uTHUKELA DISTRICT MUNICIPALITY

TENDER DOCUMENTATION

AMANGWE WATERWORKS, RISING MAIN AND HIGH LIFT PUMPS

CONTRACT NO: 25/2025-CON

TENDERER'S DETAILS:

Company / Firm Name:

Address:

Phone No:

Fax No:

Cellular No:

E-mail Address:

Contact Person:

Tender Amount

(inclusive of VAT):

Prepared by:

CONSULTING ENGINEER:

OWETHU OWABO CONSULTING (PTY) LTD
CIVIL ENGINEERING CONSULTANTS

OWETHU OWABO CONSULTING (PTY) LTD
8 ENGLISH ROAD, CHASE VALLEY
PIETERMARITZBURG, 3201
Tel: 031 350 3444 Cell: 082 969 4491
Email: allison@owethuowabo.co.za

IN ASSOCIATON WITH:

JG AFRIKA
EXPERIENCE QUALITY INTEGRITY

JG AFRIKA (PTY) LTD
6 PIN OAK AVENUE, HILTON, 3245
Tel: 033 343 6700 Fax: 033 343 6701
Email: allison@owethuowabo.co.za

Supported by:

EXPANDED PUBLIC WORKS PROGRAMME
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mig Municipal Infrastructure Grant

CHECK-LIST FOR TENDER SUBMISSION

The Tenderer is to indicate in the check-boxes provided that he has completed the required section of the tender document. Completion of this check-list will assist the Tenderer in ensuring that he has attended to all the required items for submission with this tender.

Section	Description	Completed		For office use		
		yes	no	yes	no	Comments
Cover Page	Name of tenderer					
	Contact Details					
	Tender Sum					
Section T1.3 Municipal BID Documents / Preferential Procurement Policy	MBD 1 Part A – Invitation to BID; MBD 1 Part B – Terms and Conditions for Bidding					
	MBD 2 – Tax Clearance Certificate Requirements					
	MDB 3.1 – Pricing Schedule – Firm Schedule					
	MBD 4 – Declaration of Interest					
	MBD 5 – Declaration of Procurement above R 10 Million (All applicable Taxes included)					
	MBD 6.1 – Preference Points Claim Form in terms of Preferential Procurement Regulations 2022					
	MBD 8 – Declaration of Bidder's Past Supply Chain Management Practices					
	MBD 9 – Certificate of Independent BID Determination					
Section T2.2 Returnable Schedules	Compulsory Site Inspection Certificate					
	Relevant Experience					
	Curriculum Vitae of Key Personnel					
	Schedule of Plant and Equipment					
	Schedule of Sources of Supply of Material					
	Alterations by Tenderer					
	Proposed Sub-Contractors					

Section	Description	Completed		For office use		
		yes	no	yes	no	Comments
Section T2.2 Returnable Schedules	Authority of Signatory					
	Contractor's Health and Safety Declaration					
	Contractor's Certificate of Registration with CIDB					
	Contractor's COID Registration Details					
	Tax Clearance Certificate					
	Tenderers Financial Standing					
	Form of Intent to Provide a Performance Guarantee					
	VAT Registration Certificate					
	Company Registration Certificate and Shareholding Details					
	Copies of Directors'/Members' Identity Documents					
	Preliminary Programme and Cashflow					
	Record of Addenda to Tender Document					
	Compulsory Enterprise Questionnaire					
	Joint Venture Agreement					
	Current Commitments Schedule					
	Good Standing with Municipal Accounts					
	Proof of Labour-Intensive Proficiencies					
	BBBEE Certificate					
	Database Registration					
C1.1	Form of Offer					
C1.2	Contract Data (Part 2)					
C2.2	Bill of Quantities					
C5.1.2	Health and Safety Contract between Employer and Contractor in terms of Section 37(2)					
C5.1.3	Occupational Health and Safety Indemnity Undertaking					
C5.1.4	Agreement on Occupational Health and Safety					

CONTENTS OF DOCUMENT

TENDERING PROCEDURES

C O N T E N T S

T1.1: TENDER NOTICE AND INVITATION TO TENDER

UTHUKELA DISTRICT MUNICIPALITY: INVITATION TO TENDER

AMANGWE WATERWORKS, RISING MAIN AND HIGH LIFT PUMPS

TENDER NO. 25/2025-CON

Tender Ref No.	Tender Name & Details	CIDB Grading Requirements
25/2025-CON	**Interested contractors with appropriate experience are invited to submit tenders for with appropriate experience are invited to submit tenders for The Amangwe Waterworks, Rising Main, and High Lift Pumps** **The works consists of the following:** - **Approximately 2.1km of steel bulk water rising mains and associated pipeline infrastructure** - **Approximately 800m of uPVC interlinking pipelines** - **Re-routing and remedial measures for approximately 200m of 250mm dia existing steel pipeline** - **Civil and Structural Works for the Water Treatment Works (Package Plant)** - **Supply and install a floating roof for the existing top pond** - **Remedial works to the concrete panel joints in existing ponds** - **Gravel access roads and associated stormwater drainage** - **Electrical and mechanical works for the high lift pump station (1 set of duty / standby pumps), and a 1,8Ml/day package water treatment works** - **Electrical ducting and cabling** - **Security fencing**	**7CE or higher**

The employer for this contract is uThukela District Municipality. The objective of the Employer is to employ the principles of Labour-Intensive Construction Methods as set out in the EPWP Guidelines.

Only tenderers who employ staff which satisfy EPWP requirements, and who are registered with the CIDB, or are capable of being registered prior to the evaluation of tenders, in a contractor grading equal to or higher than a grading of **7CE**, will be eligible to tender.

Tender documents will be available at the Cashier's office, uThukela District Municipality, 36 Lyell Street, Ladysmith, at a non-refundable **cost of R600.00** per document, from **24th March at 08h00** until **25th March 2025 at 16h00**. **NO DOCUMENTS WILL BE SOLD AFTER 25TH MARCH 2025.**

Tender documents will also be available at the Site Briefing Meeting but subject to payment being made prior to the meeting. **Documents will only be issued at the Site Briefing Meeting if proof of payment has been submitted to the Engineer to reserve a document before 12h00 on 24th March 2025.**

A **compulsory** Site Briefing Meeting and inspection will be held on **26th March 2025 at 10h00.** Non-attendance at the site inspection will result in the immediate disqualification of your tender.

Tenderers are to meet at the Loskop Water Treatment Works. Directions are as follows:

- From the N3 take exit ramp 179 signposted "Estcourt (North) and Loskop".
- Travel along MR10 towards Loskop for 24 km, turn left at the Injasuthi sign post.
- Follow the Injasuthi Road for approximately 500m, the Water Treatment Works is to the right of the road. (Latitude 28° 56' 34.8" South and Longitude 29° 34' 55.3" East.)

All queries relating to the issue of this document may be directed to Mr Q Shinga on 033 343 6700 or via email: Shingaq@jgafrika.com and all technical queries may be directed to Ms. A. Maud on 033 343 6700 / 082 969 4491 or via email: allison@owethuowabo.co.za

Sealed tenders endorsed "**TENDER No. 25/2025: AMANGWE WATERWORKS, RISING MAIN AND HIGH LIFT PUMPS"**, must be deposited in the tender box of the **uThukela District Municipality, 36 Lyell Street, Ladysmith by no later than 12 noon on 24th April 2025** where they will be opened in public.

It is the Tenderer's responsibility to check the document on receipt for completeness and to notify the Employer of any discrepancies or omissions. It is the Tenderer's responsibility to provide all the data and information requested completely and, in the form required. Failure to do so may result in the tender being regarded as non-responsive by the Employer.

uThukela District Municipality subscribes to the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000) and its Preferential Procurement Regulations. In terms of Regulation 6, the 80/20 preference point system will be applicable, with 80 points for Price and 20 Points for Specific Goals as per the table below. In terms of the revised Preferential Procurement Regulation in effect from 16 January 2023 Gazette Notice No.47452 dated 04 November 2022.

Specific Goal Points to be allocated as follows:

The specific goals allocated points in terms of this tender	Number of points allocated
Price	80
Specific goals (20 Points):	
Race - 100% Black Owned	5
Gender - 100% women Owned	5
Disability	5
Locality-office based in uThukela District	5
Total points for price and specific goals	**100**

All compliant tenderers are first required to pass a functionality assessment, which they must pass with more than 70% before proceeding to the 80/20 assessment.

All service providers intending to submit a tender are required to be registered on the Central Suppliers Database. Tenderers shall take note of the following Tender Conditions:

- uThukela District Municipality's procurement policy will apply;
- uThukela District Municipality does not bind itself to accept the lowest tender or any other tender and reserves the right to accept the whole or part of the tender;
- A Performance Guarantee of 10% of the Contract Value will be required on this contract;
- The Single Envelope System shall apply;
- Tenders submitted are to be valid for a period of 90 days from the closing date for submission of tenders.

LS Jili
Municipal Manager

T 1.2.2 TENDER DATA

SUB CLAUSE	DATA

The Conditions of Tender included in Section T1.2.1 are the Standard Conditions of Tender as contained in Annexure F of SANS 294:2004 - Construction Procurement Processes, Methods and Procedures. These Standard Conditions of Tender for procurement make several references to the Tender Data for details that apply specifically to this tender.

The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the Standard Conditions of Tender. Each item of data given below is cross-referenced to the relevant clause in the standard conditions of tender to which it mainly applies.

Clauses Prefixed by F1 highlight General Obligations
Clauses Prefixed by F2 highlight Tenderer's Obligations
Clauses Prefixed by F3 highlight Employer's Obligations

Each item of data given below is cross-referenced to the sub clause in the standard conditions of tender to which it mainly applies.

F1 GENERAL

F.1.1 The employer is :

UTHUKELA DISTRICT MUNICIPALITY

36 Lyell Street,

Ladysmith, 3370

F.1.2 **Tender Documents**

The tender documents issued by the employer comprise :

TENDER

T1: Tendering Procedures

T1.1 Tender notice and invitation to tender

T1.2 Tender data

T1.3 Preferential Procurement Policy

T1.4 Standard Conditions of Tender

T2: Returnable Documents

T2.1 List of returnable documents

T2.2 Returnable schedules

CONTRACT

Part 1: Agreements and contract data

C1.1 Form of offer and acceptance

C1.2 Contract data

C1.3 Forms of Security

Part 2: Pricing data

C2.1 Pricing instructions

C2.2 Bill of Quantities

Part 3: Scope of work

C3.1 Scope of work

C3.2 Drawings

Part 4: Site information

C4.1 Site information

Part 5: Annexures

C5.1 Annexures

Tender documents will be available at the Cashier's office, uThukela District Municipality, 36 Lyell Street, Ladysmith, at a non-refundable cost of R600.00 per document, from 24th March at 08h00 until 25th March 2025 at 16h00. Tender documents will also be available at the Site Briefing Meeting but subject to payment being made prior to the meeting. Documents will only be issued at the Site Briefing Meeting if proof of payment has been submitted to the Engineer to reserve a document before 12h00 on 24th March 2025.

F.1.4 The Employers Agent is:

Name: **OWETHU OWABO CONSULTING**

Address: **8 English Road, Kingston Park, Pietermaritzburg, 3201**

Postal: **P O BOX 1824, HILLCREST, 3610**

Tel: **031 350 3444**

The Owethu Owabo representative is Ms Allison Maud

Cell: **082 969 4491**

E-mail: allison@owethuowabo.co.za

In association with:

Name: **JG AFRIKA**

Address: **P O BOX 794, HILTON, 3245**

Tel: **033 343 6700**

Fax: **033 343 6701**

The JG Afrika representative is Mr Qiniso Shinga

E-mail: Shingaq@jgafrika.com

F.2.1 Only those Tenderers who satisfy the following eligibility criteria are eligible to submit tenders:

(a) The tenderer must be compliant in their tax matters with the South African Revenue Services (SARS)

(b) Tenderers must score a minimum of 70 points out of 100 points in respect of the Functionality Assessment;

(c) The tenderer has purchased the tender document and has attended the Compulsory Briefing Meeting, detailing the requirements of the Tender and features that require special attention, confirming that any tender submitted will take into account the instructions detailed therein.

(d) The tenderer has completed and signed the Form of Offer;

(e) The Tenderer submits a letter of intent from an approved insurer undertaking to provide the Performance Guarantee to the format included in Part T2.2 and C5.1 of this procurement document;

(f) The Tenderer has registered on the Central Supplier Database (CSD);

(g) The Tenderer is not in arrears for more than 90 days with municipal rates and taxes and municipal service charges. The latest municipal account is to be attached;

(h) The Tenderer or any of its directors / shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector;

(i) The Tenderer has not:

  (i) abused the Employer's Supply Chain Management System; or

  (ii) failed to perform on any previous contract and has been given a written notice to this effect;

(j) The Tenderer has completed the Declaration of Interest and the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the Tenderer's ability to perform the contract in the best interests of the Employer or potentially compromise the tender process and persons in the employ of the state are permitted to submit tenders or participate in the contract;

(k) The Tenderer is registered and in good standing with the compensation fund or with a licensed compensation insurer;

(l) The Tenderer must submit a copy of a joint venture agreement (if applicable);

(m) The Tender offer is signed by a person authorised on behalf of the Tenderer;

(n) The Tenderer has completed and signed all returnable documents where relevant;

(o) The tenderer submitting the tender shall not be insolvent, in receivership, bankrupt or being wound up, have their affairs administered by a court or judicial officer, have suspended their business activities, or be subject to legal proceedings. Refer Returnable Form L: Tenderer's Financial Standing and Position Declaration;

(p) The tenderer is required to submit his Financial Standing and a Bank Rating with this tender. Refer to Returnable Form L: Tenderer's Financial Standing. Tenderers who receive a Bank Rating ≤ D will be disqualified;

(q) The Employer is reasonably satisfied that the Tenderer has in terms of the Construction Regulations, 2014, issued in terms of the Occupational Health and Safety Act, 1993, the necessary competencies and resources to carry out the work safely;

(r) Only those tenderers who employ management and supervisory staff satisfying the requirements of the scope of work for labour-intensive competencies for supervisory and management staff are eligible to tenders. The relevant Curriculum Vitae (CV's)and qualifications are required to be included in Returnable Schedule D: Key Personnel and Schedule.

(s) Only those Tenderers who are registered with the CIDB, in a Contractor grading designation equal to or higher than a Contractor grading designation determined in accordance with the sum tendered for a 7CE class of construction work, are eligible to submit tenders.

Joint ventures are eligible to submit tenders provided that:

(i) every member of the joint venture is registered with the CIDB;

(ii) the lead partner has a Contractor grading designation in the 7CE class of construction work;

(iii) the combined Contractor grading calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a Contractor grading designation determined in accordance with the sum tendered for a 7CE class of construction work;

(iv) when the joint venture is dissolved, the Lead Partner will remain liable in terms of the contract including latent defects. The Lead Partner shall be nominated in the returnable document and shall have at least a 7CE classification. The Lead Member accepts all liability in terms of the Contract and that this liability will continue for 10 years, after Completion of the contract.

(v) included in their tender is a letter from each of the proposed joint venture members stating their undertaking that in the event of the joint venture tender being successful, the said members will enter into a joint venture agreement, which shall be based on and comply with the CIDB Sample Joint Venture Agreement.

F.2.7 The arrangements for the compulsory site inspection meeting are:

Location: Prospective Tenderers shall meet at the Loskop Treatment Works.

Date: 26th March 2025.

Starting time: 10h00

Tenderers must sign the attendance list in the name of the tendering entity. Addenda will be issued to, and tenders will be received only from, those tendering entities appearing on the attendance list.

F.2.8 Add the following:

Accept that failure to request clarification on tender documents in at least 5 working days prior to the closing time stated in the tender data, it shall be deemed that all matters in the tender document are clearly understood. Accept that the Employer or Employers Agent shall not be obligated to respond to any request for clarification of tender documents submitted in less than 5 working days prior to the closing date.

F.2.13 Parts of each tender offer communicated on paper shall be submitted as originals only

F.2.13.5 The employers address for delivery of tender offers and identification details to be shown on each tender offer package are:

Location of Tender Box: **Offices of the Cashier, Ground Floor.**

F.2.15.1 Physical address: **uThukela District Municipality, 36 Lyell Street, Ladysmith.**

Postal address: **P.O. Box 116, Ladysmith 3370.**

Identification details: Sealed tenders endorsed:

"Tender No. 25/2025-CON

AMANGWE WATERWORKS, RISING MAIN AND HIGH LIFT PUMPS

Tenderers Name"

F.2.15 The closing time for submission of tenders is **12h00 on 24th April 2025.**

Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.

Tender documents are not to be handed to staff of uThukela District Municipality or Owethu Owabo Consulting (Pty) Ltd. The Tenderer is to personally deposit the Tender in the Tender Box.

Electronic copies of the Bill of Quantities are not acceptable and only Tender documents that have been completed by hand in black, non-erasable ink, will be accepted.

F.2.16 The tender offer validity period is **90 days** from the tender closing date**.**

F.2.18 The Tenderer shall, when requested by the Employer to do so, submit the names of all management and supervisory staff that will be employed to supervise the labour-intensive portion of the works together with satisfactory evidence that such staff members satisfy the eligibility requirements.

F.2.23 Certificates

All Certificates are listed under Part T2.2 – Returnable Documents

The following certificates must be provided with the Bid:

1. Certificate of Contractor Registration issued by the Construction Industry Development Board.
2. Original Valid Tax Clearance Certificate.
3. Company / CC / Trust / Partnership registration certificates.
4. VAT Registration Certificate.
5. Workmen's Compensation Registration Certificate (or proof of payment of contributions in terms of the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993).
6. Skills Development Levy Certificate.
7. Joint Venture Agreement and Power of Attorney in case of Joint Venture.

F.3.4 The time and location for opening tenders are:

Time: **12h00 on 24th April 2025.**

Location: **UTHUKELA DISTRICT MUNICIPALITY, 36 LYELL STREET, LADYSMITH.**

F.3.7 Add the following clause:

Accept that failure to submit certificates stated in the Tender Data and failure to complete **in full the tender document, shall result in the tender regarded as non-responsive**

F.3.11 Tenders will be evaluated in terms of the Preferential Procurement Policy Framework Act, 2000 (Act 5 of 2000), the Preferential Procurement Regulations 2017 and the CIDB Act 2000 Standard for Uniformity in Construction Procurement as amended in Board Notice 136 of 2015.

All compliant tenderers are first required to pass a functionality assessment, which they must pass with more than 70 points out of 100 points, as per the Functionality Assessment, scored by the uThukela District Municipality, before proceeding to the 80/20 assessment.

The method of evaluation will be: **Method 2: Financial Offer and Preferences where:**

The 80/20 preference point scoring system will be applied with points allocated as follows :

- 80 points are allocated for the price
- 20 points for Specific Goals as per the table below.

The specific goals allocated points in terms of this tender	**Number of points allocated**
Price	80
Specific goals (20 Points):	
Race - 100% Black Owned	5
Gender - 100% women Owned	5
Disability	5
Locality-office based in uThukela District	5
Total points for price and specific goals	**100**

F.3.11.5 **Functionality is evaluated as follows**

Description	**Points**
Previous Experience	20
Financial Resources	20
Experience and Qualifications of Key Personnel	20
Previous Project Performance	40
TOTAL EVALUATION POINTS	**100**

Scoring Quality (Functionality)

Points for quality must be entered here by the **Tenderer based** on the following Quality Scorecards. **Only Tenderers scoring 70 Points** or more for quality will be considered **eligible to tender.**

Tenderers must supply supporting information to prove points claimed where this is not available in the other Returnable Schedules. If supporting information is not provided, points will not be claimed.

Criteria 1: Experience applicable to past 10 years only: Maximum Score = 20

	Tenderer to list **water related projects** which were undertaken as a **main contractor** with a **Contract Value greater than R20 million**. Project listed must be selected from those listed in the Relevant Experience, Form H, in the Returnable Documents Section (T2.1).					**Score***
	Contract	**Value**	**Reference**			
			Name	**Organisation**	**Tel No**	
1.1						
1.2						
1.3						
1.4						
1.5						
					Actual Points Obtained (S1) =	

*Points scored with reference to similar projects

Points will be scored for each water related project that is submitted as per the following:

1 Project = 4 Points
2 Projects = 8 Points
3 Projects = 12 Points
4 Projects = 16 Points
5 projects = 20 Points

Note: * Similar work (or project) means construction of bulk water or water reticulation networks, reinforced concrete reservoirs, pump stations.

Appointment letter and Completion Certificate or Client Reference Letter must be submitted for points to be claimed.

Criteria 2: Financial resources (Bank rating): Maximum Score = 20.

