetings will be held to evaluate the progress of the Contract, and to discuss matters pertaining to the Contract which any of the

parties represented may wish to raise. It is not the intention to discuss day-to-day technical matters at such meetings.

PSA9 SUMS STATED PROVISIONALLY (Clause 8.5)

PSA9.1 Contingencies

No percentage mark-up will be applicable to any payments made using contingency money other than those included in prices for variations determined in terms of Clause 37 of the Conditions of Contract.

PSA9.2 Contract Price Adjustment

As per formula in Conditions of Contract.

PSA9.3 Electric and Telkom Cables

A provisional sum has been included in Schedule 1 for reimbursement (if any) of the applicable authority for repair work or relocation of electric or Telkom cables in the event of such being required due to the construction of the civil works. In addition to the abovementioned amount, provision is made in Schedule 1 for a mark-up on any payments made by the Contractor in this regard. The mark-up shall be regarded as full compensation for overheads, charges and profits as provided for in Clause 45 of the Conditions of Contract.

PSPM 1 Mechanical Equipment

Details of all the mechanical equipment to be installed, on the contract is given in this section. Details given are amongst others:

- Size, capacity, production etc;
- Materials of manufacture;
- Operational procedures; etc

PSPM 2 General

The mechanical contractor to be appointed for this project will be responsible for the scope of works as described in the scope of works.

PSPM 3 INFORMATION

PSPM 3. 1 Information to be submitted with the Tender

Tenders shall supply all information and technical data specified in the particular Specifications for mechanical equipment. All information sheets have to be completed. As much as possible information to evaluate the equipment, and the suitability of the equipment to fulfil its duty, has to be provided at tender stage. This is the only way to convince the Tender Adjudicator of the quality and the suitability of the proposed plant to meet the design requirements.

PSPM 4 START-UP PROCEDURES

Commissioning of the proposed plant is described in Particular Specification PM: Mechanical Equipment.

The following has to be added to the start-up procedures:

- The plant will be "dry commissioned" at a pre-determined date. On this occasion, the Contractor shall convince the Engineer that his plant is installed and ready for commissioning;

- Following the dry commissioning, the "wet" commissioning of the plant will be discussed and finalised. The date of "wet" or final commissioning has to be determined to ensure that all contractors still meet their target commissioning dates.

PSPM 5 MEASUREMENT AND PAYMENT

PSPM 5.1 Preliminary and General

The Preliminary and General items shall be measured and paid for as specified in Clause 8 of SANS 1200A: General.

PSPM 5.2 Measurement of Mechanical Equipment

PSPM 5.2.1 The unit of measurement for the individual items of mechanical equipment shall be as specified in the detail specification of each item.

PSPM 5.2.2 The different items shall generally be included in the Schedule of Quantities for different stages of the Contract, viz:

- Detailed Design, Planning and Drawings
- Manufacture, Supply and Delivery on Site
- Erection, installation, site testing and Commissioning
- Maintenance

PSPM 5.3 Payment for Mechanical Equipment

PSPM 5.3.1 Payment for Detailed Design, Planning and Drawings

This item shall be applicable to all sections.

When an item to be supplied does not require any detail design, planning or drawings, this clause will be regarded as part of PSPM 5.3.2 and falls away.

The tendered rate shall cover all costs of detail design, planning and drawings as specified in Clause PM 2.2 of Particular specification PM: Mechanical

Equipment and may not exceed 15% of the total amount tendered for all items of a specific item of mechanical equipment.

In respect of the amount tendered against the relevant items of the priced Schedule of Quantities, payment will be made as follows:

- (a) 90% (ninety percent) of the amount tendered against each item when the detailed drawings and design details have been delivered to and approved by the Engineer;
- (b) 10% (ten percent) of the amount tendered against each item when the Certificate of completion is issued; and
- (c) 10% (ten percent) Retention Money will be withheld on the above and will be paid out as specified in the Conditions of Contract.