2	Score the bankers rating received (See Form L, of the Returnable Documents) to the listing below.	
	Bank Rating	**Score**
2.1	A - Undoubted for the amount of enquiry	20
2.2	B - Good for the amount of enquiry	15
2.3	C - Good for the amount quoted if applied strictly in the way of business	10
2.3	D - Fair trade for the amount of enquiry	5
2.4	E - Figures considered too high F - Financial Position Unknown G - Dishonour on records H - Frequently Dishonoured	Not eligible to tender
Tenderers bank rating	**Actual Points Obtained (S2) =**	

Criteria 3: Experience of Key personnel: Maximum Score = 20

	Proposed Key Personnel	**Experience***		**Points**
3.1	Project Director / Contracts Manager	Qualified (Y/N)		
		Years of experience		
3.2	Site Agent	Qualified (Y/N)		
		Years of experience		
3.3	Site Supervisor / Foreman	Qualified (Y/N)		
		Years of experience		
3.4	Health & Safety Officer	Qualified (Y/N)		
		Years of experience		
		Actual Points Obtained (S3) =		

*Points allocated for experience

Qualifications for Project Director / Contracts Manager, Site Agent and Site Supervisor / Foreman:
Approved degree or diploma in civil engineering / construction management Yes = 2 point
No= 0 Points

Relevant years of experience in bulk water and reticulation projects:
< 5 Years = 1 Point
5 to 10 years = 2 Points
> 10 Years = 3 Points

Qualifications for Health and Safety Officer:
Registered Health and Safety Officer with SACPCMP or in the process to register (proof must be provided) Yes =2
No = 0

Relevant years of experience:
< 1 year = 1 Point
1 to 2 years = 2 Points
> 2 Years = 3 Points

Note: Certified copies of qualifications and Curriculum Vitae (CV) of personnel are to be provided, if not included, points will not be claimed.

Criteria 4: Performance on Two Similar Projects undertaken as a main contractor: Maximum score = 40 (20 points per project)

To be completed by Employer when Evaluating Tenders

Note:*The two projects scored here will be selected and scored by the Employer from the five projects listed in the criteria 1 Experience.
*The Employer will send an "Assessment of Performance Form" (See below) to two or more of the five references listed in Criteria 1 and request them to score according to the statements listed.

No.	Criteria	No Response (Score 0)	Poor (Score 1)	Satisfactory (Score 2)	Good (Score 3)	Very Good (Score 4)
1	**Time Management:** Contractor's skill and commitment in managing time					
2	**Cost Management:** Contractor's skill and commitment to managing cost					
3	**Quality Management:** Contractor's skill and commitment in managing quality					
4	**Health and Safety (H&S):** Skill and commitment in managing health and safety					
5	**Site Conditions:** Skill and commitment in managing conditions on site					
					Actual Points Obtained (S4) = Maximum Points per project (20)	

Other comments:
……

……

Referee's Signature:…….. Date:…….

Referee's name:…….. Role Played:……..

Representing firm: …….

Projects Name:
……

……

Contract Value (Incl VAT):……

Tenderer's Name:……..

F.3.13.1 The tender offers will only be accepted if:

- The tenderer has in his or her possession an **original valid Tax Clearance Certificate** issued by the South African Revenue Services or has made arrangements to meet outstanding tax obligations
- The tenderer is registered with the Construction Industry Development Board in an appropriate contractor grading designation
- The tenderer is not in arrears for more than 3 months with municipal rates and taxes and municipal service charges
- The tenderer or any of its directors is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector
- The Tenderer has not:

  (a) abused the Employer's Supply Chain Management System, or

  (b) failed to perform on any previous contract and has been given a written notice to this effect
- The tenderer has completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process

F.3.11.7 The Value of the weighting factor W_1 is 80. Formula 2 shall apply.

F.3.18 Two paper copies of the Signed Contract is to be provided to the Engineer

The additional conditions of tender are:

All returnable schedules are to be completed and all relevant certificates attached where indicated

MBD 1 PART A

INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE UTHUKELA DISTRICT MUNICIPALITY					
BID NUMBER:	**25/2025-CON**	**CLOSING DATE:**	**24th APRIL 2025**	**CLOSING TIME:**	**12H00**
DESCRIPTION	**Amangwe Waterworks, Rising Main and High Lift Pumps**				
THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (MBD7).					

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT *(STREET ADDRESS)*

uThukela District Municipality, 36 Lyell Street, Ladysmith						
SUPPLIER INFORMATION						
NAME OF BIDDER						
POSTAL ADDRESS						
STREET ADDRESS						
TELEPHONE NUMBER	**CODE**		**NUMBER**			
CELLPHONE NUMBER						
FACSIMILE NUMBER	**CODE**		**NUMBER**			
E-MAIL ADDRESS						
VAT REGISTRATION NUMBER						
TAX COMPLIANCE STATUS	**TCS PIN:**		**OR**	**CSD No:**		
ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	☐ **Yes** ☐ **No** **[IF YES ENCLOSE PROOF]**		**ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED**		☐ **Yes** ☐ **No** **[IF YES, ANSWER PART B:3]**	
TOTAL NUMBER OF ITEMS OFFERED			**TOTAL BID PRICE**		**R**	
SIGNATURE OF BIDDER			**DATE**			
CAPACITY UNDER WHICH THIS BID IS SIGNED						

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO:		**TECHNICAL INFORMATION MAY BE DIRECTED TO:**	
DEPARTMENT	**Technical**	**CONTACT PERSON**	**Ms Allison Maud**
CONTACT PERSON	**Mr S Zikalala**	**TELEPHONE NUMBER**	**033 343 6700**
TELEPHONE NUMBER		**FACSIMILE NUMBER**	**033 343 6701**
		CELLULAR NUMBER	**082 969 4491**
E-MAIL ADDRESS	**szikalala@uthukela.gov.za**	**E-MAIL ADDRESS**	**allison@owethuowabo.co.za**

PART B

TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:	
1.1.	BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.
1.2.	**ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED–(NOT TO BE RE-TYPED) OR ONLINE**
1.3.	THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.
2. TAX COMPLIANCE REQUIREMENTS	
2.1	BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.
2.2	BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VIEW THE TAXPAYER'S PROFILE AND TAX STATUS.
2.3	APPLICATION FOR THE TAX COMPLIANCE STATUS (TCS) CERTIFICATE OR PIN MAY ALSO BE MADE VIA E-FILING. IN ORDER TO USE THIS PROVISION, TAXPAYERS WILL NEED TO REGISTER WITH SARS AS E-FILERS THROUGH THE WEBSITE WWW.SARS.GOV.ZA.
2.4	FOREIGN SUPPLIERS MUST COMPLETE THE PRE-AWARD QUESTIONNAIRE IN PART B:3.
2.5	BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
2.6	IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
2.7	WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.
3. QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS	
3.1.	IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)? ☐ YES ☐ NO
3.2.	DOES THE ENTITY HAVE A BRANCH IN THE RSA? ☐ YES ☐ NO
3.3.	DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA? ☐ YES ☐ NO
3.4.	DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA? ☐ YES ☐ NO
3.5.	IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION? ☐ YES ☐ NO
IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 ABOVE.	

NB: FAILURE TO PROVIDE ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.
NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE.

SIGNATURE OF BIDDER: ……

CAPACITY UNDER WHICH THIS BID IS SIGNED: ……

DATE: ……

MBD 3.1

PRICING SCHEDULE – FIRM PRICES

DESCRIPTION		AMOUNT
Section 1: PRELIMINARY & GENERAL		
Section 2: EARTHWORKS (PIPE TRENCHES)		
Section 3: MEDIUM PRESSURE PIPELINES		
Section 4: BEDDING (PIPES)		
Section 5: GABIONS AND PITCHING		
Section 6: EARTHWORKS, ROADWORKS AND STORMWATER		
Section 7: WATERWORKS STRUCTURES AND BUILDINGS		
Section 8: MECHANICAL AND ELECTRICAL WORKS		
Sub-Total (A)		
Add 10% to Sub-Total A for contingencies		
Sub-Total (B)		
Add 5% to Sub-Total A for CPA Allowance		
COMPANY STAMP	**SUB-TOTAL**	
	VAT (15%)	
	TOTAL	

Note: All delivery costs must be included in the bid price, for delivery at the prescribed destination.

** "all applicable taxes" includes value- added tax, pay as you earn, income tax, unemployment insurance fund contributions and skills development levies.

CONDITIONS OF TENDER

- Price(s) quoted must be valid for at least ninety (90) days from date of offer for evaluation purposes.
- Price(s) quoted must be firm and include VAT
- Tenderers original valid tax clearance certificate must be attached.
- Tender documents signed by a person who does not have authority to sign will be disqualified.
- Tenderers who did not complete the compulsory questionnaire, who abuse the employer's supply chain management system will not be conceded.
- Non-collusion affidavit to be executed by bidder and submitted with the bid.

MBD 4

DECLARATION OF INTEREST

1. No bid will be accepted from persons in the service of the state[1].

2. Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to persons in service of the state, it is required that the bidder or their authorised representative declare their position in relation to the evaluating/adjudicating authority.

3. **In order to give effect to the above, the following questionnaire must be completed and submitted with the bid**.

   3.1 Full Name of bidder or his or her representative: ……..

   3.2 Identity Number: ……

   3.3 Position occupied in the Company (director, trustee, shareholder[2]): ……

   3.4 Company Registration Number: ……

   3.5 Tax Reference Number: ……

   3.6 VAT Registration Number: ……

   3.7 The names of all directors / trustees / shareholders members, their individual identity numbers and state employee numbers must be indicated in paragraph 4 below.

   3.8 Are you presently in the service of the state? **YES / NO**

   3.8.1 If yes, furnish particulars. ……..

   ……

[1]MSCM Regulations: "in the service of the state" means to be –

(a) a member of –
   (i) any municipal council;
   (ii) any provincial legislature; or
   (iii) the national Assembly or the national Council of provinces;

(b) a member of the board of directors of any municipal entity;
(c) an official of any municipality or municipal entity;
(d) an employee of any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999);
(e) a member of the accounting authority of any national or provincial public entity; or
(f) an employee of Parliament or a provincial legislature.

[2] Shareholder" means a person who owns shares in the company and is actively involved in the management of the company or business and exercises control over the company.

3.9 Have you been in the service of the state for the past twelve months? **YES / NO**

3.9.1 If yes, furnish particulars ……

……

3.10 Do you have any relationship (family, friend, other) with persons in the service of the state and who may be involved with the evaluation and or adjudication of this bid? **YES / NO**

3.10.1 If yes, furnish particulars……

……

3.11 Are you, aware of any relationship (family, friend, other) between any other bidder and any persons in the service of the state who may be involved with the evaluation and or adjudication of this bid?

YES / NO

3.11.1 If yes, furnish particulars……

……

3.12 Are any of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES / NO**

3.12.1 If yes, furnish particulars……

……

3.13 Are any spouse, child or parent of the company's directors trustees, managers, principle shareholders or stakeholders in service of the state?

YES / NO

3.13.1 If yes, furnish particulars……

……

3.14 Do you or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company have any interest in any other related companies or business whether or not they are bidding for this contract.

YES / NO

3.14.1 If yes, furnish particulars: ……

……

4. Full details of directors / trustees / members / shareholders.

Full Name	**Identity Number**	**State Employee Number**

5. I duly confirm that the above information is correct until otherwise advised in writing AND the company undertakes to immediately, in writing on same day of appointment, advise the Municipality immediately if any of its directors/trustees/ members/shareholders assumes appointment as an employee in national, provincial and/or local government AND the company will deregister from the Municipality Supplier Database and cease forthwith from doing business with the Municipality AND the company shall be subject to a penalty of forfeiting all payments for services rendered or products delivered or installed if it fails to immediately disclose in writing the employment of any of its directors/trustees/ members/shareholders in national, provincial and/or local government.

…….. ……..
Signature **Date**

…… ……
Capacity **Name of Bidder**

MBD 5

DECLARATION FOR PROCUREMENT ABOVE R10 MILLION (ALL APPLICABLE TAXES INCLUDED)

For all procurement expected to exceed R10 million (all applicable taxes included), bidders must complete the following questionnaire:

* Delete if not applicable

1 Are you by law required to prepare annual financial statements for auditing?

*** YES / NO**

1.1 If yes, submit audited annual financial statements for the past three years or since the date of establishment if established during the past three years.

……

……

2 Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue for more than 30 days?

*** YES / NO**

2.1 If no, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than three months or other service provider in respect of which payment is overdue for more than 30 days.

*** YES / NO**

2.2 If yes, provide particulars.

……

……

3 Has any contract been awarded to you by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract?

*** YES / NO**

3.1 If yes, furnish particulars

……

……

4. Will any portion of goods or services be sourced from outside the Republic, and, if so, what portion and whether any portion of payment from the municipality / municipal entity is expected to be transferred out of the Republic?

***YES / NO**

4.1 If yes, furnish particulars

……
……

CERTIFICATION

I, THE UNDERSIGNED (NAME)

……

CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT.

I ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

…….. ……
Signature **Date**

…….. ……..
Position **Name of Bidder**

MBD 6.1

PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2022

This preference form must form part of all tenders invited. It contains general information and serves as a claim form for preference points for specific goals.

NB: BEFORE COMPLETING THIS FORM, TENDERERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022.

---

1. GENERAL CONDITIONS

1.1 The following preference point systems are applicable to all bids:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2 The value of this bid is estimated to not exceed R50 000 000 (all applicable taxes included) and therefore the 80/20 system shall be applicable.

1.3 Preference points for this bid shall be awarded for:

(a) Price; and
(b) Specific Goals.

1.4 **To be completed by the organ of state:**
The maximum points for this tender are allocated as follows:

	POINTS
PRICE	**80**
SPECIFIC GOALS	**20**
Total points for PRICE and SPECIFIC GOALS	**100**

1.5 Failure on the part of a tenderer to submit proof or documentation required in terms of this tender to claim points for specific goals with the tender, will be interpreted to mean that preference points for specific goals are not claimed.

1.6 The purchaser reserves the right to require of a bidder, either before a bid is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the purchaser.

2. DEFINITIONS

2.1 "**tender"** means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;

2.2 **"price"** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;

2.3 **"rand value"** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

2.4 **"tender for income-generating contracts"** means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions;

2.5 **"the Act"** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000);

3. POINTS AWARDED FOR PRICE

3.1 The 80/20 or 90/10 Preference Point Systems

A maximum of 80 or 90 points is allocated for price on the following basis:

80/20 **or** **90/10**

$$Ps = 80\left(1 - \frac{Pt - P\min}{P\min}\right) \quad \text{or} \quad Ps = 90\left(1 - \frac{Pt - P\min}{P\min}\right)$$

Where

Ps = Points scored for comparative price of bid under consideration

Pt = Comparative price of bid under consideration

Pmin = Comparative price of lowest acceptable bid

4. POINTS AWARDED FOR SPECIFIC GOALS

4.1 In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in table 1 below as may be supported by proof/ documentation stated in the conditions of this tender:

4.2 In cases where organs of state intend to use Regulation 3(2) of the Regulations, which states that, if it is unclear whether the 80/20 or 90/10 preference point system applies, an organ of state must, in the tender documents, stipulate in the case of:

(a) an invitation for tender for income-generating contracts, that either the 80/20 or 90/10 preference point system will apply and that the highest acceptable tender will be used to determine the applicable preference point system; or

(b) any other invitation for tender, that either the 80/20 or 90/10 preference point system will apply and that the lowest acceptable tender will be used to determine the applicable preference point system,

Then the organ of state must indicate the points allocated for specific goals for both the 90/10 and 80/20 preference point system.

Table 1: Specific goals for the tender and points claimed are indicated per the table below.

***(Note to tenderers: The tenderer must indicate how they claim points for each preference point system.*)**

The specific goals allocated points in terms of this tender	**Number of points allocated (80/20 system)**	**Number of points claimed (80/20 system) (*To be completed by the tenderer*)**
Price	80	
Specific goals (20 Points):		
- Race-100% Black Owned	5	
- Gender-100% women Owned	5	
- Disability	5	
Locality-office based in uThukela District	5	
Total points for price and specific goals	**100**	

DECLARATION WITH REGARD TO COMPANY/FIRM

4.3 Name of firm: ……

4.4 Company registration number: ……

4.5 TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
- ☐ One person business/sole propriety
- ☐ Close corporation
- ☐ Public Company
- ☐ Personal Liability Company
- ☐ (Pty) Limited
- ☐ Non-Profit Company
- ☐ State Owned Company

[TICK APPLICABLE BOX]

4.6 I, the undersigned, who is duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the specific goals as advised in the tender, qualifies the company/ firm for the preference(s) shown and I acknowledge that:

(i) The information furnished is true and correct;

(ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form.

(iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 4.2, the contractor may be required to furnish documentary proof to the satisfaction of the organ of state that the claims are correct;

(iv) If the Specific Goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have –

(a) disqualify the person from the tendering process;

(b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;

(c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;

(d) recommend that the tenderer or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted from obtaining business from any organ of state for a period not exceeding 10 years, after the audi alteram partem (hear the other side) rule has been applied; and

(e) forward the matter for criminal prosecution

.....
SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME: .....

DATE: .....

ADDRESS: .....
.....
.....
.....

MBD 8

DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

1 This Municipal Bidding Document must form part of all bids invited.

2 It serves as a declaration to be used by municipalities and municipal entities in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.

3 The bid of any bidder may be rejected if that bidder, or any of its directors have:

a. abused the municipality's / municipal entity's supply chain management system or committed any improper conduct
b. in relation to such system;
c. been convicted for fraud or corruption during the past five years;
d. willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or
e. been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004).

4 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
4.1	**Is the bidder or any of its directors listed on the National Treasury's Database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector?** *(Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the* audi alteram partem *rule was applied).* ***The Database of Restricted Suppliers now resides on the National Treasury's website(www.treasury.gov.za) and can be accessed by clicking on its link at the bottom of the home page.***	Yes ☐	No ☐
4.1.1	If so, furnish particulars:		
4.2	Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)? The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.	Yes ☐	No ☐
4.2.1	If so, furnish particulars:		
4.3	Was the bidder or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes ☐	No ☐

Item	Question	Yes	No
4.3.1	If so, furnish particulars:		
4.4	**Does the bidder or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?**	Yes ☐	No ☐
4.4.1	If so, furnish particulars:		
4.5	Was any contract between the bidder and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
4.7.1	If so, furnish particulars:		

CERTIFICATION

I, THE UNDERSIGNED (FULL NAME) ……..…… CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM TRUE AND CORRECT.

I ACCEPT THAT, IN ADDITION TO CANCELLATION OF A CONTRACT, ACTION MAY BE TAKEN AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

…….. ……
Signature Date

…….. ……
Position Name of Bidder

MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

1 This Municipal Bidding Document (MBD) must form part of all bids[1] invited.

2 Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).[2] Collusive bidding is a pe se prohibition meaning that it cannot be justified under any grounds.

3 Municipal Supply Regulation 38 (1) prescribes that a supply chain management policy must provide measures for the combating of abuse of the supply chain management system, and must enable the accounting officer, among others, to:

a. take all reasonable steps to prevent such abuse;

b. reject the bid of any bidder if that bidder or any of its directors has abused the supply chain management system of the municipality or municipal entity or has committed any improper conduct in relation to such system; and

c. cancel a contract awarded to a person if the person committed any corrupt or fraudulent act during the bidding process or the execution of the contract.

4 This MBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.

5 In order to give effect to the above, the attached Certificate of Bid Determination (MBD 9) must be completed and submitted with the bid:

[1] Includes price quotations, advertised competitive bids, limited bids and proposals.

[2] Bid rigging (or collusive bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.

MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

_____

_____

(Bid Number and Description)

in response to the invitation for the bid made by:

_____

(Name of Municipality / Municipal Entity)

do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of: _____that

(Name of Bidder)

1. I have read and I understand the contents of this Certificate;

2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;

3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;

4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign, the bid, on behalf of the bidder;

5. For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:

    (a) has been requested to submit a bid in response to this bid invitation;

    (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and

    (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder

6. The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium[3] will not be construed as collusive bidding.

7. In particular, without limiting the generality of paragraphs 6 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:

    (a) prices;
    (b) geographical area where product or service will be rendered (market allocation)
    (c) methods, factors or formulas used to calculate prices;

    (d) the intention or decision to submit or not to submit, a bid;

(e) the submission of a bid which does not meet the specifications and conditions of the bid; or

(f) bidding with the intention not to win the bid.

8. In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this bid invitation relates.

9. The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

[3] Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

10. I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

Signature: ……. Date: ……..

Position: …… Name of Bidder: ……

Annexure F
(normative)

Standard Conditions of Tender

As published in Annexure F of the CIDB Standard for Uniformity for construction Procurement, Board Notice 136 Government Gazette No 38960 of 10 July 2015

F.1 General

F.1.1 Actions

F.1.1.1 The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in F.2 and F.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

F.1.1.2 The employer and the tenderer and all their agents and employees involved in the tender process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict, and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

Note: 1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his or her position even if no improper acts result.

2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

F.1.1.3 The employer shall not seek and a tenderer shall not submit a tender without having a firm intention and the capacity to proceed with the contract.

F.1.2 Tender Documents

The documents issued by the employer for the purpose of a tender offer are listed in the tender data.

F.1.3 Interpretation

F.1.3.1 The tender data and additional requirements contained in the tender schedules that are included in the returnable documents are deemed to be part of these conditions of tender.

F.1.3.2 These conditions of tender, the tender data and tender schedules which are only required for tender evaluation purposes, shall not form part of any contract arising from the invitation to tender.

F.1.3.3 For the purposes of these conditions of tender, the following definitions apply:

a) **conflict of interest** means any situation in which:

i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfil his or her duties impartially;
ii) an individual or organisation is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or

iii) incompatibility or contradictory interests exist between an employee and the organisation which employs that employee.

b) **comparative offer** means the price after the factors of a non-firm price and all unconditional discounts it can be utilised to have been taken into consideration;

c) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process;

d) **fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels;

e) **organization** means a company, firm, enterprise, association or other legal entity, whether incorporated or not, or a public body;

f) **functionality** means the measurement according to the predetermined norms of a service or commodity designed to be practical and useful, working or operating, taking into account quality, reliability, viability and durability of a service and technical capacity and ability of a tenderer.

F.1.4 Communication and employer's agent

Each communication between the employer and a tenderer shall be to or from the employer's agent only, and in a form that can be readily read, copied and recorded. Communications shall be in the English language. The employer shall not take any responsibility for non-receipt of communications from or by a tenderer. The name and contact details of the employer's agent are stated in the tender data.

F.1.5 Cancellation and Re-Invitation of Tenders

F1.5.1 An organ of state may, prior to the award of the tender, cancel a tender if-

(a) due to changed circumstances, there is no longer a need for the services, works or goods requested; or
(b) funds are no longer available to cover the total envisaged expenditure; or
(c) no acceptable tenders are received.

F1.5.2 The decision to cancel a tender must be published in the CIDB website and in the government Tender Bulletin for the media in which the original tender invitation was advertised.

F.1.6 Procurement procedures

F.1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to F.3.13, be concluded with the tenderer who in terms of F.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.

F.1.6.2 Competitive negotiation procedure

F.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of F.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of F.3.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

F.1.6.2.2 All responsive tenderers, or not less than three responsive tenderers that are highest ranked in terms of the evaluation method and evaluation criteria stated in the tender data, shall be invited in each round to enter into competitive negotiations, based on the principle of equal treatment and keeping confidential the proposed solutions

and associated information. Notwithstanding the provisions of F.2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

F.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to make a fresh tender offer, based on the same evaluation criteria, with or without adjusted weightings. Tenderers shall be advised when they are to submit their best and final offer.

F.1.6.2.4 The contract shall be awarded in accordance with the provisions of F.3.11 and F.3.13 after tenderers have been requested to submit their best and final offer.

F.1.6.3 Proposal procedure using the two stage-system

F.1.6.3.1 Option 1

Tenderers shall in the first stage submit technical proposals and, if required, cost parameters around which a contract may be negotiated. The employer shall evaluate each responsive submission in terms of the method of evaluation stated in the tender data, and in the second stage negotiate a contract with the tenderer scoring the highest number of evaluation points and award the contract in terms of these conditions of tender.

F.1.6.3.2 Option 2

F.1.6.3.2.1 Tenderers shall submit in the first stage only technical proposals. The employer shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

F.1.6.3.2.2 The employer shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender data, and award the contract in terms of these conditions of tender.

F.2 Tenderer's obligations

F.2.1 Eligibility

F.2.1.1 Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

F.2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

F.2.2 Cost of tendering

F2.2.1 Accept that, unless otherwise stated in the tender data, the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer complies with requirements.

F2.2.2 The cost of the tender documents charged by the employer shall be limited to the actual cost incurred by the employer for printing the documents. Employers must attempt to make available the tender documents on its website so as not to incur any costs pertaining to the printing of the tender documents.

F.2.3 Check documents

Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.

F.2.4 Confidentiality and copyright of documents

Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

F.2.5 Reference documents

Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

F.2.6 Acknowledge addenda

Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.

F.2.7 Clarification meeting

Attend, where required, a clarification meeting at which tenderers may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the tender data.

F.2.8 Seek clarification

Request clarification of the tender documents, if necessary, by notifying the employer at least five working days before the closing time stated in the tender data.

F.2.9 Insurance

Be aware that the extent of insurance to be provided by the employer (if any) might not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

F.2.10 Pricing the tender offer

F.2.10.1 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes (except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable 14 days before the closing time stated in the tender data.

F2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.

F.2.10.3 Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.

F.2.10.4 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

F.2.11 Alterations to documents

Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations.

F.2.12 Alternative tender offers

F.2.12.1 Unless otherwise stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

F.2.12.2 Accept that an alternative tender offer may be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.

F.2.12.3 An alternative tender offer may only be considered in the event that the main tender offer is the winning tender.

F.2.13 Submitting a tender offer

F.2.13.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works, services or supply identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

F.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.

F.2.13.3 Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.

F.2.13.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.

F.2.13.5 Seal the original and each copy of the tender offer as separate packages marking the packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

F.2.13.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked “financial proposal” and place the remaining returnable documents in an envelope marked “technical proposal”. Each envelope shall state on the outside the employer’s address and identification details stated in the tender data, as well as the tenderer's name and contact address.

F.2.13.7 Seal the original tender offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the tender data.

F.2.13.8 Accept that the employer will not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

F.2.13.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

F.2.14 Information and data to be completed in all respects

Accept that tender offers, which do not provide all the data or information requested completely and in the form required, may be regarded by the employer as non-responsive.

F.2.15 Closing time

F.2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

F.2.15.2 Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of these conditions of tender apply equally to the extended deadline.

F.2.16 Tender offer validity

F.2.16.1 Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data.

F.2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

F.2.16.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted.

F.2.16.4 Where a tender submission is to be substituted, submit a substitute tender in accordance with the requirements of F.2.13 with the packages clearly marked as "SUBSTITUTE".

F.2.17 Clarification of tender offer after submission

Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

Note: *Sub-clause F.2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.*

F.2.18 Provide other material

F.2.18.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment. Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

F.2.18.2 Dispose of samples of materials provided for evaluation by the employer, where required.

F.2.19 Inspections, tests and analysis

Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender data.

F2.2.20 Submit securities, bonds and policies

If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies and certificates of insurance required in terms of the conditions of contract identified in the contract data.

F.2.21 Check final draft

Check the final draft of the contract provided by the employer within the time available for the employer to issue the contract.

F.2.22 Return of other tender documents

If so instructed by the employer, return all retained tender documents within 28 days after the expiry of the validity period stated in the tender data.

F.2.23 Certificates

Include in the tender submission or provide the employer with any certificates as stated in the tender data.

F.3 The employer's undertakings

F.3.1 Respond to requests from the tenderer

F.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five working days before the tender closing time stated in the Tender Data and notify all tenderers who drew procurement documents.

F.3.1.2 Consider any request to make a material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to prequalify a tenderer to submit a tender offer in terms of a previous procurement process and deny any such request if as a consequence:

a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements;
b) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or
c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

F.3.2 Issue Addenda

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date that tender documents are available until three days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who drew documents.

F.3.3 Return late tender offers

Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

F.3.4 Opening of tender submissions

F.3.4.1 Unless the two-envelope system is to be followed, open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

F.3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, number of points claimed for its BBBEE status level and time for completion for the main tender offer only.

F.3.4.3 Make available the record outlined in F.3.4.2 to all interested persons upon request.

F.3.5 Two-envelope system

F.3.5.1 Where stated in the tender data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

F.3.5.2 Evaluate functionality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the functionality evaluation more than the minimum number of points for functionality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any points claimed on BBBEE status level. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for functionality.

F.3.6 Non-disclosure

Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

F.3.7 Grounds for rejection and disqualification

Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

F.3.8 Test for responsiveness

F.3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

a) complies with the requirements of these Conditions of Tender,
b) has been properly and fully completed and signed, and
c) is responsive to the other requirements of the tender documents.

F.3.8.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer*'s* opinion, would:

a) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work*,*
b) significantly change the Employer*'s* or the tenderer's risks and responsibilities under the contract, or
c) affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.

F.3.9 Arithmetical errors, omissions and discrepancies

F.3.9.1 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with F.3.11 for:

a) the gross misplacement of the decimal point in any unit rate;
b) omissions made in completing the pricing schedule or bills of quantities; or
c) arithmetic errors in:
    i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or
    ii) the summation of the prices.

F3.9.2 The employer must correct the arithmetical errors in the following manner:

a) Where there is a discrepancy between the amounts in words and amounts in figures, the amount in words shall govern.
b) If bills of quantities or pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
c) Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

Consider the rejection of a tender offer if the tenderer does not correct or accept the correction of the arithmetical error in the manner described above.

F.3.10 Clarification of a tender offer

Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

F.3.11 Evaluation of tender offers

F.3.11.1 General

Appoint an evaluation panel of not less than three persons. Reduce each responsive tender offer to a comparative offer and evaluate them using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

F.3.11.2 Method 1: Price and Preference

In the case of a price and preference:

1) Score tender evaluation points for price
2) Score each tender in respect of the financial offer made and preferences claimed, if any, in accordance with the provisions of F.3.11.7 and F.3.11.8.
3) Add the points scored for price and preference.

F.3.11.3 Method 2: Functionality, Price and Preference

In the case of a functionality, price and preference:

1) Score each tender in respect of the financial offer made, preference claimed, if any, and the quality offered in accordance with the provisions of F3.11.7 to F3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any. Score functionality, rejecting all tender offers that fail to achieve the minimum number of points for functionality as stated in the Tender Data.
2) No tender must be regarded as an acceptable tender if it fails to achieve the minimum qualifying score for functionality as indicated in the tender invitation.
3) Tenders that have achieved the minimum qualification score for functionality must be evaluated further in terms of the preference points system prescribed in paragraphs 4 and 5 below.

The 80/20 preference point system for acquisition of services, works or goods up to Rand value of R50 million.

4) (a)(i) The following formula must be used to calculate the points for price in respect of tenders (including price quotation) with a rand value equal to, or above R 30 000 and up to Rand value of R 50 000 000 (all applicable taxes included):

$$Ps = 80 \quad 1 - \quad \left(\frac{Pt - P\text{min}}{P\text{min}} \right)$$

Where
Ps = Points scored for comparative price of tender or offer under consideration;
Pt = Comparative price of tender or offer under consideration; and
*P*min = *Comparative price of lowest acceptable tender or offer.*

4)(a)(ii) An employer of state may apply the formula in paragraph (i) for price quotations with a value less than R30 000, if and when appropriate:

4)(b) Subject to subparagraph (4)(c), points must be awarded to a tender in respect of the preferences claimed in accordance with the table below and in accordance with the provisions of F.3.11.8 :

The specific goals allocated points in terms of this tender	Number of points allocated
Price	80
Specific goals (20 Points):	
Race - 100% Black Owned	5
Gender - 100% women Owned	5
Disability	5
Locality-office based in uThukela District	5
Total points for price and specific goals	**100**

(4)(c) A maximum of 20 points may be allocated in accordance with subparagraph (4)(b).

(4)(d) The points scored by tender in respect of Specific Goals contemplated in subparagraph (4)(b) must be added to the points scored for price as calculated in accordance with subparagraph (4)(a).

(4)(e) Subject to paragraph 4.3.8 the contract must be awarded to the tender who scores the highest total number of points.

The 90/ 10 preference points system for acquisition of services, works or goods with a Rand value above R 50 million.

(5) (a) The following formula must be used to calculate the points for price in respect of tenders with a Rand value above R1 000 000 (all applicable taxes included):

$$Ps = 90 \quad 1 - \quad \left(\frac{Pt - P\text{min}}{P\text{min}} \right)$$

Where
Ps = Points scored for comparative price of tender or offer under consideration;
Pt = Comparative price of tender or offer under consideration; and
Pmin = Comparative price of lowest acceptable tender or offer.

(5) (b) Subject to subparagraph(5)(c), points must be awarded to a tender for Specific Goals in accordance with the table below:

The specific goals allocated points in terms of this tender	Number of points allocated
Price	80
Specific goals (20 Points):	
Race - 100% Black Owned	5
Gender - 100% women Owned	5
Disability	5
Locality-office based in uThukela District	5
Total points for price and specific goals	**100**

5) (c) A maximum of 10 points may be allocated in accordance with subparagraph (5)(b).

5) (d) The points scored by tender in respect of Specific Goals contemplated in subparagraph (5) (b) must be added to the points scored for price as calculated in accordance with subparagraph (5)(a).

5) (e) Subject to paragraph 4.3.8 the contract must be awarded to the tender who scores the highest total number of points

F.3.11.6 Decimal places

Score price, preference and functionality, as relevant, to two decimal places.

F.3.11.7 Scoring Price

Score price of remaining responsive tender offers using the following formula:

$N_{FO} = W_1 \times A$

where: N_{FO} is the number of tender evaluation points awarded for price.
W_1 is the maximum possible number of tender evaluation points awarded for price as stated in the Tender Data.
A is a number calculated using the formula and option described in Table F.1 as stated in the Tender Data.

Table F.1: Formulae for calculating the value of A

Formula	Comparison aimed at achieving	Option 1a	Option 2 a
1	Highest price or discount	$A = (1 + (\frac{P - Pm}{Pm}))$	$A = P / Pm$
2	Lowest price or percentage commission / fee	$A = (1 - (\frac{P - Pm}{Pm}))$	$A = Pm / Pa$

*P*m is the comparative offer of the most favourable comparative offer.
P is the comparative offer of the tender offer under consideration.

F.3.11.8 Scoring preferences

Confirm that tenderers are eligible for the preferences claimed in accordance with the provisions of the tender data and reject all claims for preferences where tenderers are not eligible for such preferences.

Calculate the total number of tender evaluation points for preferences claimed in accordance with the provisions of the tender data.

F.3.11.9 Scoring functionality

Score each of the criteria and subcriteria for quality in accordance with the provisions of the Tender Data.

Calculate the total number of tender evaluation points for quality using the following formula:

$N_Q = W_2 \times S_O / M_S$

where: S_O is the score for quality allocated to the submission under consideration;
M_S is the maximum possible score for quality in respect of a submission; and
W_2 is the maximum possible number of tender evaluation points awarded for the quality as stated in the tender data

F.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer*'s* information the policies and / or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

F.3.13 Acceptance of tender offer

Accept the tender offer, if in the opinion of the employer, it does not present any risk and only if the tenderer:

a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
c) has the legal capacity to enter into the contract,

d) is not insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act, 2008, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,
e) complies with the legal requirements, if any, stated in the tender data, and
f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

F.3.14 Prepare contract documents

F.3.14.1 If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:

a) addenda issued during the tender period,
b) inclusion of some of the returnable documents, and
c) other revisions agreed between the employer and the successful tenderer.

F.3.14.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

F.3.15 Complete adjudicator's contract

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

F.3.16 Notice to unsuccessful tenderers

F.3.16.1 Notify the successful tenderer of the employer's acceptance of his tender offer by completing and returning one copy of the form of offer and acceptance before the expiry of the validity period stated in the tender data, or agreed additional period.

F.3.16.2 After the successful tenderer has been notified of the employer's acceptance of the tender, notify other tenderers that their tender offers have not been accepted.

F.3.17 Provide copies of the contracts

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance.

F.3.18 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these conditions of tender, but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

F3.19 Transparency in the procurement process

F3.19.1 The CIDB prescripts require that tenders must be advertised and be registered on the cidb i.Tender system.
F3.19.2 The employer must adopt a transparency model that incorporates the disclosure and accountability as transparency requirements in the procurement process.

F3.19.3 The transparency model must identify the criteria for selection of projects, project information template and the threshold value of the projects to be disclosed in the public domain at various intervals of delivery of infrastructure projects.

F3.19.4 The client must publish the information on a quarterly basis which contains the following information:

- Procurement planning process
- Procurement method and evaluation process
- Contract type
- Contract status

- Number of firms tendering
- Cost estimate
- Contract title
- Contract firm(s)
- Contract price
- Contract scope of work
- Contract start date and duration
- Contract evaluation reports

F3.19.5 The employer must establish a Consultative Forum which will conduct a random audit in the implementation of the transparency requirements in the procurement process.

F3.19.6 Consultative Forum must be an independent structure from the bid committees.

F3.19.7 The information must be published on the employer's website.

F 3.19.8 Records of such disclosed information must be retained for audit purposes.

RETURNABLE DOCUMENTS

C O N T E N T S

T 2.1 LIST OF RETURNABLE DOCUMENTS

The Tender Document must be submitted as a whole. All forms must be properly completed as required, and the document shall not be taken apart or altered in any way whatsoever. All the documents that will eventually form part of the contract are listed in the Tender Data. Returnable schedules and forms are included in **T2.2** hereafter.

Returnable schedules included in Part T2 that will be required for Tender Adjudication purposes:

A. Authority for Signatory
B. Amendments, Qualifications and Alterations by Tenderer
C. Alternative Tenders
D. Key Personnel
E. Proof of Labour Intensive Construction Proficiency
F. Schedule of Proposed Sub-Contractors
G. Schedule of Sources of Supply of Materials
H. Relevant Experience
I. Schedule of Plant and Equipment
J. Schedule of Proposed Previously Disadvantaged Sub-Contractors
K. Banking Details
L. Declaration by Bank Manager
M. Compulsory Site Inspection
N. B-BBEE Verification Certificate
O. Certificate of Authority for Joint Venture
P. Proof of Registration with uThukela District Municipality
Q. Record of Addenda to Tender Documents
R. Workmen's Compensation Registration Certificate
S. Declaration with Reference to Registration with CIDB
T. Tax Clearance Requirements
U. South African Revenue Services and VAT Registration Certificate
V. OHS Act Declaration and Submission
W. Compulsory Enterprise Questionnaire
X. Declaration of Interest
Y. Status of Concern submitting Tender and Tenderers Profile
Z. Dayworks Schedule
AA. Proposed Implementation Programme
AB. Form of Intent to Provide a Performance Guarantee
AC. Current Commitments
AD. Central Supplier Database Registration

T2.2 RETURNABLE SCHEDULES

A. AUTHORITY FOR SIGNATORY

Signatories for companies must establish their authority by enclosing herewith a copy of the relevant resolution of the Board of Directors duly signed and dated

B. AMENDMENTS, QUALIFICATIONS AND ALTERATIONS BY TENDERER

Should the Tenderer desire to make any departures from, or modifications to the General Conditions of Contract, Specifications, Bill of Quantities or Drawings, or to qualify his tender in any way; he shall set out his proposals clearly hereunder or alternatively state them in a covering letter attached to the tender, and referred to hereunder. Failing to comply with the aforesaid will deem the tender unqualified. If no departures or modifications are desired the Schedule hereunder is to be marked NIL and in any case signed by the Tenderer.

I / We herewith propose the amendments, alternatives and discounts. as set out in the tables below:

(a) AMENDMENTS

PAGE	CLAUSE OR ITEM No.	REMARKS

[Notes: (1) Amendments to the General and Special Conditions of Contract are not acceptable;
(2) The Tenderer must give full details of all the financial implications of the amendments and qualifications in a covering letter attached to his tender.

(b) ALTERNATIVES

PAGE	CLAUSE OR ITEM No.	REMARKS

[Notes:..... (1) Individual alternative items that do not justify an alternative tender, and an alternative offer for time for completion should be listed here.
(2) In the case of a major alternative to any part of the work, a separate Bill of Quantities, programme, etc, and a detailed statement setting out the salient features of the proposed alternatives must accompany the tender.
(3) Alternative tenders involving technical modifications to the design of the works and methods of construction shall be treated separately from the main tender offer.

(c) DISCOUNTS

PAGE	CLAUSE OR ITEM No.	REMARKS

[Note: The Tenderer must give full details of the discounts offered in a covering letter attached to his tender, failing which, the offer will be prejudiced]

SIGNED ON BEHALF OF TENDERER: ……..

C. ALTERNATIVE TENDERS

On condition that the Tenderer submits an offer in accordance with the Tender Documents, any alternative offers which he may wish to submit as proposals, detailed hereunder or on separate sheets referred to hereunder and attached to this page, will be given consideration at the Employer's discretion, provided that they are described, measured and priced in sufficient detail to enable the Engineer to draw reliable conclusions.

PROPOSALS (described, measured and priced)

SIGNED ON BEHALF OF TENDERER: ……..

D. KEY PERSONNEL

In terms of the Project Specification and the Conditions of Tender, unskilled workers may only be brought in from outside the local community if such personnel are not available locally.

The Tenderer shall list below the personnel which he/she intends to utilize on the Works, including key personnel which may have to be brought in from outside if not available locally.

CATEGORY OF EMPLOYEE	NUMBER OF PERSONS					
	KEY PERSONNEL, PART OF THE CONTRACTOR'S ORGANISATION		KEY PERSONNEL TO BE IMPORTED IF NOT AVAILABLE LOCALLY		UNSKILLED PERSONNEL TO BE RECRUITED FROM LOCAL COMMUNITY	
	HDI	NON-HDI	HDI	NON-HDI	HDI	NON-HDI
Site Agent, Project Managers						
Foremen, Quality Control and Safety Personnel						
Technicians, Surveyors, etc.						
Artisans and other Skilled workers						
Plant Operators						
Unskilled Workers						
Others						

The Tenderer shall attach hereto the *curricula vitae*, in the form included hereafter, of at least the site agent and the project manager. The information is necessary for evaluation of the tender.