PSPM 5.3.2 Payment for the manufacture, Supply and Delivery on Site at Point of Installation

This item shall be applicable to all sections.

The tendered rate shall cover the cost of manufacture, procurement, supply, loading, offloading, craning in the place of manufacture and on site, transport storage and delivery on the site, including all costs for labour, plant, equipment, tools, consumables attendance, overheads, profit and all other costs to execute all the work as specified in Clause PM 2.3 of the particular Specification PM Mechanical Equipment.

In respect of all amounts tendered against the relevant items of the priced Schedule of Quantities, payment will be made as follows:

- (a) 90% (ninety percent) of the amount tendered against each item when the equipment and materials under each item have been delivered to the site, including copies in triplicate of Packing lists, Shipping Documents as referred to in the Special Conditions of Contract and Consignment Notes, railing or transport specifications all to the satisfaction of the Engineer;
- (b) 10% (ten percent) of the amount tendered against each item when the Certificate of Completion is issued; and
- (c) 10% (ten percent) Retention Money will be withheld on the above and will be paid out as Specified in the Conditions of Contract.

PSPM 5.3.3 Payment for the Erection, Installation, Testing on Site and Commissioning

This item shall be applicable to all sections.

The tendered rate shall cover the costs of loading, offloading, storage on site, transport on site, hoisting, erection, installation, painting, grouting, liaison, testing on site, commissioning and production of both the draft and final Operation and Maintenance manuals, as well as maintenance, if no separate item is scheduled, including all cost as for labour, plant, equipment, tools, consumables, attendance, overheads, profit, additional site visits and all other costs to execute all the work as specified in Clause PM 2.4 of Particular Specification PM : Mechanical Equipment. The tendered rate shall not be less than 20% of the total amount tendered for all the items of a specific piece of mechanical equipment.

In respect of the amounts tendered against the relevant items of the priced Schedule of Quantities, payment will be made as follows:

- (a) in respect of the amounts tendered against each item in accordance with the progress of the work on a pro rata basis of the value of the work carried out to the total value of the work in completion of such other basis as the Engineer may determine up to a maximum of ninety (90) per cent of the amount tendered against each item on completion of Site testing;
- (b) ten (10) percent of the total amount tendered against each item when the Certificate of Completion is issued; and
- (c) ten (10) percent Retention Money will be withheld on the above and will be paid out as specified in the Conditions of Contract.

PSPM 5.3.4 Payment for Maintenance

This item will not be applicable to all Sections, but only where itemised in the Schedule of Quantities.

The tendered rate shall cover the cost of all site visits, liaison, labour, plant equipment, tools, consumables, spares (if breakdown is not due to incorrect operation by the personnel of the Employer), attendance, overheads, profit and all other costs to execute the maintenance over the full maintenance Period as Specified in Clause PM 2.5 of specified Particular Specification PM: Mechanical Equipment.

If Maintenance is not itemised separately, the cost of maintenance shall be deemed to be included in the rates for the other items.

C3.5 MANAGEMENT

C3.5.1 Applicable SANS and SABS standards

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
- iii) SANS 1921-4, Third party management support
- iv) SANS 1921-5, Earthworks activities which are to be performed by hand
- v) SANS 1921 -6, HIV/AIDS Awareness

The abovementioned South African National Standards make several references to the Specification Data for data, provisions and variations that make these standards applicable to this contract. The Specification Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and these standards.

Each item of Specification Data given below is cross-referenced to the clause in the standard to which it mainly applies.