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

CURRICULUM VITAE OF KEY PERSONNEL

CONTRACTS DIRECTOR

Name:	**Date of birth:**
Profession:	**Nationality:**
Qualifications and year obtained:	
Professional Institution and Registration Number:	
Name of Employer (firm):	
Current position:	**Years with firm:**
No. of years' Experience as Contracts Director:	
Employment History:	
Experience Record Pertinent to Required service (Community Water Projects):	

Certified copies of qualifications are to be attached to this schedule.

Certification:

I, the undersigned, certify that to the best of my knowledge and belief this data correctly describes me, my qualifications and my experience.

....

SIGNATURE OF THE INCUMBENT IN THE SCHEDULE DATE

CURRICULUM VITAE OF KEY PERSONNEL

CONTRACTS MANAGER

Name:	**Date of birth:**
Profession:	**Nationality:**
Qualifications and year obtained:	
Professional Institution and Registration Number:	
Name of Employer (firm):	
Current position:	**Years with firm:**
No. of years' Experience as Contracts Manager:	
Employment Record:	
Experience Record Pertinent to Required service (Water Supply Projects):	

Certified copies of qualifications are to be attached to this schedule.

Certification:

I, the undersigned, certify that to the best of my knowledge and belief this data correctly describes me, my qualifications and my experience.

....

SIGNATURE OF THE INCUMBENT IN THE SCHEDULE DATE

CURRICULUM VITAE OF KEY PERSONNEL

CONTRACT SITE AGENT

Name:	**Date of birth:**
Profession:	**Nationality:**
Qualifications and year obtained:	
Professional Institution and Registration Number:	
Name of Employer (firm):	
Current position:	**Years with firm:**
No. of years' Experience as Site Agent:	
Employment Record:	
Experience Record Pertinent to Required service (Community Water Supply Projects):	

Certified copies of qualifications are to be attached to this schedule.

Certification:

I, the undersigned, certify that to the best of my knowledge and belief this data correctly describes me, my qualifications and my experience.

…….. ……
SIGNATURE OF THE INCUMBENT IN THE SCHEDULE DATE

CURRICULUM VITAE OF KEY PERSONNEL

CONTRACT HEALTH AND SAFETY OFFICER

Name:	**Date of birth:**
Profession:	**Nationality:**
Qualifications and year obtained:	
Professional Institution and Registration Number:	
Name of Employer (firm):	
Current position:	**Years with firm:**
No. of years' Experience as Health and Safety Officer:	
Employment Record:	
Experience Record Pertinent to Required service (Community Water Supply Projects):	

Certified copies of qualifications are to be attached to this schedule.

Certification:

I, the undersigned, certify that to the best of my knowledge and belief this data correctly describes me, my qualifications and my experience.

…….. ……
SIGNATURE OF THE INCUMBENT IN THE SCHEDULE DATE

E. PROOF OF LABOUR INTENSIVE PROFICIENCY

Refer Table 1 Page C3.1/69.

The tenderer is required to furnish proof of labour intensive proficiency. Details to be attached to this page.

F. SCHEDULE OF PROPOSED SUB-CONTRACTORS

The Tenderer shall list below any Sub-Contractors he wishes to employ to carry out part(s) of the Work.

The acceptance of his tender shall not be construed as approval of all or any of the listed Sub-Contractors. Should any or all of the Sub-Contractors not be approved subsequent to acceptance of the tender, this shall in no way invalidate this tender. Furthermore, the tendered unit rates for the various items of work shall remain final and binding.

PART OR TYPE OF WORK	PROPOSED SUB-CONTRACTORS

SIGNED ON BEHALF OF TENDERER: ……..

G. SCHEDULE OF SOURCES OF SUPPLY OF MATERIALS

The Tenderer shall list below the proposed type, source or trade name of the materials he wishes to use.

The acceptance of his tender shall not be construed as approval of all or any of the listed materials. Should any or all of the materials not be approved subsequent to acceptance of tender, this shall in no way invalidate this tender and the tendered unit rates for the various items of work shall remain final and binding.

MATERIAL	TYPE OR TRADE NAME	SOURCE
SAND (Concrete)		
SAND (Mortar)		
STONE		
CEMENT		
PIPES (uPVC, HDPe, Klambon)		

SIGNED ON BEHALF OF TENDERER: ……..

H. RELEVANT EXPERIENCE

Tenderers shall furnish hereunder brief details of similar works which they have satisfactorily constructed in the past. At least five projects shall be listed. The information shall include a description of the Works, the Contract Value and the name and contact details of the Employer

An attached list will not suffice unless it contains all the requested information.

Failure to properly comply with this requirement may invalidate the Tender.

	Project 1	**Project 2**	**Project 3**
Name of Employer			
Contract No.			
Contract Name			
Name and Address of Employer's Representative for project			
Phone No. for Reference			
Email Address for Reference			
Location of Works			
Nature of Work			
Contract Period			
Completion Date			
Contract Value (Incl. VAT)			

Note: To claim points for Functionality, Appointment Letter and Completion Certificate or Client Reference Letter must be submitted.

Tenderer to listed water related projects that were undertake as the **Main Contractor**.

	Project 4	**Project 5**	**Project 6**
Name of Employer			
Contract No.			
Contract Name			
Name and Address of Employer's Representative for project			
Phone No. for Reference			
Email Address for Reference			
Location of Works			
Nature of Work			
Contract Period			
Completion Date			
Contract Value (Incl. VAT)			

Note: To claim points for Functionality, Appointment Letter and Completion Certificate or Client Reference Letter must be submitted.

Tenderer to listed water related projects that were undertake as the **Main Contractor**.

SIGNED ON BEHALF OF TENDERER: ……..

I. SCHEDULE OF PLANT AND EQUIPMENT

The following are lists of major items of relevant equipment that I / we presently own or lease and will have available for this contract if my / our tender is accepted.

(a) Details of major equipment that is owned by me / us and immediately available for this contract.

DESCRIPTION, SIZE, CAPACITY	YEAR OF MANUFACTURE	NUMBER

Attach additional pages if more space is required

(b) **Details of major equipment that will be hired, or acquired for this contract if my / our tender is accepted**

DESCRIPTION, SIZE, CAPACITY	NUMBER	HOW ACQUIRED	
		HIRE / BUY	SOUCE

Attach additional pages if more space is required

NOTE: *After the award of the contract, the Contractor must satisfy the Engineer that all the above plant and equipment, or equivalent plant and equipment will be on the site at all times when required. The Contractor shall maintain all plant and equipment in a good working order for the duration of the contract.*

The Contractor also undertakes to bring onto the site, without additional costs to the Employer, any additional plant and equipment which, in the opinion of the Engineer, is necessary for completing the contract within the tendered contract period.

SIGNED ON BEHALF OF TENDERER: ……

J. SCHEDULE OF PROPOSED PREVIOUSLY DISADVANTAGED SUB-CONTRACTORS

The Tenderer shall list below the names of Previously Disadvantaged Sub-Contractors he wishes to employ to carry out part(s) of the Work.

The acceptance of this tender shall not be construed as approval of all or any of the listed Sub-Contractors.

PART OR TYPE OF WORK	PROPOSED SUB-CONTRACTOR

SIGNED ON BEHALF OF TENDERER: ……

K. BANKING DETAILS

NAME OF TENDERER	
NAME OF ACCOUNT HOLDER AT BANK	
TYPE OF ACCOUNT (*Please tick block)*	Current/Cheque ☐ Savings ☐ Transmission ☐
BANK	
BRANCH NAME	
ACCOUNT NUMBER	
BRANCH CODE	
BANK TELEPHONE NUMBER	
BANK ADDRESS	
NAME OF BANK MANAGER	
TELEPHONE NUMBER	
FAX NUMBER	
NUMBER OF YEARS ABOVE ACCOUNT HAS BEEN WITH BANK	
CREDIT FACILITIES AVAILABLE (*State amount)*	

SIGNATURE OF TENDERER: ……

DATE:……

L. DECLARATION BY BANK MANAGER

This is to certify that the Tenderer has sufficient good standing With this bank that he will, in my opinion, be financially able to complete a contract of R…….. over the tendered duration of ……months.

In addition we confirm that, for the amount of the enquiry, the Tenderer is rated Code ……..

NAME OF BANK MANAGER: ……

SIGNATURE OF BANK MANAGER: …….. **DATE:** …….

BANK STAMP

M. COMPULSORY SITE INSPECTION

NOTICE OF COMPULSORY SITE INSPECTION

A compulsory site inspection will be held on **Wednesday 26 March 2024 at 10h00.**

Tenderers are to meet at the Loskop Water Treatment Works. Directions are as follows:

- From the N3 take exit ramp 179 signposted "Estcourt (North) and Loskop".
- Travel along MR10 towards Loskop for 24 km, turn left at the Injasuthi sign post.
- Follow the Injasuthi Road for approximately 500m, the Water Treatment Works is to the right of the road. (Latitude 28° 56' 34.8" South and Longitude 29° 34' 55.3" East.)

Compulsory Site Inspection Certificate

It is hereby certified that I have attended the Compulsory Site Inspection and have satisfied myself of the conditions and circumstances which may influence the Works and the cost thereof.

(Print clearly)

NAME OF REPRESENTATIVE: ……..

ON BEHALF OF TENDERER:…….

ADDRESS: ……..

……..

TELEPHONE NUMBER: ……..……

SIGNATURE (FOR TENDERER): ……..

SIGNATURE (FOR EMPLOYER) ……..

N. B-BBEE VERIFICATION CERTIFICATE

The Tenderer is required to furnish proof of B-BBEE. Certified valid copy of B-BBEE Certificate to be inserted.

NOT REQUIRED

O: CERTIFICATE OF AUTHORITY FOR JOINT VENTURE

This returnable schedule is to be completed by Joint Ventures.

We the undersigned, are submitting this tender offer in Joint Venture and hereby authorise Mr/Mrs ……, authorised signatory of the company, …… acting in the capacity as lead partner, to sign all documents in connection with the tender offer and any contract resulting from it on our behalf.

NAME OF FIRM	ADDRESS	DULY AUTHORISED SIGNATORY
		Signature: …… Name: …… Designation: ……
		Signature: …… Name: …… Designation: ……
		Signature: …… Name: …… Designation: ……
		Signature: …… Name: …… Designation: ……

Power of Attorney and JV Agreement to be attached to this page.

P: PROOF OF REGISTRATION WITH UTHUKELA DISTRICT MUNICIPALITY

The Tenderer is required to furnish proof of registration on uThukela's Supplier database.

Q. RECORD OF ADDENDA TO TENDER DOCUMENTS

We confirm that the following communications received from the employer or his Agent before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer.		
	Date	**Title or Details**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

Attach additional pages if more space is required.

SIGNATURE OF TENDERER: ……

DATE:……

R. WORKMEN'S COMPENSATION REGISTRATION CERTIFICATE

Attach original, (or certified copy), of the Workmen's Compensation Letter of Good Standing to this page. When applicable the option to submit an original or certified copy of the letter from the Agent authorized by the Workmen's Compensation Commissioner will be accepted.

NOTE: Failure to do so will lead to your tender being disqualified.

SIGNATURE OF TENDERER: ……

DATE:……

S: DECLARATION WITH REFERENCE TO REGISTRATION WITH CIDB

I/we understand that failure to register or apply for registration with the Construction Industry Development Board (CIDB) will disqualify me/us from tendering for Government, Provincial and Municipal construction works and I/we declare as follows:

(Name of enterprise tendering)

_____

(Please tick the applicable statement).

1	has registered with the CIDB and that there is no objection to the CIDB disclosing the enterprise's financial, resource and experience grading for Tender Adjudication purposes of this Tender. Proof of registration is attached to this Tender.	

2	has submitted an application to CIDB for the registration and is waiting for the grading assessment. Proof of the application is attached to this Tender.	

3	complies with all the requirements for registration and declares that an application with the CIDB for registration will be submitted within two (2) weeks from the date of this declaration and to do so may result in this Tender being classified as non-responsive.	

4	does not intend submitting an application for registration with the CIDB and it is understood that this could cause this Tender being classified as non-responsive.	

5	CONTRACTOR'S CURRENT REGISTRATION AND CIDB RATING	REGISTRATION	
		CIDB RATING	

Attach proof of CIDB Grading

SIGNATURE OF TENDERER: ……

DATE:……

T. TAX CLEARANCE REQUIREMENTS

IMPORTANT NOTES:

1. The following is an abstract from the Preferential Procurement Regulations 2001 promulgated with the Preferential Policy Framework Act No 5 of 2000:

   "**Tax clearance certificate**

   16. No contract may be awarded to a person who has failed to submit an original Tax Clearance Certificate from the South African Revenue Service ("SARS") certifying the taxes of that person to be in order or that suitable arrangements have been made with SARS."

2. The PCC 001 form, Application for Tax Clearance Certificate (in respect of tenders), must be **completed by the tenderer in every detail and submitted to the Receiver of Revenue** where the tenderer is registered for income tax purposes. The Receiver of Revenue will then furnish the tenderer with a Tax Clearance Certificate that will be valid for 12 months from date of issue. **This Tax Clearance Certificate must be submitted in the original with the tender, that is before the closing time and date of the tender.**

Each party to a Consortium/Joint Venture/Sub-contractors must complete a separate Tax Clearance Certificate.

Failure to submit an original and valid Tax Clearance Certificate, or certified copy thereof, will invalidate the tender.

1. In tenders where Consortia/Joint Ventures/Sub-Contractors are involved each party must submit a separate Tax Clearance Certificate. Copies of the Application for Tax Clearance Certificates are available at any Receiver's Office.

2. Tenderers are required to submit either their original Tax Clearance Certificate or a copy of their Tax Clearance Certificate with SARS Pin Number

   SARS Pin No……

3. Tenderers are required to be registered with the National Treasury Central Suppliers Data Base. Tenders are to provide the following:

   CSD Suppliers Number:……..

   Registration Reference Number: ……..

   NOTE: Failure to do so will lead to your tender being disqualified.

   Attach valid Tax Clearance Certificates to this page.

SIGNATURE OF TENDERER: …….

DATE:……

U. SOUTH AFRICAN REVENUE SERVICES AND VAT REGISTRATION CERTIFICATE

ARE YOU A REGISTERED TAX PAYER?	YES	NO
IF YES, WHAT IS YOUR INCOME TAX NUMBER?	……	
AT WHAT SARS OFFICE ARE YOU REGISTERED?	……	
ARE YOU REGISTERED FOR VAT?	YES	NO
IS YES, WHAT IS YOUR VAT REGISTRATION NO.?	……	
ARE YOU REGISTERED FOR EMPLOYEE'S TAX?	YES	NO
IS YES, WHAT IS YOUR REFERENCE NO.?	……	
AT WHAT SARS OFFICE ARE YOU REGISTERED?	……	
ARE YOU REGISTERED FOR UIF?	YES	NO
IF YES, WHAT IS YOUR REGISTRATION NO.?	……	

AN ORIGINAL (OR CERTIFIED COPY) VAT REGISTRATION CERTIFICATE FROM SARS MUST BE ATTACHED TO THIS PAGE.

FAILURE TO COMPLETE ALL THE DETAILS REQUESTED ON THIS PAGE MAY RESULT IN THE DISQUALIFICATION OF YOUR TENDER.

SIGNATURE OF TENDERER: ……

DATE:……

V. OHS ACT DECLARATION AND SUBMISSION

In terms of Clause 5(1)(h) of the OHSA 1993 Construction Regulations 2014 (referred to as "the Regulations" hereafter), a Contractor may only be appointed to perform construction work if the Employer is satisfied that the Contractor has the necessary competencies and resources to carry out the work safely in accordance with the Occupational Health and Safety Act No 85 of 1993 and the Construction Regulations 2014.

To that effect a person duly authorised by the tenderer must complete and sign the declaration hereafter in detail.

Declaration by Tenderer

1. I the undersigned hereby declare and confirm that I am fully conversant with the Occupational Health and Safety Act No 85 of 1993 (as amended by the Occupational Health and Safety Amendment Act No 181 of 1993), and the Construction Regulations 2014.

2. I hereby declare that my company has the competence and the necessary resources to safely carry out the construction work under this contract in compliance with the Construction Regulations and the Employer's Health and Safety Specifications.

3. I propose to achieve compliance with the Regulations by one of the following:

   (a) From my own competent resources as detailed in 4(a) hereafter: ..... ***Yes / No**

   (b) From my own resources still to be appointed or trained until competency is achieved, as detailed in 4(b) hereafter: ..... ***Yes / No**

   (c) From outside sources by appointment of competent specialist subcontractors as detailed in 4(c) hereafter: ..... ***Yes / No**

   (***** = *delete whatever is not applicable*)

4. Details of resources I propose:

   (Note: Competent resources shall include safety personnel such as a construction supervisor and construction safety officer as defined in Regulation 8, and competent persons as defined in Regulations 7, 8, 10, 11, 12, 13, 14, 15, 18, 19, 20, 22, 23, 25, 26, and 28, as applicable to this contract)

   (a) Details of the competent and qualified key persons from my company's own resources, who will form part of the contract team:

NAMES OF COMPETENT PERSONS	POSITIONS TO BE FILLED BY COMPETENT PERSONS

SIGNATURE OF TENDERER: ……

DATE:……

W. COMPULSORY ENTERPRISE QUESTIONNAIRE

The following particulars must be furnishes. In the case of a Joint Venture, a separate enterprise questionnaire in respect of each partner must be completed and submitted.

Section 1:	**Name of Enterprise:**
Section 2:	**VAT Registration number:**
Section 3:	**CIDB Registration number:**

Section 4: Particulars of Sole Proprietors and Partners in Partnership

Name*	Identity Number*	Personal Income tax number*

***** Complete only if sole proprietor or partnership and attach separate page if more than 3 partners.

Section 5: Particulars of Companies and Close Corporations

Company Registration Number: .....

Close Corporation Number: .....

Tax Reference Number: .....

Section 6: Record in the Service of the State

Indicate by marking the relevant boxes with a cross, if any sole proprietor, partner in a partnership or director, manager, principal shareholder or stakeholder in a company or close corporation is currently or has been within the last 12 months in the service of any of the following:

- ☐ A member of any municipal council
- ☐ A member of any provincial legislature
- ☐ A member of the National Assembly or the National Council of Province
- ☐ A member of the board of directors of any municipal Entity
- ☐ An official of any municipality or municipal entity
- ☐ An employee of any provincial department, national or provincial public entity or constitutional institution Within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999)
- ☐ A member of an accounting authority of any national or Provincial public entity
- ☐ An employee of Parliament or a provincial legislature

If any of the above boxes are marked, disclose the following:

Name of sole proprietor, partner, director, manager, principal shareholder or stakeholder	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

Signed on behalf of Tender: ……

X. DECLARATION OF INTEREST

1. Any legal person, including persons employed by uThukela District Municipality (hereinafter called the EMPLOYER), or persons who act on behalf of the Employer or persons having a kinship with persons employed by the employer, including a blood relationship, may make an offer or offers in terms of this tender invitation.

   In view of possible allegations of favouritism, should the resulting tender, or part thereof, be awarded to persons employed by the Employer, or to persons who act on behalf of the employer, or to persons connected with or related to them, it is required that the TENDERER or his authorised representative shall declare his position vis-à-vis the evaluating authority and/or take an oath declaring his interest, where:

   - the Tenderer is employed by the Employer or acts on behalf of the employer,

     and/or

   - the legal person on whose behalf the tender document is signed has a relationship with a person/persons who are involved with the evaluation of the tender(s), or where it is known that such a relationship exists between the person or persons for whom or on whose behalf the declarant acts and persons who are involved with the evaluation of the tender.

IN ORDER TO GIVE EFFECT TO THE ABOVE, THE FOLLOWING QUESTIONNAIRE SHALL BE COMPLETED AND SUBMITTED WITH THE TENDER:

2. Are you or any person connected with the tender employed by the Employer?

   (Tick the applicable box) ☐ YES ☐ NO

   If YES, state particulars:

   ……

   .

   ……

3. Do you or any person connected with the tender have a relationship (family, friend, other) with a person employed by the Employer?

   (Tick the applicable box) ☐ YES ☐ NO

   If YES, state particulars:

   ……

   .

   ……

4. Are you or any person connected with the tender aware of any relationship (family, friend, other) between another tenderer and any person employed by the Employer?

   (Tick the applicable box) ☐ YES ☐ NO

   If YES, state particulars:

   ……

   .

   ……

SIGNATURE OF TENDERER: ……

DATE:……

Y. STATUS OF CONCERN SUMBITTING TENDER AND TENDERERS PROFILE

1. GENERAL

State whether the Tenderer is a company, a partnership, a person or a close corporation by making an X in the appropriate space.

Company		***Partnership***		***Person***		***Close Corporation***	

2. INFORMATION TO BE PROVIDED

2.1 IF THE TENDERER IS A COMPANY

a) Affix a certified copy of the Certificate of Incorporation to this page.

……

b) List the Directors and each Director's date of appointment

……

……

……

……

c) List the Shareholders

……

……

……

……

d) List all companies of which your Company is a shareholder

……

……

……

2.2 IF THE TENDERER IS A PARTNERSHIP

a) Provide the full name and state each partner's share in the partnership

……

……

……

……

2.3 IF THE TENDERER IS A PERSON

a) Provide the full name and qualifications of the person

……

……

2.4 IF THE TENDERER IS A CLOSE CORPORATION

a) State each member's share in the closed corporation and affix a certified copy of the Founding Statement of the corporation.

……

……

……

2.5 TENDERER'S PROFILE

Insert tenderer's profile. The tenderer's profile, with traceable reference, to include:

- Previous Experience in Civil Engineering Work;
- Expertise, Experience and Resources;
- Capacity to undertake the work and
- Relevant construction equipment to undertake work

Unless this information has been included elsewhere in the tender document

2.6 PHYSICAL ADDRESS OF BUSINESS

……

……

2.7 DATE BUSINESS WAS STARTED

……

……

SIGNATURE OF TENDERER: ……

DATE:……

Z. DAYWORKS SCHEDULE

1.0 GENERAL

Tenderers must complete this list which shall be used for the assessment of value of the work which the Engineer instructed in writing that must be done on a daywork basis, all in agreement with Clause 6.5 of the General Conditions of Contract and coupled the Special Conditions of Contract. All the rates are fixed and shall be binding till and with the issuing of the final certificate, except for statutory increases that will be announced from time to time.

2.0 LABOUR COSTS

Rates for labour as listed below shall include all the allowances as specified in the General Conditions of Contract and Special Contract Specifications. The rates submitted in this Schedule shall include for all the costs, remuneration, bonuses, profits, overheads, allowances etc.

Description	Unit	Rate	Description	Unit	Rate
Unskilled labour	Per hour		Artisan	Per hour	
Semi-skilled labour	Per hour		Foreman/Section leader	Per hour	

3.0 EQUIPMENT COSTS

Full comprehensive rates, which also include the cost of the operators, must be listed below. Rates must also include all the costs of consumable items, maintenance, depreciation, tools and all other coincidences that shall be necessary to operate the equipment for the purpose it is designed for. The rates must also include all the overhead costs, profits, site supervision, insurance, holidays with payment, travelling costs (or travelling allowances) and residence allowances of operators and any other allowance that is applicable. No further percentage allowances shall be applicable on the equipment. The Tenderer must list under each heading the fabrication and specification of the equipment available.

Description	Unit	Rate
Trucks (5m³)	Per hour	
TLB	Per hour	
Excavator (Indicate the capacity)	Per hour	
	Per hour	
Water Tanker (Indicate the capacity)	Per hour	
Tractor and Trailer	Per hour	
Generator	Per day	

…… ……
Signature Date

AA. PROPOSED IMPLEMENTATION PROGRAMME

The Tenderer is to attach a programme clearly showing proposed activities and resources.

AB. FORM OF INTENT TO PROVIDE A PERFORMANCE GUARANTEE

It is hereby undertaken that a Performance Bond/Deed of Surety drafted in accordance with the pro-forma provided in the Tender Documents (refer to Pro-Forma Documentation) will be provided by the Institution listed below:

Name of Institution.....

Address .....

Telephone .....

Signature
.....

Name
.....

Capacity
.....

Date
.....

Confirmed by Institution's Authorised Representative:

Signature(s) .....

Name (Print) .....

Capacity .....

On behalf Institution
.....

Date .....

The Tenderer must attach hereto a letter from the bank or institution, with whom he has made the necessary arrangements, to the effect that the said bank or institution will be prepared to provide the required performance guarantee when asked to do so.

AC. CURRENT COMMITMENTS

Tenderers are to list ALL current projects and commitments.

Project	Value	Anticipated Completion	Client Contact Details

SIGNATURE OF TENDERER: ……

DATE:……

AD: CENTRAL SUPPLIER DATABASE RGISTRATION

Name of Tenderer: ……

Database Registration Number: ……

No awards will be made to a tenderer who is not registered on the Central Supplier Database (CSD).

The establishment of a Central Supplier Database (CSD) will result in one single database to serve as the source of all supplier information for all spheres of government. The purpose of centralising government's supplier database is to reduce duplication of effort and cost for both supplier and government while enabling electronic procurement processes.

Registration on the Central Supplier Database must be done online via the website:

https://secure.csd.gov.za/

SIGNATURE OF TENDERER: ……

DATE:……

PART 1

AGREEMENTS AND CONTRACT DATA

C O N T E N T S

C1.1 FORM OF OFFER AND ACCEPTANCE

A. OFFER

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

Contract No. 25/2025,
Amangwe Waterworks, Rising Main, and High Lift Pumps

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 authorized, 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:

Print clearly in words………

……………………………………………………………………………………… **Rand.** **R**…………………………………………. *(in figures)*

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.

FOR THE TENDERER
Print clearly

Signature(s) ……………………………………………… ……………………………………………………

Name(s) ……………………………………………… …. ……………………………………………………

Capacity ……………………………………………… ……………………………………………………

Organisation *Name* ……………………………………………………………………………………………

Address……………………………………………………………………………………………………

………

Witness Signature ……………………………………………………… **Date** ………………………………

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 1	Agreements and Contract Data (which includes this Agreement)
PART 2	Pricing Data
PART 3	Scope of Work
PART 4	Site Information

Drawings and documents, or parts thereof, may be incorporated by reference into Parts 1 – 4 above.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender 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 Agreement. No amendments to or deviations from said documents are valid unless contained in this Schedule, which must be duly signed by the authorized representative(s) of both parties.

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 bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the Conditions of Contract identified in the Contract Data at, or just after, the date this Agreement comes into effect. 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 the Contractor) within FIVE 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

Print clearly

Signature(s) …… ……

Name(s) …… …. ……

Capacity …… ……

Organisation *Name* ……

Address……

……

Witness Signature …… **Date** ……

C. SCHEDULE OF DEVIATIONS

Notes:

1. The extent of deviations from the tender documents issued by the Employer prior to 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 further matter in such letter, which constitutes a deviation as aforesaid become the subject to agreements reached during the process of the 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 and 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. SUBJECT: ……..

   DETAILS: ……..

   ……..

4. SUBJECT: ……..

   DETAILS: ……..

   ……..

5. SUBJECT: ……..

   DETAILS: ……..

   ……..

6. SUBJECT: ……..

   DETAILS: ……..

By the duly authorized representatives signing this Schedule of Deviations, 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 Tender Schedules, as well as any confirmation, clarification or change 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

Print clearly

Signature(s) …… ……

Name(s) …… …. ……

Capacity …… ……

Organisation *Name* ……

Address……

……

Witness Signature …….. **Date** ……

FOR THE EMPLOYER

Print clearly

Signature(s) …… ……

Name(s) …… …. ……

Capacity …… ……

Organisation *Name* ……

Address……

……

Witness Signature …….. **Date** ……

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

Print clearly

Signature(s) …… ……

Name(s) …… …. ……

Capacity …… ……

Witness Signature …… **Date** ……

C1.2 CONTRACT DATA

A. CONDITIONS OF CONTRACT

The General Conditions of Contract for Construction Works Second Edition (2015), published by the South African Institution of Civil Engineering, is applicable to this Contract.

B. CONTRACT SPECIFIC DATA

(Clause numbers refer to Clauses in the General Conditions of Contract for Construction Works (2015)

* ***To be completed by Tenderer***

DESCRIPTION	CLAUSE	DETAILS
Non-working and special non-working days	5.8.1	Non-working days are Sundays. Special non-working days are the year-end break and public holidays
Defects Liability Period	1.1.1.13	12 months from the date of issue of the Certificate of Completion
* Time for achieving Practical Completion (including non-working and special non-working days)	1.1.1.14 5.5.1	Employers Time for Completion is **18 months** excluding Annual shutdown and public holidays
Name of Employer	1.1.1.15	uThukela District Municipality
Address of Employer	1.2.1.2	36 Lyell Street, Ladysmith. P.O. Box 116, Ladysmith, 3370.
Name of Employer's Agent	1.1.1.16	Owethu Owabo Consulting (Pty) Ltd
In Association with	1.1.1.16	J G Afrika (Pty) Ltd
Contract Pricing Strategy	1.1.1.26	Re-measurement Contract
Address of Engineering Consultant	1.2.1.2	P O Box 1824, Hillcrest, 3610 8 English Road, Chase Valley, Pietermaritzburg, 3201
Address of Associated Engineering Consultant	1.2.1.2	P O Box 794, Hilton, 3245 6 Pin Oak Avenue, Hilton, 3245
Documentation Required Before Commencement with Works Execution	5.3.1	- Health and Safety Plan (Refer to Clause 4.3) - Initial Programme (Refer to Clause 5.6) - Performance Guarantee (Refer to Clause 6.2) - Insurances (Refer to Clause 8.6)
Time to Submit Documentation Required Before Commencement with Works Execution	5.3.2	14 days after the Commencement Date

DESCRIPTION	CLAUSE	DETAILS
Non Working days Year end break	5.8.1	Sundays , Public Holidays 12/12/2025 to 05/01/2026 (both days included)
Amount of Penalty	5.13.1	R4000 per calendar day
Latent Defect Period	5.16.3	10 years
Performance Guarantee	6.2.1	10% of the Tender Sum
Validity of Performance Guarantee	6.2.3	No expiry date to be specified
Duration of Guarantee	6.2.3	Until the date of issue of Certificate of Completion
Percentage allowances for dayworks	6.5.1.2.3	15%
Provisional Sums	6.6.1.2.1	Commission will not be paid if no percentage is stated by the Contractor.
Price Adjustment Factor	6.8.2	x = 0.10 a = 0.25 b = 0.15 c = 0.50 d = 0.10
Percentage advance on material not yet built into the Permanent Works	6.10.1.5	80 percent
Percentage Retention	6.10.3	10 percent
Limit of Retention Money	6.10.3	10 percent of the completed work to a maximum of 5% of the Contract Value
Insurance of the Works	8.6.1	Required
Insured Sum	8.6.1.1.1	Contract price
Special Risks Insurance	8.6.1.2	Required
Minimum Amount of Liability Insurance	8.6.1.3	R5 000 000.00 for each and every claim
Settlement of disputes to be by	10.5.2 & 10.7.1	Ad-hoc adjudication followed by Arbitration (following the Rules for Conduct of Arbitrations published by the Association of Arbitrators)
Number of Adjudication Board Members	10.5.3	One

C. CONTRACT PRICE ADJUSTMENT SCHEDULE

VARIATION IN COST OF SPECIAL MATERIALS: See Clause 6.8.3.

***** ***To be completed by Tenderer***

***Special materials, items or portions of the Works concerned**	***Method by which variations shall be determined**	***Rate or Price for the base month**

***Period of validity of tender is ninety (90) days from closing date of tenders*.**

Signature: ……

On behalf of: ……

Date: ……

D. SPECIAL CONDITIONS OF CONTRACT

Clause 1.2.1
DELIVERY OF NOTICES

Add the following sub-clause 1.2.1.3

" Delivered by e-mail "

CLAUSE 3.2..3
SPECIFIC APPROVAL OF THE EMPLOYER REQUIRED

Clause 3.2.3 – Add the following sub-clauses:

3.2.3.1 "The Employer's Agent shall not reduce the quality of the works without the written approval of the Employer".

CLAUSE 4.1
EXTENT OF CONTRACTOR'S OBLIGATIONS

Clause 4.1.3 – Add the following sub-clause:

"Where the Contractor elects to offer a design affecting the permanent works, the design shall be subject to the written approval of the Engineer. The Contractor shall make any changes required by the Engineer at no extra cost to the Employer."

CLAUSE 4.3
LEGAL PROVISIONS

Clause 4.3.1 – Add the following sub-clause:

4.3.1.1 The Occupational Health and Safety Act (1993) (OHS Act) shall apply. The Engineer's Representative shall be co-opted as a member of the Contractor's Safety Committee for the Works in accordance with Section 19 of the OHS Act. The Explosives Regulations Act 26 of 1956 and as amended shall apply.

Clause 4.3.2 – Delete the words "If required"

CLAUSE 5.8
NON-WORKING HOURS AND SPECIAL NON-WORKING DAYS

The first paragraph is to be amended to read:-

"None of the Works shall be executed except between 07:00 and 17:00 on Monday to Friday inclusive and 07:00 and 13:00 on Saturday of any week or on any non-working and special non-working days stated in the Contract Data unless"

Delete sub-clauses 5.8.1.2 and 5.8.1.3.

CLAUSE 5.12
EXTENSION OF TIME FOR PRACTICAL COMPLETION

Clause 5.12.2.2 - Add the following :-

"Where these conditions are attributable solely to rainfall and the resultant stoppage of work, the Contractor may only make claim for an extension of time for completion where the Work items stopped were critical to the date

for practical completion of the whole of the Works as indicated by the programme provided in terms of Clause 5.6.1 and the aggregated claims exceed the allowance to be made as described in the Table below."

Month	No. rain days lost	Month	No. rain days lost
January	2.0	July	1.0
February	2.0	August	1.0
March	1.0	September	1.0
April	1.0	October	2.0
May	1.0	November	2.0
June	1.0	December	1.0

CLAUSE 6.6
PROVISIONAL SUMS

Sub-Clause 6.6.1.2.2 - Delete the entire sub-clause.

CLAUSE 6.8.2
PRICE ADJUSTMENT FACTOR

Add sub-clause 6.8.2.1:

"The Price Adjustment Factor shall only be applicable to those contracts whose tender prices exceed R3 000 000.00 ".

Add sub-clause 6.8.2.2:

"Should a contract which would otherwise have been fixed price not be awarded within 120 calendar days of the date for receipt of tenders, then escalation as described below will become payable. The amount will be quantified using the standard formula from the General Conditions of Contract for Construction Works (GCC 2010), with the calculation based on the following:-

(1) The coefficients to be used with the indices shall be:-
x = 0, 10 a = 0,25 b = 0,15 c = 0,50 d = 0,10

(2) The base month for indices shall be the month prior to the month for receipt of tender. The current month for indices shall be the month in which the tender is due for submission.

CLAUSE 8.5
REPORTING ACCIDENTS

Clause 8.5.1 – Delete, in the second paragraph, "If required by the Employer's Agent".

TESTING AND COMMISSIONING

Testing and commissioning of the works described in this contract shall be witnessed by the Engineer in the presence of a representative of the Employer.

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.

LINKAGE OF PAYMENT FOR LABOUR INTENSIVE COMPONENT OF WORKS TO SUBMISSION OF PROJECT DATA

The Contractor's payment invoices shall be accompanied by labour information for the corresponding period in a format specified by the employer. If the contractor chooses to delay submitting payment invoices, labour returns shall still be submitted as per frequency and timeframe stipulated by the Employer. The Contractor's invoices shall not be paid until all pending labour information has been submitted.

APPLICABLE LABOUR LAWS

The current Ministerial Determination (also downloadable at www.epwp.gov.za), Expanded Public Works Programmes, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of Labour in Government Notice, shall apply to works described in the scope of work as being labour intensive and which are undertaken by unskilled or semi-skilled workers.

METHOD SPECIFICATION

Certain operations will be executed by Labour Intensive Construction methods and are indicated as L.I. in the Schedule.

GUIDELINES FOR THE IMPLEMENTATION OF L.I.C. INFRASTRUCTURE PROJECTS UNDER THE EXPANDED PUBLIC WORKS PROGRAMME

The tenderers should take note of the relevant requirements, of Government Gazette Notice 34032 dated 15 Feb 2015, regarding the following:

1. Basic conditions of employment.
2. Sourcing of labour in accordance with SANS 1914-5
3. Participation of targeted labour.
4. Use of local service providers
5. Reporting mechanisms and headings.

CIVIL ENGINEERING INDUSTRY MINIMUM WAGE RATE

Locally employed persons shall be remunerated at the Task Grade 1 Wage rate per hour whichever is the greater, effective during the currency of the Contract as reflected in:

1. The latest Sectorial Determination for the Civil Engineering Sector (Government Gazette No. 41904, 14 September 2018); or

2. A Civil Engineering Industry & Task Grade COLLECTIVE AGREEMENT facilitated by the Bargaining Council for the Civil Engineering Industry (BCCEI); or as adopted following:

3. A signed agreement between the South African Federation of Civil Engineering Contractors (SAFCEC) and labour unions.

All other terms of Employment shall be structured in accordance with the 'Guidelines for the Implementation of Labour-Intensive Infrastructure Projects, under the Expanded Public Works Programme (EPWP).

PART 2

PRICING DATA

C O N T E N T S

C2.1 PRICING INSTRUCTIONS

1. The Tenderer is advised to check the number of pages and, should any be found to be missing or in duplicate or the figures or writing indistinct or the Bill of Quantities containing any obvious errors, the Tenderer must inform the Engineer at once and have it rectified. No liability whatsoever will be admitted in respect of errors due to the foregoing.

   Should there by any doubt or obscurity as to the meaning of any particular item, the Tenderer must obtain an explanation of it, in writing, from the Engineer. No claims for extras arising from any such doubt or obscurity will be admitted after delivery of the tender.

2. The work is to be in accordance with the drawings, specifications and instructions and under the supervision and to the entire satisfaction of the Engineer.

3. The Bills of Quantities should be read in conjunction with the Conditions of Contract, the Specifications and Drawings for the full intent and meaning of each clause or item. The quantities are measured generally in accordance with SANS 1200.

4. The sum and unit prices to be inserted in the Bill of Quantities are to be the fully inclusive value of the work described under the several items, including all costs and expenses which may be required in and for the construction of the work described, together with all general risks, liabilities and obligations set forth or implied in the documents on which the tender is based.

5. A sum or unit price is to be entered against each item in the Bill of Quantities, whether quantities are stated or not. Items against which no price is entered will be considered as covered by other prices or rates in the Bills.

6. **Arithmetical errors :**

   - Where there is a discrepancy between the amounts in figures and in words, the amount in words shall govern.
   - Where there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
   - Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the Tenderers addition of prices, the total of the prices shall govern and the Tenderer will be asked to revise selected item prices and their rates to achieve the tendered total of the prices.

7. **All unit prices, extensions and totals must be filled in, in BLACK INK**. **Failure to do so will render the tender as non-responsive.**

8. No claim whatsoever will be allowed in respect of errors in pricing due to brevity of description of items which are fully described when read in conjunction with the relevant instruction.

9. The Tenderer is advised that, where trade or patent names are used in description of items in the Bill of Quantities, except in the case of nominated suppliers or sub-Contractors, it does not necessarily follow that these specific materials will be used.

   The trade or patent names are inserted in the description only as a guide to the Tenderer and to make clear the type of material required. All or any of these items may be replaced at the Engineer's discretion by other similar and approved materials without affecting the Billed Unit Prices.

   Where such a change involves a difference in the basic price of the item, the Contractor will be requested to submit a revised unit price before the order is placed and this will be subject to the approval and acceptance of the Engineer.

Where, however, a trade or patent name is used in the description of an item and the Tenderer offers an alternative material, the onus will be on the Tenderer to produce proof that his material offered is equal in all respects to the material used in the description.

10. The Tenderer is hereby advised that, while every endeavor has been made to ensure the correctness of the quantities and descriptions of all labour and materials in the Bill of Quantities, any errors (whether in excess or short of the actual quantity, or insufficiently or incorrectly described) will be adjusted on completion of the Contract by the Engineer. For this purpose, the entire contents of the Bill of Quantities are to be considered as provisional and therefore subject to re-measurement and adjustment in part or as a whole. All such adjustment will be based on, or pro rata to, the Schedule unit prices submitted by the Contractor. The Bill of Quantities is not necessarily correct for ordering purposes.

11. It is deemed that provision for head office overheads, consumables, stores, profit, etc, as well as all labour, material and plant costs, is made in the priced items of the measured Bill following the Preliminary and General Bill and that any increases and decreases in the measured quantities will correspondingly adjust for these charges.

12. The column headed 'CLAUSE' in the Bill of Quantities, where used, indicates specifications and/or clauses in which further information in respect of billed items can be obtained. This is meant as an aid to Tenderers but does not imply that the specifications or clauses referred to are the only sources of information in respect of these items and further information and explanations may be found elsewhere in the Contract Documents and on the Drawings.

13. It is deemed that all costs incurred by the Contractor to ensure conformity with the Environmental Management Specifications, is made in the priced items of the measured Bill following the Preliminary and General Bill and that any increases and decreases in the measured quantities will correspondingly adjust for these charges.

14. It is deemed that all costs incurred by the Contractor to ensure conformity with the OHS Act and Construction Regulations Specifications, is made in the priced items of the measured Bill following the Preliminary and General Bill and that any increases and decreases in the measured quantities will correspondingly adjust for these charges.