The associated Specification Data is as follows:

SANS 1921-1, Construction and management requirements for works contracts – Part 1: General engineering and construction works	
Clause	Specification data
Essential data	
4.1.7	There are no requirements for drawings, information and calculations for which the contractor is responsible
4.3.1	Refer to scope of works
4.7.3	No over break allowances for blasting is provided for
4.14.3	Refer to scope of works
4.14.5	The Contractor is required to provide latrine and ablution facilities

SANS 1921-5, Construction and management requirements for works contracts – Part 5: Earthworks activities which are to be performed by hand	
Clause	Specification Data
Essential Data:	
5.1	The depth of trenches which are to be excavated by hand is 1,5 metres
SANS 1921-6, Construction and management requirements for works contracts – Part 6: HIV/AIDS awareness	
4.2.1(a)	A qualified service provider is one that is accredited or a provisionally accredited training service provider in the HIV/AIDS field. A list of accredited service providers can be obtained from the Construction SETA (CETA) (tel 011-265 5900), Health and Welfare SETA (HWSETA) (011-622 6852) or on the Health and Welfare SETA website: www.hwseta.org.za
Additional clauses	
	The duration of each workshop is not to be less than 2 ½ hours.

C3.5.2 Planning and Programming

The time for completion will be 6 months, which includes the allowance for inclement weather. All statutory holidays for the Civil Engineering Industry falling within the authorised contract period, will be allowed as extensions to this period, but the Contractor will not be paid additional Time-Related charges for these days (Ref. PSA 8.4.1).

The Contractor shall submit to the Engineer within 14 days of the Commencement Date, a detailed programme setting out clearly the sequence of work, and the resources, which he intends to use.

C3.5.3 Environment

a) Sand and dust control

The Contractor shall, for the duration of the contract, take appropriate measures to control the dust and soil movement, which may arise due to his operations.

b) Precautions Against Nuisance

Operations are being conducted in an urban area and in the presence of passing traffic. Precautions shall be taken to protect the public and to prevent unnecessary noise, dust or other nuisance.

Any rock or debris falling from trucks on the roads in use by the public shall be removed immediately. Precautions shall be taken to prevent fouling of public roads and completed construction by trucks transporting muddy material. The Engineer may order the Contractor to broom off and clean roads continuously where the mud tracking of vehicles or falling debris may constitute a danger to the travelling public.

c) Silencing of Plant

Plant used on the Works shall be efficiently silenced and comply with the Noise Control By-Laws as appeared in the Administrator's Notice No. 1784 of 29 November 1978. Noise operations will be permitted only between the hours of 7:00 am and 5:00 p.m. Any work outside normal hours will be permitted only on the written authority of the Engineer, laid down in Clause 26 of the General Conditions of Contract.

C3.5.4 Accommodation of Traffic On Public Roads Occupied By The Contractor

The works involves the construction of new roadways and stormwater within an established residential community. The works will be undertaken in such a manner to provide access to residential property accesses and special attention must be drawn to the accommodation/deviation of traffic on the affected area of the works.

The need to accommodate the traffic safely and with the least amount of inconvenience to the travelling public is necessary throughout the construction period. 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.

Failure to maintain road signs, warning signs or flicker lights, etc, in a good condition shall constitute ample reason for the Engineer to stop the execution of the works until the road signs, etc, have been repaired to his satisfaction. The Contractor may not commence constructional activities before adequate provision has been made to accommodate traffic in accordance with the specifications.

C3.5.5 Testing, Completion, Commissioning, and Correction of Defects

Materials of work that do not conform to the approved samples submitted in terms of the General Conditions of Contract will be rejected. The Engineer reserves the right to submit samples to tests, to ensure that the material represented by the samples meet the specification requirements.

The onus to produce work that conforms in quality and accuracy of detail to the requirements of the specifications and drawings rests with the Contractor, and the Contractor shall at his own expense, institute a quality control system and provide experienced engineers, foremen, surveyors, material technicians, other technicians and technical staff, together with all transport, instruments and equipment to ensure adequate supervision and positive control of the Works at all times.

The costs of supervision and process control, including testing carried out by the Contractor, will be deemed to be included in the rates tendered for the related items of work.

The Contractors attention is drawn to the provisions of the various Specifications regarding the minimum frequency of testing required. The Contractor shall at his own discretion increase this frequency where necessary to ensure adequate control.