15. Those 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. 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 in the Scope of Works.

16. Payment for items which are designated to be constructed labour-intensively (either in this schedule or in the Scope of Works) will not be made unless they are constructed using labour-intensive methods. Any unauthorized 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.

17. The Contractor will be required to prepare and submit monthly returns.

C2.2 BILL OF QUANTITIES

SUMMARY OF BILL OF QUANTITIES

PART 1 :	*PRELIMINARY AND GENERAL*	*R*
PART 2 :	*EARTHWORKS (PIPE TRENCHES)*	*R*
PART 3 :	*MEDIUM PRESSURE PIPELINES*	*R*
PART 4 :	*BEDDING(PIPES)*	*R*
PART 5 :	*GABIONS*	*R*
PART 6 :	*EARTHWORKS, ROADWORKS AND STORMWATER*	*R*
PART 7 :	*WATERWORKS STRUCTURES AND BUILDINGS*	*R*
PART 8 :	*MECHANICAL AND ELECTRICAL WORKS*	*R*

SUBTOTAL ..... *R* .....

ADD CONTINGENCIES

Add 10 % ..... R .....

SUBTOTAL ..... **R .....**

ADD ESCALATION

Add 5 % ..... R .....

SUBTOTAL ..... **R .....**

VALUE ADDED TAX

Add 15 % ..... R .....

TOTAL CARRIED TO TENDER FORM ..... **R .....**

SIGNED ON BEHALF OF TENDERER: .....

PART 3

SCOPE OF WORKS

C O N T E N T S

SECTION C3: THE WORKS

1. DESCRIPTION OF THE WORKS

1.1 Employer's Objectives

The Employer's objectives are to provide an adequate and reliable source of water to the local communities within Wards 1, 2 and 3 through the implementation of Amangwe Abstraction Works and the Water Treatment Works as part of the greater Bhekuzulu – Epangweni Community Water Supply project. This Contract forms a portion of the new scheme. Labour Intensive methods will be used where practical, in accordance with EPWP Guidelines.

1.2 Overview of the Works

The Works encompasses the construction of a new package-type water treatment works (including all mechanical and electrical works); mechanical and electrical equipping of a high-lift pump station; approximately 2.1 km of bulk water rising mains and associated infrastructure; interlinking pipelines; installation of a floating cover to one existing 10Ml concrete lined reservoir; remedial works to the joints concrete lined reservoir panels; and gravel access roads and stormwater control.

Labour intensive works comprise the activities described in SANS 1921-5, (*Earthworks activities which are to be performed by hand)*, and its associated specification data. Such works shall be constructed using local workers who are temporarily employed in terms of this Scope of Work.

1.3 Extent of the works

The work to be executed under this Contract comprises the following:

Civil and Building Works:

- Construction of the civil works for the package-type water treatment plant, comprising earthworks, concrete slabs, brick building works. the associated infrastructure such as a header tank, earth sludge ponds, valve chambers, connecting to existing pipelines and fencing;
- The excavation of pipe trenches for bulk water pipelines;
- The laying, bedding, backfilling, compacting, and testing of 2.1 km of Steel rising main pipelines of 200mm diameter;
- The laying, bedding, backfilling, compacting, testing and disinfecting of 1.0km of HDPE /uPVC / Steel pipelines ranging from 75mm to 250mm diameter;
- The construction of pipeline associated infrastructure such as air valves, scour valves, meters and chambers, non-return valves and chambers and miscellaneous specials as required;
- The refurbishment of existing infrastructure such as gate valves, pipelines, concrete lined ponds etc;
- Design, supply and install floating cover to existing 10Ml concrete lined pond; and
- The construction of gravel access roads and associated stormwater control.

Mechanical and Electrical Works:

- The design, fabrication / supply, installation and commissioning of a 1.8 Ml/day package water treatment plant complete;

- The supply and installation of duty and standby pumps at the intermediate high lift pump station (constructed by others) drawing water from the 300kl Reservoir, and discharging into the 200mm dia. rising main to the waterworks.

- All electrical works connecting the power supply from existing Eskom transformers to high lift pump room, cabling plus pump controls, MCC panels, etc and to the package treatment plant.

NOTE 1:

The contractor is responsible for the design of the mechanical, electrical and related equipment required for the water treatment works and high-lift pump station.

He shall provide the Process and Instrumentation Diagrams, to indicate the detail of the equipment supplied by him. The Contractor is required to submit details of the pipework and fitting arrangements within the high-lift pump station, and meter chambers. He is also required to design his equipment and layout to fit into the high-lift pump station and chambers constructed by others.

Refer to the Particular Specification PC: Electrical and Mechanical Works specification.

NOTE 2:
Tenderers are required to allow in their tendered prices for the supply of all necessary materials, the supply and use of tools, the provision, operation and maintenance of all Contractor's plant and equipment, the supply and supervision of all labour and workmanship and everything and every service necessary for the construction, completion and maintenance of the Works in the manner required by the Contract and the entire satisfaction of the Engineer.

1.4 Location of the works

The project falls under the uThukela District Municipality (DC 23) and the Amangwe Waterworks will be located alongside the Injasuthi River approximately 50 km west of Estcourt, and 45 km south of Winterton, KwaZulu Natal. It includes communities within the Amangwe Tribal Authority. The project area falls within Wards 1 and 3 of the Inkosi Langalibalele Local Municipality.

A locality Plan included is attached in Section C5: Annexures

2. ENGINEERING

2.1 Employer's design

Available design details will be issued to the Contractor at the time of site handover for programming purposes.

3. PROCUREMENT

3.1 Preferential Procurement Procedures

The Tenderer is referred to the criteria required in the Tender Data, as well as SANS 10396: 2003: Implementing Preferential construction procurement Policies using targeted Procurement Procedures as well as SANS 1914: 2002: Targeted Procurement parts 1 to 6.

4. CONSTRUCTION

4.1 Applicable National and International Standards

4.1.1 For the purposes of this Contract, the latest addition of the following SANS 1200 Standardised Specifications shall apply:

Specification		Title
SANS 1200 A	:	General
SANS 1200 AB	:	Engineer's Office
SANS 1200 C	:	Site Clearance
SANS 1200 D	:	Earthworks
SANS 1200 DB	:	Earthworks (Pipe Trenches)
SANS 1200 DK	:	Gabions and Pitching
SANS 1200 DM	:	Earthworks (Roads, Subgrade)
SANS 1200 G	:	Concrete
SANS 2001-CC1:2007	:	Part CC1: Concrete Works (structural)
SANS 1200 PSHA	:	Structural Steelwork (sundry Items)
SANS 1200 L	:	Medium Pressure Pipelines
SANS 1200 LB	:	Bedding (Pipes)
SANS 1200 LC	:	Cable Ducts
SANS 1200 LE	:	Stormwater Drainage

Variations and additions to the SANS 1200 Standardised Specifications are given in Portion 2 of the Project Specifications.

4.1.2 The following Particular Specifications form part of this Contract.

PA: Health and Safety
PB: EPWP Labour Intensive Specification
PC: Electrical and Mechanical Works Specification
PD: Mechanical Specification
PE: Electrical Specification
Project Specific Health & Safety Specifications
Environmental Management Plan

The following SANS specifications are also referred to:

SANS 1914: Targeted Construction Procurement
SANS 1921: Construction and Management Requirements for Works Contracts.

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

SA Bureau of Standards
Private Bag X191
PRETORIA
0001

4.2 PARTICULAR SPECIFICATIONS

The following variations and additions to the SANS 1200 Standardised Specifications referred to in the last clause of Portion 1 will be valid for this Contract. The prefix "PSA" indicates an amendment to SANS 1200 A, "PSC": to SANS 1200 C, etc. The numbers following these prefixes are the relevant Clause numbers in SANS 1200. (Amend the prefixes as applicable).

PSA GENERAL (SANS 1200 A)

PSA 2 INTERPRETATIONS

PSA 2.3 Definitions

c) Measurement and Payment

Replace the definitions for fixed charge, time-related charge and value-related charge with the following:

"**Fixed charge:** A charge that is not subject to adjustment on account of variation in the value of the Contract amount or the Contract time of completion.

Time-related charge: A charge, the amount of which is varied in accordance with the time for completion of the work as adjusted in accordance with the provisions of the Contract.

Value-related charge: A charge, the amount of which is varied pro rata the final value of the measured work executed and valued in accordance with the provisions of the Contract."

PSA 3 MATERIALS

PSA 3.1 Quality

Add the following:

"All manufactured materials supplied shall be new materials unless the contrary is specified. All materials shall bear the SANS mark, whether so specified or not.

The Contractor shall submit to the Engineer samples of all materials intended to be incorporated in the works, at least two weeks prior to the materials being required for construction.

The submission of the samples shall, where ordered by the Engineer, be accompanied by results of tests on the samples undertaken by an independent laboratory on his behalf and at his cost on the samples in question, before consideration by the Engineer."

Add the following :

PSA 3.3 Ordering of Materials

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

PSA 4 PLANT

PSA 4.2 Contractors Offices, Stores and Services

Add the following:

"The Contractor shall be responsible for the security of his construction camp and the construction site at his own cost. The Contractor shall make his own arrangements to house his employees."

PSA 5 CONSTRUCTION

PSA 5.1 Survey

PSA 5.1.1 Setting out the Works

Add before the first sentence :

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

PSA 8 MEASUREMENT AND PAYMENT

PSA 8.1 Measurement

PSA 8.1.2 Preliminary and general items or section

PSA 8.1.2.2 Tendered Sums

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

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

- Risks, costs and obligations in terms of the General Conditions of Contract and of this Standardized Specification, except to the extent that provision is made in these Project Specifications to cover compensation for any of these items of work.
- Head-office and site overheads and supervision.
- Profit and financing costs.
- Expenses of a general nature not specifically related to any item or items of permanent or temporary work.
- Providing facilities on Site for the Contractor's personnel, including offices, storage facilities, workshops, laboratories, living accommodation, tools and equipment, ablutions, for providing services such as water, electricity, communications, sewerage, sewage and rubbish disposal, for access roads to access the various parts of the works and all other facilities required, as well as for the maintenance and removal on completion of the Works of these facilities and the cleaning-up of the camp site on completion of the works.
- Dealing with water, including the work required in the ponds to construct the floating roof and joint repairs.
- Providing facilities for the Engineer and his staff as specified in SANS 1200 AB and in these Project Specifications."

PSA 8.2.2 Time-related items

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

"Subject to the provisions of 8.2.3 and 8.2.4, payment under item PSA 8.4.1 (time-related item) will be made monthly in equal amounts, calculated by dividing the sum tendered for the item by the tendered Contract Period in months, provided always that the total of the monthly amounts so paid for the item is not more than in proportion to the progress of the work as a whole.

Should the Engineer grant an extension of the time for completion of the Works, the Contractor will be entitled to an increase in the relevant sums tendered for the time-related item."

PSA 8.3 Scheduled fixed-charge and value-related items

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

PSA 8.3.2.1 Facilities required by the Engineer

The Engineer will require office accommodation as per PSAB specification. It is a requirement that this office establishment is situated within the Contractor's proposed site camp.

PSA 8.3.3 Contractor to provide 'As-Built' Information

The sum tendered shall include for the provision of all co-ordinate values and levels necessary to enable accurate 'as-built' drawings to be compiled for completion of the works, including all pipelines horizontal alignments; all isolating valves, air valves, scour valves, meter chambers, pressure reducing valve chambers (including levels); erf connection (take off points) and domestic meters positions . Certificate of Practical Completion will only be issued after delivery of as-built survey information to the Engineer.

PSA 8.4 Scheduled time-related items

Replace the items with the following:

PSA 8.4.1 Time-related preliminary and general charges Unit : Sum

The sums tendered shall include full compensation for all time-related preliminary and general charges as described in sub-clause PSA 8.1.2.2. Payment will be made as described in sub-clause PSA 8.2.2."

PSA 8.5 .1 Compliance with OHS Act Unit: Sum

A payment item is included in the Schedule of Quantities to cover the Contractor's cost for compliance with the OHS Act and the Construction Regulation 2014. The tendered sum shall include full compensation to the Contractor for compliance with all the requirements of the OHS Act and the Construction Regulation 2014 at all times. The successful tenderer shall provide the Engineer with a complete breakdown of this tendered sum.

This sum will be paid to the Contractor in equal monthly amounts.

PSA 8.5.2 Compliance with Environmental Management Plan (EMPr) Unit: Sum

A payment item is included in the Schedule of Quantities to cover the Contractor's cost for compliance with ALL requirements of the Environmental Management Plan (EMPr), a copy of the EMPr and associated relevant information is included in this document. The tendered sum shall include full compensation to the Contractor for compliance with all the requirements of the EMPr at all times. The successful tenderer shall provide the Engineer with a complete breakdown of this tendered sum.

This sum will be paid to the Contractor in equal monthly amounts.

PSA 8.6 Miscellaneous Items

An item which refers to this payment clause will be measured in the unit specified.

The sum or rate for the item will cover the cost of all labour, plant and material required to complete the work as specified.

PSAB ENGINEER'S OFFICE (SANS 1200AB)

PSAB 1 SCOPE

This specification covers the requirements for office accommodation and housing for the Engineer and his staff.

PSAB 3.1 Nameboards

The Contractor shall supply and erect, at an approved site, two nameboards that shall comply with the size, painting, decorating and detail as detailed on the drawing included in Section C5: Annexures of these documents

PSAB 3.2 Office Building

The Contractor for this section of the work shall, at the commencement of the Contract, supply and erect one furnished office for the exclusive use and benefit of the Engineer's Representative.

The Contractor shall provide for the removal of the premises on completion of the work.

The ownership of the premises and furnishings shall remain with the Contractor on completion of the work.

The office shall at least have a floor area of 12 square metres.

Offices shall be conventional shape and design, weatherproof, lined, ceiled, wood or concrete floor. The office shall have at least 2 square metres of glassed window area of which 1 square metre shall be capable of being opened. All doors shall be provided with lock and key. For this purpose portable office accommodation will be acceptable.

The following furniture shall be provided and installed in the office:

a) two desks with drawers and locks of minimum size 1.5 by 0.9 metres;
b) one table of minimum size 2,0 by 1,0 metres;
c) four office chairs;
d) one lockable steel filing cabinet;
e) one lockable steel storage cabinet;
f) the Contractor shall provide, maintain and keep in good sanitary condition adequate sanitary accommodation for the use of the Engineer and his staff;
g) the Contractor shall provide for the proper servicing maintenance and cleaning of the office during the contract period;
h) the Contractor shall provide two carports for the Engineer.

The office shall be equipped with electricity, lighting and air conditioner. The entire area shall be securely fenced with one access gate.

PSAB 3.3 Survey and other Equipment

The Contractor shall provide a Dynamic Cone Penetrator (DCP) that is to be retained on site at all times, and any other labour required for this purpose.

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

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

PSC SITE CLEARANCE (SANS 1200 C)

PSC 3 MATERIALS

PSC 3.1 Disposal of Material

Add the following:

"The Contractor shall make his own arrangements for the disposal of excess material obtained from clearing and grubbing which material shall be disposed of in terms of the EMPr. The disposal site shall meet with the approval of the Local Authority within whose area it falls, and the spoiling shall comply with all the statutory and municipal regulations. Clean building rubble and the like may be disposed of at designated spoil sites. Any other material that could contaminate the environment shall be disposed of off-site at the Contractor's expense. No overhaul will be paid for any spoil materials and the contractor shall allow for all haulage in his tendered rates. All costs related to this activity shall be deemed to be included in the rates tendered for site clearance. No burning of material will be allowed on site."

PSC 5 CONSTRUCTION

PSC 5.1 Areas to be Cleared and Grubbed

Add the following:

The contractor is required to restrict the clearing of vegetation along pipeline routes to a minimum. Width will be restricted to a maximum of 1m for single pipeline trenches and to a maximum of 1.6m for pipeline trenches containing more than one pipe per trench. The contractor is to clear and grub only where directed by the Engineer.

PSC 5.2 Cutting of Trees

PSC 5.2.3.2 Individual Trees

A penalty of R2000 per tree shall apply. Prior to removing any trees, the Contractor shall together with the Engineer mark the trees to be preserved.

PSC 5.3 Clearing

Add the following:

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

Alien vegetation shall be cleared and disposed of, continuously over the entire construction footprint for the duration of the Contract, in terms of the EMPr.

PSC 5.6 Conservation of Topsoil

Conservation of topsoil is required. Topsoil will be conserved in terms of SANS 1200 D, Subclause 5.2.1.2 and the EMPr.

Add the following new subclause:

PSC 5.9 Topsoiling and Reinstatement of Vegetation

The contractor is required to restrict the removal of topsoil and the working width (construction footprint) along pipeline routes to an absolute minimum. The width will be restricted to a maximum of 1m for single pipeline trenches and to a maximum of 1.6m for pipeline trenches containing more than one pipe per trench. If the Contractors working width (construction footprint) exceeds the specified minimum widths, all costs related to the additional working width required for pipeline trenches are to the contractors cost. The entire construction footprint shall be topsoiled and revegetated and the full working width reinstated.

Topsoil shall be excavated from stockpiles, hauled, spread and lightly tamped to a final thickness of 100mm and neatly trimmed to required lines, grades and levels.

Grass sods and other vegetation, obtained from the topsoil stockpile, shall be replanted after topsoiling has been completed. The completed area shall be well watered. The Contractor shall ensure that the planted areas are not permitted to dry out. Any grass or other vegetation that fails to grow shall be replaced by the Contractor at his own expense, with fresh grass or other vegetation or seed, as appropriate until satisfactory cover has been achieved.

PSC 8 MEASUREMENT AND PAYMENT

PSC 8.1 Basic Principles

Add the following:

Separate payment will be made for clearing and grubbing, topsoil removal and re-vegetation along pipeline routes and spoil sites. The contractor is to clear pipeline trenches and / or spoil sites only where directed by the Engineer. The top 150mm of material (topsoil and vegetation) is to be stripped and stockpiled separately from other excavated material, for replacement on completion of backfilling and reinstatement operations.

Delete the last paragraph:
“Where conservation of topsoil without prior clearing ……”

Replace with:
Separate payment will be made for the conservation of topsoil.

PSC 8.2 Scheduled Items

PSC 8.2.1 Clear and Grub

Add the following

Separate payment will be made for clear and grub and topsoil removal. Clearing and grubbing is only to be executed as directed by the Engineer.

The tendered rate shall cover all costs associated with the clearing of the area and the disposal of vegetation and rubble to an approved disposal site.

PSC 8.2.5 Take down existing fences

Add the following:

“The tendered rate shall also include for the re-erection of the fence to an equal or improved condition as prior to dismantling, photographing the fence prior to the removal or dismantling, and temporary fencing where required all as specified.”

The removal of existing fences and re-erection of these fences will measured per linear meter.

PSC 8.3 Topsoil Removal

Separate payment will be made for clear and grub and topsoil removal. The contractor is to clear trenches, only where directed by the Engineer. The topsoil and vegetation are to be removed such that the top 150mm of topsoil and vegetation is kept separate from the cleared and grubbed material and other excavated material. All costs related to topsoil removal and separate stockpiling shall be included in the rates tendered for topsoil removal.

The unit of measurement for pipelines will be per linear meter.

PSC 8.3 Topsoiling and Reinstatement of Vegetation

No additional measurement will be made for topsoiling and re-vegetation of pipeline trenches for increased working widths (construction footprint) of pipeline trenches in excess of those specified under Clause PSC 5.9. All costs related to the topsoiling and revegetation of the increased working widths in excess of the maximum widths specified shall be to the Contractors cost. The entire construction footprint shall be topsoiled and revegetated and the full working width (construction footprint) reinstated.

The rate shall cover the cost of excavating topsoil from the stockpiles, hauling, spreading and lightly tamping and trimming to the required lines and levels and replanting vegetation and grass sods across the restricted working width as detailed in PSC 5.9. The final thickness of topsoil after tamping shall be 100mm. The planted area shall be well watered on completion.

Payment for this item will only be scheduled after an even coverage of at least 50% of vegetation has been achieved over the entire area (construction footprint) to be reinstated, including that portion of the construction footprint in excess of the specified maximum working widths under Clause PSC 5.9, which is to the Contractor cost.

The unit of measurement for pipelines will be per linear meter.

The unit of measurement for spoil sites will be square meters.

PSD EARTHWORKS

PSD 2 INTERPRETATIONS

PSD 2.1 SUPPORTING SPECIFICATIONS

Replace subclause 2.1.2 with the following:

"PSD 2.1.2 Any of the other SANS 1200 specifications may form part of the Contract documents."

PSD 2.3 DEFINITIONS

Replace the word and the definition for "Borrow" with the following:

"**Borrow material**: Material, other than material obtained from excavations required for the works, obtained from sources such as borrow pits or the authorised widening of excavations. 'Borrow' shall have a corresponding meaning."