On completion and submission of every part of the work to the Engineer for examination, the Contractor shall furnish the Engineer with the results of the relevant tests to indicate compliance with the specifications.

C3.5.6 Recording Of Weather

Daily temperature and rainfall data shall be recorded in the site diary, and a copy shall be provided to the engineer's representative on a weekly basis. A rainfall gauge shall be located at the contractor's site camp. Temperature readings shall be taken at commencement and closure of the site on a daily basis. Additional readings will be required during construction of layer works, concrete works and surfacing.

C3.5.7 Format of Communications

Communication throughout the contract will be undertaken via written communication either by fax, site instruction or post. Email communication will only be considered as proof of communication when followed up by a written communication on the letterheads of the author or via a site instruction.

Request for inspection of the works will be accepted telephonically, however this request must be recorded in the site diary and site instruction book.

C3.5.8 Key Personnel

A schedule of key personnel to be employed with curriculum vitae of relevant experience shall be provided to the employers' representative prior to site handover.

C3.5.9 Management Meeting

The Engineer will conduct site meetings, prepare and circulate minutes, as determined by him at the beginning of the contract. The Contractor shall attend these meetings and shall ensure that when necessary, the required sub-contractor is represented. The approved minutes shall become part of the contract documents.

The Contractor shall be required to conduct safety meetings at intervals agreed to between the Employer or his Safety Agent and the Contractor as specified in the Health and Safety Specification bound in this document.

C3.5.10 Payment Certificates

The contractor shall submit to the engineer after the end of each month a statement in the required format, showing the estimated amount due to him, calculated in accordance with the General Conditions of Contract. The statement to be submitted by the contractor shall consist of 2 copies of the schedule of quantities.

C3.5.11 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.

C3.5.12 Site Visitors Book

A Site Visitors Book must be kept on site. All visitors visiting to the site must report to the site office and sign in the Site Visitors book before entering the construction site. The Agent and/or the Safety Officer must always accompany the Visitor. The Visitor must wear a hard hat, safety shoes and safety clothing when required.

C3.5.13 Information In Respect Of Plant

Information relating to plant on Site shall be recorded in the Daily Site Diary. In addition, the Contractor shall deliver to the Engineer, on a monthly basis, a detailed summary of construction plant kept on the Site, full particulars given for each day of the month. Distinction shall be made between plant in working order and plant out-of-order. Such inventory shall be submitted by the first day of the month following the month to be reported.

C3.5.14 Information In Respect Of Employees

Information relating to labour and management on Site shall be recorded in the Daily Site Diary, in addition, the Contractor shall deliver to the Engineer, on a monthly basis, a detailed summary of supervisory staff, labour employed (own and local labour) by category, and sub-contractors (both local and imported) for each day of the month. Such return shall be submitted by the first day of the month following the month to be reported.

PART C4 : SITE INFORMATION

C4 SITE INFORMATION

C4.1 Nature of Ground

The regional geology consists of located sediments of the Eccu Group that is part of the Karoo Supergroup. The sediments consist of shales, mudstones and sandstones. The information given is intended as a guide to the Tenderer, who must make his own independent assessment as to the nature of the ground conditions.

The Tenderer will be permitted to excavate trial holes in the area of the works at his own expense provided that they are properly safeguarded and reinstated. Should the Tenderer wish to excavate his own trial holes; he shall first ascertain, in conjunction with the Engineer, the position of any underground services, which may exist in the area. The Tenderer shall indemnify the Municipality against the cost of repairing any underground services damaged by the Tenderer or his agents, while carrying out such excavations.

C4.2 Spoil Material

No indiscriminate spoiling of material will be allowed. All unsuitable or surplus material shall be spoiled off site to a spoil site/municipal dump, chosen by the Contractor.

C4.3 Finishing – off the Site

The site shall be finished-off in accordance with the specifications as well as to the requirements of all applicable environmental standards.