Replace the definition for "Specified density" with the following:

"**Specified density**: The specified dry density expressed as a percentage of modified AASHTO dry density."

Replace the definition for "Stockpile" with the following:

"**Stockpile** (verb): The process of selecting and, when necessary, loading, transporting and off-loading material in a designated area for later use for a specific purpose"

Add the following definitions:

"**Commercial source**: A source of material provided by the Contractor, not the Employer, and excludes any borrow pit, provided by the Contractor

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

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

PSD 3 MATERIALS

PSD 3.1 CLASSIFICATION FOR EXCAVATION PURPOSES

PSD 3.1.1 Method of classifying

Add the following:

"The Contractor shall immediately inform the Engineer if and when the nature of the material being excavated changes to such an extent that a new classification is warranted for further excavation. Failure on the part of the Contractor to advise the Engineer in good time shall entitle the Engineer to reclassify, at his discretion, such excavated material."

PSD 3.2.1 Material suitable for backfill or fill against structures

Replace the contents of this subclause with the following:

"Material used for backfill behind structures shall generally be the material excavated, subject to the following conditions:

(a) The material shall not contain an excessive number of stones retained on a 50 mm sieve;
(b) The material shall not contain large clay lumps that do not break up under the action of the compaction equipment; and

(c) The liquid limit of the material shall not exceed 40, neither shall the PI exceed 18."

PSD 5 CONSTRUCTION

PSD 5.1 PRECAUTIONS

PSD 5.1.1 Safety

PSD 5.1.1.1 Barricading and lighting

Replace "Machinery and Occupational Safety Act, 1983 (Act 6 of 1983)" *with* "Occupational Health and Safety Act, 1993 (Act No 85 of 1993)".

PSD 5.1.1.2 Safeguarding of excavations

Replace "Machinery and Occupational Safety Act" *with* "Occupational Health and Safety Act, 1993 (Act No 85 of 1993)".

PSD 5.1.2 Existing services

PSD 5.1.2.2 Detection, location and exposure

Replace the contents of subclause 5.1.2.2 with the following:

"The exposure by the Contractor of underground services, as required in terms of subclause 5.4 of SANS 1200 A (as amended) shall be carried out by careful hand excavation at such positions and to such dimensions as are agreed to by the Engineer.

Unless otherwise instructed or agreed by the Engineer, no service shall be left exposed after its exact position has been determined and all excavations carried out for the purposes of exposing underground services shall be promptly backfilled and compacted to the following densities:

(a) In roadways: 93% modified AASHTO density; and

(b) In all other areas: 90% modified AASHTO density.

Where hand excavations to expose underground services have to be carried out in roadways, the Contractor shall reinstate the road layerworks in accordance with the provisions of subclause 5.9 of SANS 1200 DB.

Payment in respect of exposing the services by means of hand excavation as described above, will be made in accordance with subclause PSD 8.3.8.1.

Payment in respect of reinstating layerworks in roadways will be made in accordance with subclause 8.3.6.1 of SANS 1200 DB (as amended)."

PSD 5.1.2.3 Protection of cables

Replace subclause 5.1.2.3 with the following:

"5.1.2.3 Protection during construction

Further to the requirements of subclause 5.4.2 of SANS 1200 A (as amended), major excavating equipment and other plant shall not be operated dangerously close to known services. Where necessary, excavation in close proximity to known services shall be carefully carried out with suitable hand tools, excluding picks wherever their use could damage the services. No additional payment will apply to such more difficult work.

Should any service not being a known service be discovered or encountered during the course of the Contract, the Contractor shall, in addition to complying with the requirements of subclause 5.4.2 of SANS 1200 A (as amended),

immediately notify the Engineer thereof and implement such measures as will prevent damage of such service or, if it was damaged in the course of discovery, will prevent and minimise the occurrence of any further damage occurring."

PSD 5.1.2.4 Negligence

Delete subclause 5.1.2.4.

PSD 5.1.3 Stormwater and groundwater

Add the following:

"The Contractor shall, where applicable and at the earliest practicable opportunity, install the permanent drainage specified or shown on the Drawings and shall at his own cost provide the temporary drainage required to protect the works."

PSD 5.1.6 Road traffic control

Delete the second sentence of subclause 5.1.6.

PSD 5.2 METHODS AND PROCEDURES

PSD 5.2.2 Excavation

PSD 5.2.2.1 Excavation for general earthworks and for structures

Add the following to paragraph (b):

"When the nature of the material precludes the above procedure, additional excavations shall be carried out to provide working space of 600mm for structures, but the Contractor may excavate a greater working width at no additional cost to the Employer." The tendered rate for item 8.3.5 will be deemed to be included in the cost for pipeline trench excavations and no additional costs for excavation to structures will apply.

Replace the first sentence of paragraph (e) with the following:

"Where excavations have been carried below the authorised levels, the Contractor shall backfill such excavations to the correct level with approved gravel compacted to 90% of modified AASHTO density or to the density of the surrounding material, whichever is the higher density. The cost of the remedial measures shall be for the Contractor's account.

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

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

PSD 5.2.2.3 Disposal

Spoil sites will be identified, by the Engineer, for the disposal of all surplus and unsuitable material generated from trench excavations. The material shall be disposed of by spreading in layers not exceeding 300mm thickness, shaped as directed on site and compacted to 90% Mod AASHTO at the designated spoil sites as directed by the Engineer.

Where directed by the Engineer, spoil sites are to be cleared as per PSC 8.1.

Add the following subclause in subclause 5.2.2:

"PSD 5.2.2.4 Selection and stockpiling

Approval or designation of the material in a particular borrow pit or excavation for a particular purpose does not imply that all the material in the borrow pit or excavation is suitable for the particular purpose to which the said approval or designation relates, nor that all material in the borrow pit or source should be used for the particular purpose. The Contractor shall select suitable material from that borrow pit or source, discard unsuitable material and reserve material for other purposes as necessary.

The Contractor shall organise and carry out his operations in such a manner as will prevent the contamination of suitable embankment and backfill material with unsuitable materials. Any excavated material which becomes, in the Engineer's opinion, unsuitable for use in embankments or backfill as a result of contamination, shall be disposed of in a manner acceptable to the Engineer and shall be replaced by the Contractor with materials acceptable to the Engineer, all at the Contractor's cost.

PSD 5.2.5 Transport for earthworks

Replace the contents of SUB CLAUSE 5.2.5 WITH THE FOLLOWING:

"The transport of all excavated materials, shall be deemed to be free-haul for a distance of 5km from origin, the cost of which is included in the Contractor's tendered rates and prices for the excavation of the materials. No separate compensation shall apply for the transportation of excavated materials within this distance."

PSD 7 TESTING

PSD 7.2 TAKING AND TESTING OF SAMPLES

Replace the contents of this subclause with the following:

"The Contractor shall arrange with the approved independent laboratory engaged by the Contractor to carry out sufficient tests on a regular basis as agreed between him and the Engineer to determine whether the degree of compaction, and, where applicable, the quality of materials used, comply with the Specifications and shall submit the results of these tests to the Engineer in a form approved by him.
The compaction requirements for fills and selected layers shall be as follows:
A minimum of 4 density tests shall be taken on each layer; at least 75% of the dry- density tests on any lot shall achieve a density equal to or above the specified density; no single value shall be more than one percentage points below the specified value."

PSD 8 MEASUREMENT AND PAYMENT

PSD 8.3 SCHEDULED ITEMS

PSD 8.3.1 Site preparation

Replace sub-clauses 8.3.1.1 and 8.3.1.2 with the following:

"Where site preparation such as clearing, grubbing, the removal of large trees or the removal and stockpiling of topsoil is required, the provisions and scheduled items of SANS 1200 C shall apply, as amended."

PSD 8.3.1.2 Remove topsoil to a nominal depth 150 mm, stockpile and maintain

Add the following:
The unit of measurement for pipelines will be per linear meter.

The unit of measurement for spoil sites will be square meters.

Add the following new subclause:
PSD 8.3.2(b)(5) Transport, place and compact surplus material at spoil sites

The rate tendered for this item shall cover the additional cost of loading, transporting (within the 5km freehaul distance), placing, compacting to 90% Mod AASHTO and shaping surplus material at designated spoil sites.

The unit of measurement shall be per cubic meter of compacted fill material.

PSD 8.3.3 Restricted excavation

Replace the words "in 1 m increments" *at the end of the first sentence of sub item (a) with* "to the depths as shown on the drawings".

Replace "in 5.2.2.1 – 5.2.2.3 (inclusive)" *at the end of subclause (a) with* "in subclause 5.2.2.1 to 5.2.2.5 (inclusive)".

Add the following sub item:

"(c) Extra over sub item 8.3.3 (a) for hand excavation ..... Unit: m³

This item shall apply to hand excavation ordered by the Engineer or when the Engineer considers that, owing to circumstances, excavation by mechanical excavators is not practicable. It shall not apply to hand excavation for trimming or finishing an excavation made by mechanical means.

The tendered rate shall include full compensation for the additional cost of excavating by means of hand tools."

All excavations for foundations for particular structures below the given bulk excavation levels shall be classified as restricted excavation as scheduled for the purposes of measurement and payment.

PSD 8.3.8 Existing services

PSD 8.3.8.1 Location

Replace item 8.3.8.1 with the following:

"8.3.8.1 Hand excavation for locating and exposing existing services ..... Unit: m³

The unit of measurement shall be the cubic metre of material excavated, measured in place according to the authorised or actual dimensions of the excavation, whichever is the lesser.

The tendered rates shall cover the cost of excavating in all materials by means of hand tools within authorised dimensions and at locations approved by the Engineer for all precautionary measures necessary to protect the services from damage during excavation and backfilling, and for subsequent backfilling and compacting. Compaction of material in all areas except in roadways shall be to 90% of the modified AASHTO density.

The tendered rates shall also include for keeping excavations safe, for dealing with surface and subsurface water, for removing surplus excavated material from the site, for transporting all material and for supplying adequate supervision during both excavation and backfilling operations.

PSDB EARTHWORKS (PIPE TRENCHES)

PSDB 3 MATERIALS

PSDB 3.1 Classes of excavation

PSDB 3.1.1 Machine Excavation

As per sub-clause 3.1 of SANS 1200DB, except that no distinction will be made between soft and intermediate excavation. All excavation falling into these categories will be measured as soft material.

Machine based excavation shall only be permitted on written approval of the Engineer.

PSDB 3.1.2 Hand Excavation

The "Dynamic Cone Penetrometer" (DCP) test shall be used to differentiate between different classes of material. The average DCP for a 300mm thick soil horizon will be used for classification purposes.

(i) Soft material: All material where the penetration is 50mm/blow or more.

(ii) Firm material: All material where the penetration is less than 50 but more than or equal to 20mm/blow.

The item for hand excavation in the Schedule of Quantities will be split into soft and firm for measurement purposes.

PSDB 3.5 Backfill Material

In areas subject to traffic, backfill material shall be a G5 material compacted in layers of 150 mm to 95% Mod AASHTO density.

Add the following paragraphs to subclause 3.5:

"(c) Cement-stabilized backfilling

Backfilling shall, where directed by the Engineer, be stabilized with 5% cement. The aggregate shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed with 5% cement and shall be compacted in layers of 100 mm thick to 90% of modified AASHTO density.

(d) Soilcrete backfilling

The aggregate for soilcrete shall be mixed with 5% cement and shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed in a concrete mixer with the cement and enough water to acquire a consistency that allows the mixture to be placed with vibrators to fill all voids between the pipe and the sides of the trench. Shuttering shall be used where necessary."

PSDB 3.7 SELECTION

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

PSDB 5 CONSTRUCTION

PSDB 5.1 Precautions

PSDB 5.1.2.3 Sloping Ground

Add the following:

The Engineer may order the construction of cross embankments to minimise erosion in areas where backfilling of trenches has been completed. Measurement and payment will be on a daywork basis.

Add the following new sub-clause:

PSDB 5.1.2.4 Cross walls in trenches

"The Engineer may order the construction of earth cross walls in completed portions of trenches to minimise the danger of flooding. Measurement and payment will be on a daywork basis."

PSDB 5.2 Minimum Base Width

The minimum base widths of trenches shall be as listed below:

External pipe diameter	Base Width
Up to and including 40 mm	450 mm
Over 40 mm and up to and including 160 mm	600 mm
Over 160 mm and up to and including 250mm	800 mm
Over 250 mm and up to and including 355mm	As per SANS 1200 DB

Where two or more pipes are placed in one trench, the trench width and spacing between the pipes shall be as detailed on the drawings.

PSDB 5.4 Excavation

Unless otherwise permitted in writing by the Engineer, not more than 500 m of trench, per working face, shall be opened in advance of a pipe laying operation.

No trench may be left open over the shut-down period. The cost of backfilling any trenches before the shut-down period and the re-opening thereof after the shut-down period shall be for the Contractor's account.

Notwithstanding the requirements of SANS 1200DB Sub-Clause 8.3.2 the depths for excavation shall be amended to read:

a) Over 0,0m and up to and including 1,5m;
b) Over 1,5m and up to and including 2,0m;
c) Over 2,0m and up to and including 2,5m.

Where no longitudinal sections prescribe levels, trench depths shall be as follows:

a) All pipe diameters in non- trafficked areas:
External pipe diameter plus 900mm (800mm cover to the pipe)

b) All pipe diameters in unregistered road reserves:
External pipe diameter plus 900mm (800mm cover to the pipe)

c) All pipe diameters in registered road reserves:
External pipe diameter plus 1100mm (1000mm cover to the pipe)

d) All pipe diameters for pipe crossing unregistered and registered roads:
External sleeve pipe diameter plus 1100mm (1000mm cover to sleeve pipe)

PSDB 5.6.3; 5.6.4 Disposal of Excavation Material
Add the following:

Spoil sites will be identified on site for the disposal of all surplus and unsuitable material generated from trench excavations. The material shall be disposed of by spreading in layers not exceeding 300mm, shaped as directed on site and compacted to 90% Mod AASHTO at the designated spoil sites as directed by the Engineer .

Where directed by the Engineer, spoil sites are to be cleared as per PSC 8.1.

PSDB 5.6.5 Deficiency of backfill material

A freehaul distance of 5 km will be allowed for the importation of backfill material from surplus excavated materials along the trench route.

No payment will be made for additional backfill material in the trenches due to overbreak etc. The Contractor must allow for such costs in the tendered rates for excavation measured under Sub-Clause 8.3.2 of SANS 1200DB.

No payment will be made for the selection and/or importation of additional backfill material to meet the material specification in road crossings. The Contractor must allow for such costs in the tendered rates for compaction in road reserves measured under Sub-Clause 8.3.3.3 of SANS 1200DB.

Add the following sub-clause:

PSDB 5.12 Work in restricted areas

In certain areas working space may be restricted. Rates tendered shall include full compensation for any difficulty encountered while working in restricted areas and narrow widths, and no extra payment will be made, nor will any claim for payment due to these difficulties be considered."

PSDB 8 MEASUREMENT AND PAYMENT

PSDB 8.1 Basic Principles

PSDB 8.1.1 Amend to read:

"The basic principle of measurement and of payment for earthworks for a pipe trench is that the rates tendered for excavation shall cover the cost of excavation and the re-use of the excavated material for backfilling and the disposal of any surplus material along the pipeline route or to designated spoil sites within a freehaul distance of 5km."

PSDB 8.1.5 Add the following new sub-clause:

Payment in respect of items scheduled under item 8.3 will be as follows:

i) 50% payment on completion of excavation.
ii) 50% on completion of backfill, full reinstatement and disposal of surplus material.

PSDB 8.2 Computation of Quantities

PSDB 8.2.1 Add:

"No additional excavation will be measured as a result of overbreak or boulder removal during trenching operations. No additional excavation will be measured for excavation around pipe at chamber positions".

PSDB 8.2.3(a) Excavation will be measured volumetrically:

(i) where longitudinal sections prescribe levels, excavation will be measured from depths specified;
(ii) where no longitudinal sections prescribe levels, excavation will be measured to depths as specified in PSDB 5.4.

PSDB 8.3 Scheduled items

PSDB 8.3.2 Excavation

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

Replace "of 1.0m" in the first sentence of 8.3.2(a) with:

"as specified in the Schedule of Quantities".

Add the following new items:

PSDB 8.3.2(d) Hand excavation of pipe trenches, backfill, compact and dispose of surplus material

i) Soft Material…… Unit: m³
ii) Firm Material……. Unit: m³

The unit of measurement shall be the cubic metre of material excavated in accordance with the authorised dimensions, measured in place before excavation. Volumes will be computed in accordance with Sub-Clause PSDB 5.2 and PSDB 8.2.

All excavation, backfilling and loading of surplus/unsuitable material onto trucks for disposal shall be carried out by hand and the use of mechanical equipment for these activities shall not be permitted.

The tendered rate shall cover the cost of complying with the requirements of Sub-Clause 5.1 of SANS 1200 DB (except where particular items are scheduled to cover particular costs (see Sub-Clause 5.1.2.2)), excavation to the required lines, levels and grades, backfilling, compacting and disposing of surplus/unsuitable material as specified in PSDB 5.6.3 and 5.6.4.

That rate tendered shall also include full compensation for all additional time, effort, supervision etc. for excavating by hand methods in locations where in the opinion of the Engineer the use of mechanical excavation plant is undesirable.

Prior to trench excavation by hand, materials will be classified and agreed as outlined in PSDB 3.1.2.

All pipe trenches will be excavated by hand methods unless ordered otherwise by the Engineer.

Those portions of the trench which in the Engineer's opinion are too hard to be excavated to the full depth by hand will be excavated in their entirety using plant instead."

PSDB 8.3.2(e) Extra over item 8.3.2(a) for:

i) Backfill stabilised with 5% cement where directed by the Engineer…… Unit: m³

The unit of measurement shall be the cubic meter of backfill material, measured in place after compaction according to the authorised dimensions, which was stabilised on the Engineer's instructions in accordance with subclause PSDB 3.5(c).

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing, backfilling and compacting the stabilised material to 90% of modified AASHTO density.

ii) Soilcrete backfill where directed by the Engineer…… Unit: m³

The unit of measurement shall be the cubic metre of soilcrete placed on the Engineer's instructions in accordance with subclause PSDB 3.5(d), measured in place according to the authorised dimensions.

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete as well as for the cost of shuttering if required.

PSDB 8.3.4 (b) Temporary Works: Control of Water Inflow

Replace item 8.3.4 with the following:

The unit of measurement will number (No).

The rate tendered will cover the cost of excavating and maintaining a well point adjacent to the trench to 1.0m below the trench invert level as well as providing, operating, maintaining and removing pumping equipment on completion and backfilling, compacting and reinstating vegetation at well point.

Well points are to be constructed where ordered by the Engineer in wetlands only.

Add the following new subclause:

PSDB 8.3.4 (c) Extra over item 8.3.2(a) for construction of Temporary works at river and stream crossings …… Unit: m^3

The rate shall cover the extra cost of providing the necessary plant and/or materials required to undertake river and stream crossings to an average depth of 2m, including temporary diversion of water flow, de-watering equipment etc., and removing such goods and restoring the site to its original condition on completion of that part of the project for which the temporary works were erected.

PSDK GABIONS AND PITCHING

PSDK 5 CONSTRUCTION PSDK 5.3.3 Grouted pitching

Replace the words "(table 4)" *in the second line of the first paragraph with* "(table 2)".

PS CC1 CONCRETE
SANS 2001-CC1: 2007

PS CC1 4.2 MATERIALS

PS CC1 4.2.1 CEMENTITIOUS BINDERS

Add the following:

"Only CEM II/A-V 42,5 (Portland fly ash cement) according to (SANS 50197-1), may be used. The cement may not consist of more than 20% siliceous fly ash blended with the OPC (Ordinary Portland Cement). Alternatively, CEM III/A 32,5N blast furnace cement or CEMV/A(S-V) 32,5N composite cement may be used provided the longer shutter stripping times required for these types of cement are observed.

Should the Contractor wish to use any other type of cement, he shall obtain the Engineer's prior written approval (see SABS 1200 G Section 8: Measurement and Payment 8.1.3.2 and 8.1.3.3)."

Sub Clause PS CC1 4.2.1.3

Add the following:

"Cement shall be used in the order in which it is received.

Unless approved by the Engineer, cement kept in storage for longer than 8 weeks shall not be used in the Works without the Engineer's permission.

Any cement that contains lumps that cannot easily be crumbled to powder between the fingers, may not be used."

PS CC1 4.2.3 AGGREGATES

Subclause PS CC1 4.2.3.1

Add the following:

"At least four weeks before submitting a concrete mix design for approval (in terms of PS CC1 4.7.5), the Contractor shall supply at his own cost representative samples to the Engineer of the aggregates he intends using, together with certificates from an approved laboratory indicating that the aggregates comply with the specifications. Approximately 50 kg of each sample of aggregate shall be supplied.

After approval, these samples shall be taken as standard for the agreed aggregates to be used in the Works. If at any time during the course of the Contract the Engineer considers that there has been any deviation from the approved standard, the Contractor shall submit further tested samples of material to the Engineer for approval."