C4.4 Existing Services

Although every effort has been made to depict existing services (water mains, electric cables, telephone cables etc.), as accurately as possible on the contract drawings, insofar as they are known, variations do arise and the Contractor shall exercise extreme care when working in the area. Items have been allowed in the Schedule of Quantities for dealing with and protecting services.

The Contractor shall take whatever precautions are required to protect these services from damage during the period of the Contract.

C4.5 Proving of Underground Services

It is stressed that all services in a particular area must be proven before commencing work in that area.

Insofar as bulk earthworks are concerned, where services are indicated on the drawings or where from site observations can reasonably be expected that such services are likely to exist where excavations are to take place, the Contractor shall without instructions from the Engineer carefully excavate by hand to expose and prove their positions.

When a service is not located in its expected position the Contractor shall immediately report such circumstances to the Engineer who will decide what further searching or other necessary action is to be carried out and shall instruct the Contractor accordingly.

Should any service be damaged by the Contractor in carrying out the works, and should it be found that the procedure laid down in this clause has not been followed than all costs in connection with the repair of service will be to the Contractors account.

Proving of services shall be completed at least two weeks in advance of the actual programmed date for commencing work in the area. The position of these services located must be co-ordinated and levelled by the Contractor, and the information given in writing to the Engineer's representative.

The requirements of this clause do not relieve the Contractor of any obligations as detailed under the General Conditions of Contract or the Special Conditions of Contract.

PART C5 : DRAWINGS

C5.1 SCHEDULE OF DRAWINGS

SCHEDULE OF TENDER DRAWINGS

The following drawings included Under Part C5 as attached, form part of this Contract in terms of Clause 2.1 of the General Conditions of Contract. The drawings issued to tenderer's must be regarded as provisional and preliminary for the tenderer's benefit to generally assess the scope of work.

LIST OF CONTRACT DRAWINGS		
DRAWING NO.	DESCRIPTION	STATUS
J079-L1	Locality Map	Tender Drawing
J168 -D01	Emanzana WWTW Site Plan	Tender Drawing
J168 -D02	Inlet Works Details	Tender Drawing
J168 -D03	Clarifier Details	Tender Drawing
J168 -D04	Bioreactor Details (Sheet 1 of 2)	Tender Drawing
J168 -D04	Bioreactor Details (Sheet 2 of 2)	Tender Drawing
J168 -D05	RAS Pump station Details	Tender Drawing
J168 -D06	Sludge Drying Beds	Tender Drawing
J168 -D06	WAS, Clarifier-Bioreactor Drainage and Sludge Drying Beds Pump station (Sheet 1 of 2)	Tender Drawing
J168 -D07	WAS, Clarifier-Bioreactor Drainage and Sludge Drying Beds Pump station (Sheet 2 of 2)	Tender Drawing
J168 -D08	Chlorine Building	Tender Drawing
J168 -D09	Control Building Details	Tender Drawing
J168 -D10	Metal Work (Sheet 1 of 2)	Tender Drawing
J168 -D10	Metal Work (Sheet 2 of 2)	Tender Drawing
J168 -D11	Pump station Crawl Beam Assemble Detail	Tender Drawing
J168 -D12	Standard Details (Sheet 1 of 2)	Tender Drawing
J168 -D12	Standard Details (Sheet 2 of 2)	Tender Drawing
J168 -D13	Site Office Plan	Tender Drawing
J168 -D14	Name board Details	Tender Drawing
J079-L1	Locality Map	Tender Drawing

The Tenderer shall satisfy him/herself that the set of drawings is complete in accordance with the above schedule, and if any are found missing or duplicated, or the writing or figures indistinct, he/she shall apply to the Engineer immediately and have the discrepancy rectified.

The tenderer's attention is brought to clause 2.4 in the Contract Specific Data pertaining to the ambiguity or discrepancy between the documents.

No liability whatsoever will be admitted by the Employer in respect of errors in tenders attributed to any such discrepancy.

ANNEXURE A:

TENDER STAGE DRAWINGS