Add the following

"Sub Clause PS CC1 4.2.3.8

Where reactive aggregates such as Malmesbury Group aggregates, and certain Table Mountain Formation and other quartzitic aggregates are used for concrete, the Contractor shall, in order to ensure that the concrete is not subject to alkali-aggregate reaction, design his mixes and/or use cement with a sufficiently low alkali content such that the total equivalent sodium oxide content of the concrete is less than 1,8 kg/m^3.

(NOTE: The equivalent sodium oxide content (alkali content) is measured as (Na20 + 0,658 K20). For cement it is expressed as a percentage by mass, for concrete it is expressed in kg/m^3).

In the case of other aggregates that are less reactive the Engineer will determine the type and degree of precautionary measures to be adopted."

PS CC1 4.3 FORMWORK

PS CC1 4.3.1 GENERAL

Add the following subclause:

"PS CC1 4.3.1.9 Finish: chamfers and fillets

All exposed external angles in concrete work shall have 25 mm x 25 mm chamfers unless otherwise specified or ordered. Internal corners in concrete work need not have fillets unless such fillets have been specified on the drawings or ordered by the Engineer."

PSCC1 4.3.1.8 Classification of finishes

Formwork for all formed surfaces shall be smooth, except where otherwise specified.

PS CC1 4.3.2 DESIGN AND CONSTRUCTION OF FORMWORK AND FALSEWORK

PS CC1 4.3.2.1 General

PS CC1 4.3.2.1.4

All formwork or scaffolding required for any part of the works shall be designed by the Contractor, and before commencing with the erection of any formwork or scaffolding, the Contractor shall submit the methods he proposes to use to the Engineer for approval.

Add the following:

"The Engineer has the authority to order alterations to the design or the sizes of any part of the formwork or scaffolding. The Contractor shall check the safety and suitability of all such alterations. The fact that the Engineer has approved or altered any part of the formwork of scaffolding shall not be construed as relieving the Contractor of his responsibility with regard to the strength and stability of the formwork or scaffolding.

PS CC1 4.3.6 Preparation for formwork

PS CC1 4.3.6.2

Add the following:

"Construction joints shall be positioned as shown on the drawings."

PS CC1 4.3.8 Removal of formwork

Add the following subclause:

"PS CC1 4.3.8.6

The Contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and/or for back propping of beams and slabs."

PS CC1 4.4 REINFORCEMENT

PS CC1 4.4.2 FIXING

Add the following subclause:

"PS CC1 4.4.2.8

The Engineer will inspect the reinforcing after it has been fixed in place, the formwork has been cleaned, cover blocks have been positioned, and before concreting commences.

Welding and heating of reinforcing steel for fixing or bending will not be permitted."

PS CC1 4.4.3 Cover

SubClause 4.4.3.1

The exposure conditions of the concrete is classified as severe.

PS CC1 4.5 HOLES, CHASES AND FIXING BLOCKS

PS CC1 4.5.3

Add the following:

"Cover blocks for reinforcing and fixtures may be placed into the concrete provided that neither the strength nor any other desirable characteristic (such as the appearance) of the concrete section is affected or impaired in the opinion of the Engineer.

The holes or cavities left in the concrete of structures shall be filled with an approved non-shrink grout applied strictly in accordance with the manufacturer's specifications."

Add the following subclause:

"PS CC1 4.5.4 Spacers

Spacers of approved design include approved plastic or other proprietary spacers, or purpose made precast mortar blocks.

Where mortar blocks are used they shall be properly shaped so as not to slip out of position and shall be made of the same mix as the mortar of the concrete in which they are to be placed. The mortar shall be well compacted by approved means into the moulds to result in blocks with a density of at least 2 300 kg/m^3 and which are free from honeycombing. The mortar blocks shall be cured in water for at least 7 days. Blocks which have not been manufactured and cured strictly in accordance with these requirements or which are in any other way considered unsatisfactory by the Engineer, will be rejected and shall be removed from the Site."

PS CC1 4.6 EMBEDDED ITEMS

PS CC1 4.6.3 PIPES, CONDUITS AND DUCTS

Add the following sub clause:

PS CC1 4.6.3.4

"All pipes passing through concrete floors, walls or slabs shall be cast into a concrete member simultaneously with the casting of the member. Openings for pipes shall only be left in concrete members when so directed by the Engineer or when shown on the drawings. Pipes shall be installed in such openings according to the details shown on the drawings.

PS CC1 4.7 CONCRETE QUALITY

PS CC1 4.7.5 Durability

The exposure conditions of the concrete are classified as "severe".

Add the following Sub Clause:

PS CC1 4.7.5.3

"The minimum cement content shall be 325 kg/m^3. The maximum water: cement ratio shall be 0,55 for ordinary Portland cement (OPC), CEM 1 42,5 according to SABS ENV 197-1, and 0,50 for composite (blast furnace or PFA) cements, when allowed."

PS CC1 4.7.6 PRESCRIBED – MIX CONCRETE

Add the following:

"With the exception of mixes weaker than 15 MPa, all concrete for structural units/the Works shall be considered to be strength concrete.

The concrete mixes shall be designed by an approved laboratory. The results of actual test mixes must be submitted for approval together with 7-day and 28-day strength test results. Special attention is drawn to the fact that the concrete mix must provide a very dense and impervious concrete.

No concrete shall be cast until the mix designs have been approved by the Engineer. The Engineer may call for revised mix designs at any stage during the Contract."

PS CC1 4.7.7 Batching

Batching of strength concrete shall be by mass.

PS CC1 4.7.8 Mixing

PS CC1 4.7.8.1 Mixing at the Construction Site

Add the following subclause:

PS CC1 4.7.8.1.3 Minimum Plant

The Contractor shall have the following minimum plant available and in sound working order:

(a) Two concrete mixers, each of sufficient capacity to complete a slabs within 4 hours and without interruption

(b) Two weigh-batchers to supply the mixers

(c) Three concrete vibrators, at least one of which shall be powered by an internal combustion engine

(d) One air compressor

(e) Suitable and adequate plant to transport and raise concrete and other material and equipment from ground level to the top of the structure at all stages of construction

(f) Elevated storage tanks of adequate capacity to ensure that sufficient water will be available before commencement of every major concrete-placing operation

If the Plant used for placing concrete for the structure is electrically or mechanically powered, the Contractor shall also provide some other approved, non-electrically-powered standby means for placing concrete at an adequate rate in the event of a power or mechanical failure of the main Plant.

PS CC1 4.7.8.2 Ready-mixed concrete

Add the following:
"Ready-mixed concrete may be used on the Site. In addition to the supplier's sampling at the batching plant, the Contractor shall take 3 cube samples per ready mix concrete truck delivery to site for strength testing." Cube crushing strengths and slump test values from the supplier shall also be made available to the Engineer.

PS CC1 4.7.12.1 Construction joints

Add the following Sub Clause:

PS CC1 4.7.12.1.5

Vertical construction joints in the walls will not be permitted.

The joints between screeds and concrete floors shall be regarded as construction joints and the surface of the floor shall be prepared as described for construction joints.

Should the Contractor's method of construction necessitate the placing of a construction or other joint in a position not shown on the drawings, such method of construction and position of the joint shall be approved by the Engineer in writing. The cost of such joint shall be included in the tendered rates and shall include scabbling of the concrete where steel reinforcement is continuous.

PS CC1 4.7.13 Curing and protection

PS CC1 4.7.13.2

Add the following:

"The curing methods of retaining the formwork in place or covering with a waterproof membrane are strongly recommended. Concrete will not be paid for unless properly cured and proof of curing is continuously visible on site."

PS CC1 4.7.14 Adverse weather conditions

PS CC1 4.7.14.1

Add the following:

“The area of the pour shall be shaded before and during concreting and the concrete shall be shaded from the time of mixing until eight hours after placing.”

PS CC1 4.7.15 Concrete Surfaces

PS CC1 4.7.15.1

Add the following:

d) Where power floating is specified or scheduled and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, the screeded surface shall be power floated to produce a dense, smooth and uniform surface free of all trowel marks. In corners and areas of restricted access the concrete surface shall be finished by steel floating in accordance in CC1 4.7.15.1 c).

The timing of power-floating is critical to its success. Power-floating shall not commence until the concrete can support the weight of a man without indentation and until the moisture sheen has disappeared. Thus several hours will have to elapse after concreting has been completed before this operation can commence. Night work may therefore be required.

The main objective of power floating the mortar skim on the no-fines underdrainage layer is to achieve a plane, smooth surface. This need not be dense.

PS CC1 4.7.19 Defects

PS CC1 4.7.19.1

Add the following:

"All defects shall be repaired as soon as possible after the formwork has been removed and the Engineer has inspected the concrete. A statement of the method to be used for each repair shall be submitted to the Engineer for his approval before any work is carried out. The Engineer may prohibit the further placing of concrete in the particular area concerned until he is satisfied that the repair has been satisfactorily executed."

Add the following subclause:

"**PS CC1 4.7.24 Applied loads**

No crushed-stone covering or any other loads shall be placed on the roof of the structure before the concrete has attained its design strength, unless approved supports are provided.

PS CC1 4.7.25 Pipes and conduits

All pipes passing through concrete floors, walls or slabs shall be cast into the concrete member simultaneously with the casting of the member. Openings for pipes shall only be left in the concrete members when so directed by the Engineer or when shown on the drawings. Pipes shall be installed in such openings according to the details shown on the drawings.

PS CC1 4.7.26 Soilcrete

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

PS CC1 5.1 TESTS

PS CC1 5.1.1 General

Add the following Sub Clause:

PS CC1 5.1.1.1

"The Contractor shall provide sufficient storage capacity for the concrete cubes and shall arrange to have them tested by an approved laboratory.

The cost of all testing, including the cost of sampling, storage and transport of samples shall be included in the rates tendered for concrete work."

PS CC1 5.1.3 Frequency of sampling

Add the following:

One sample shall consist of three concrete test cubes.

For each sample taken, the position in the structure shall be recorded where the batch represented by that sample is placed.

Sampling of concrete of a particular grade shall be as specified in Subclause 5.1.2 with the following frequency of sampling referred to in Subclause 5.13 being amended to read as follows:

"A minimum of 1 sample per ready mix truck delivery or a minimum of 4 samples per day of each grade of concrete placed or 6 samples for pours in excess of 10 m^3 shall be taken."

PS CC 5.1.2 ACCEPTANCE CRITERIA FOR STRENGTH CONCRETE

PC CC1 5.1.2.6

Add the following:

"Test results obtained from the supplier of ready-mixed concrete will not be accepted for evaluation in terms of subclause 5.1, but samples for testing shall be taken of such concrete at the point of placing."

PS CC1 5.2 TOLERANCES

PS CC1 5.2.1 General

PS CC1 5.2.1.1

Add the following:

"Degree-of-accuracy II is applicable except that abrupt changes in a continuous surface shall not be more than 3 mm. Every specified permissible deviation is binding in itself. The cumulative effect of permissible deviations will not be considered. The maximum permissible vertical deviation is subject to the other permissible deviations.

	Permissible deviation		
	Degree of Accuracy		
	III	II	I
	mm	mm	mm
"vertically, per metre of height	5	3	2
Subject to a maximum of	50	30	10

PS CC1 6 MEASUREMENT AND PAYMENT

The SABS 1200 G Section 8: MEASUREMENT AND PAYMENT Clauses will apply

PSG 8.1 MEASUREMENT AND RATES

PSG 8.1.1 Formwork

Delete "or splays over 20 mm x 20 mm" *from the first line of paragraph 8.1.1.2. Add the following to paragraph 8.1.1.2:*

"Splays up to and including 25 mm x 25 mm will not be measured separately and will be deemed to be included in the formwork costs."

PSG 8.1.1.5

Delete "(see 5.2.1 C)" from the first line of paragraph 8.1.1.5 and add the following in its place "(see SANS 2001-CC1:2007 sub clause 4.7.15)".

PSG 8.1.1.6

Delete "or splays over 20 mm x 20 mm" *from the second line of paragraph 8.1.1.6 and replace with* "Splays up to and including 25 mm x 25 mm".

Add the following paragraphs:

8.1.1.8 No formwork will be measured to edges of blinding layers under structures, and the cost thereof (if needed) will be deemed to be included in the rates tendered for concrete in blinding layers."

PSG 8.1.2 Reinforcement

Replace the contents of this subclause with the following:

"The unit of measurement for steel bars shall be the ton of reinforcement in place, in accordance with the drawings or as authorised by the Engineer.

The unit of measurement for welded steel fabric shall be the area of fabric reinforcement in place, and the quantity shall be calculated from the net area covered by the mesh, excluding overlaps.
Clips, ties, separators, stools and other steel used for positioning reinforcement will not be measured, unless these are shown on the bending schedules.

The tendered rate shall include full compensation for the supply, delivery, cutting, bending, welding, placing and fixing of the steel reinforcement, including all tying wire, stools, supports and waste."

PSG 8.1.3 Concrete

Delete ", or the plan size of the excavation where additional excavation is provided to facilitate erection of forms" *from the second line of paragraph 8.1.3.1(c).*

PSG 8.4 SCHEDULED CONCRETE ITEMS

PSG 8.4.3 Strength concrete

Add the following after the last sentence:

"In the case of structural floor screeds, the unit of measurement shall be the square metre and the average thickness and proportions will be stated."

Replace "Unit: m^3" *with* "Unit: m^3 or m^2"

PSG 8.5 JOINTS

Replace "Unit: m" *with* "Unit: m or m²".

PSG 8.8 HD BOLTS AND MISCELLANEOUS METALWORK

Replace "Unit: t" *with* "Unit: No.".

Add the following items:

"PSG 8.9 MISCELLANEOUS WORK OTHER THAN METALWORK..... Unit: as scheduled

Separate items will be scheduled for each type of miscellaneous work.

The tendered rates shall include full compensation for providing all labour, materials and equipment required to carry out the work, for all preparatory work, for constructing the work scheduled in a workmanlike manner and for finishing off and cleaning up when the work has been completed.

PSG 8.10 DRAINAGE PIPES:

Perimeter and under-floor drains will be measured linear.

The unit rate shall cover the cost of the supply of the pipes and junctions, excavation, disposal of spoil, laying of the pipes and junctions, building them into junction boxes and the supply and placing of stone, sand and membrane around the pipes and membrane over the top of the drain, all as applicable.

PSG 8.13 PIPES, SPECIALS, FITTING AND VALVES

PSG 8.13.1 Encased in concrete

Pipes, valves of all kinds, specials and fittings will be measured by number of individual items or groups of items as billed.

The unit rates shall cover the cost of the supply and installation of the items concerned complete with all jointing materials, 500mm long Denso tape wrap at soil/concrete interface, and all other fittings and attachments billed or shown on the drawings. In the case of valves the unit rate shall also cover the cost of all spindles and fixing brackets, if any. In the case of pipes through the walls of the structures the unit rates shall also cover the cost of building the item into the wall.

PSG 8.13.2 Not encased in concrete

Pipes, valves of all kinds, specials and fittings will be measured by number of individual items or groups of items as billed.

The unit rates shall cover the cost of the supply and installation of the items concerned complete with all jointing materials and all other fittings and attachments billed or shown on the drawings. In the case of valves the unit rate shall also cover the cost of all spindles and fixing brackets, if any.

PSG 8.14 SCREEDS

(a) Floor screeds (1:3) with falls including V-joints to form panels and a smooth steel-trowelled finish/power float finish to top:

(i) Description of application and thickness..... Unit: m²

(ii) Etc. for other applications and thicknesses

The unit of measurement shall be the square metre of screeds constructed.

The tendered rate shall include full compensation for constructing the screeds as specified including supplying of all materials, preparing the concrete surface to receive the screeds and for all else that may be necessary to complete the work."

PSHA STRUCTURAL STEELWORK (sundry items)

PSHA 3 MATERIALS

Add the following Clauses:

"PSHA 3.4 LADDERS & MISCELLANEOUS ITEMS

PSHA 3.4.1 Ladders

Ladders shall be fabricated from one of the following materials, as specified or indicated on the drawings:

a) Stainless steel tubular (welded or seamless) sections and plate.
b) Mild steel tubular sections and plate.
c) Mild steel angle sections and plate.

Tubes shall comply with SANS 657 or SANS 965 as relevant. Mild steel shall be Grade 300 W complying with SANS 657.

PSHA 3.4.2 Miscellaneous fabrications

Unless otherwise specified on the drawings or in the schedules, mild steel fabrications other than ladders shall be ex mild steel angle sections, tubular sections, or plate and shall all be hot-dip galvanized in accordance with SANS 763 (using heavy duty coatings where applicable in terms of Table 2 thereof)."

PSHA 5 FABRICATION & ASSEMBLY

PSHA 5.2.7 Ladders

Delete the 1st sentence and replace with:

Ladders shall be fabricated complete with rungs and supporting stays welded to the tubes or angle iron, all to the details shown on the drawings. Ladders manufactured from tubular mild steel sections shall have all open ends welded closed to prevent moisture entering the tubes. After fabrication, mild steel ladders shall be hot-dip galvanized in conformity with SANS 763 to a thickness of 105 micrometres in the case of angle iron ladders and 55 micrometres for tubular ladders.

PSHA 8.3.7 Box Screen for Header Tank Outlet

The stainless steel frame and mesh box screen, is to be designed and fabricated to the details and dimensions given as described in the BOQ item. The work in fabrication, supply and installation will be measured as a lump Sum.
The tendered rate must include all design, procurement, fabrication, transport and installation costs, including gaining access to the Header Tank sump, cleaning and preparing the concrete floor surface for installation.

PSL MEDIUM PRESSURE PIPELINES (SANS 1200L)

PSL 1 SCOPE

This specification covers the manufacture, supply and installation of uPVC, Polyethylene and steel water pipelines of diameter 80 to 150mm NB and 200 to 250mmNB complete with ancillary works, suitable for use under working pressure up to 3,5 MPa.

PSL 2 INTERPRETATIONS

PSL 2.1 References

PSL 2.1.2 Supporting Specifications:

In addition to the specifications listed in SABS 1200L, the following additional specifications have reference (Dominant specifications are indicated in **Bold**):

SANS 62-1	**Steel pipes Part 1: Pipes suitable for threading and of nominal size not exceeding 150mm.**
SANS 62-2	**Steel Pipes Part 2: Screwed pieces and pipe fittings up to 150mm nominal bore.**
SANS 719	**Electric welded low carbon steel pipes for aqueous fluids.**
SANS 720	Coated and lined mild steel pipelines (electric fusion welded).
SANS 763	Hot-dipped (galvanized) zinc coatings.
SANS 974-1	Rubber Joint Rings (non-cellular) Part 1: Joint rings for use in water, sewer and drainage systems.
SANS 1117	Plastic Tape Wrapping
SANS 10121	Cathodic protection of buried and submerged structures.
SANS 1123	**Steel pipe flanges**.
SANS 1217	**The production of painted and powder coated steel pipes.**
BS 4504	Flanges and bolting for pipes, valves and fittings.
ISO 2084	Pipeline flanges for general use.

PSL 3 MATERIALS

PSL 3.1 General

Pipes and fittings shall be handled and stored in accordance with pipe type and suppliers requirements.

PSL 3.4 Steel Pipes, Fittings and Specials

Steel pipes supplied under this contract shall comply with SABS 719 (as amended) or SABS 62 as specified or detailed on the contract drawings.

PSL 3.4.2 Pipes of nominal bore up to 150mm

Steel pipes supplied under this contract up to a nominal bore of 150mm shall comply SABS 62 as specified and shall comply with the following:

a) Steel pipes with screw – threaded ends of nominal bore up to 150mm shall comply with the following:

- Grade required – SABS 62 Heavy Class Steel Pipes

b) Plain ended steel pipes of nominal bore up to 150mm shall comply with the following:

- Grade required – SABS 62 Medium Class Steel Pipes

c) Groove-Ended Pipe systems of Nominal Bore up to 150mm dia.

- Groove ended pipe steel pipes, fittings and couplings shall comply with SANS 815-2:2004.

d) Coating and Lining shall be in accordance with the relevant specification for particular products and as specified in the Schedule of Quantities.

e) Pipe wall thicknesses and Coupling types shall be as described in the Schedule of Quantities.

PSL 3.4.3 Pipes of nominal bore over 150mm

Steel pipes supplied under this contract shall comply with SABS 719 (as amended) as specified and shall comply with the following:

a) Groove-Ended Pipe systems of Nominal Bore 150 up to 300mm Dia

- Groove ended pipe steel pipes, fittings and couplings shall comply with SANS 815-2:2004.
- Coating and Lining shall be in accordance with the relevant specification for particular products specified in the Schedule of Quantities.
- Pipe wall thicknesses and Coupling types shall be as described in the Schedule of Quantities.
- Steel pipelines installed below ground shall be hot dip galvanised and TOSA wrapped whilst steel pipelines installed above ground pipes shall be hot dip galvanised only.

PSL 3.4.4 Fittings and Specials

All fittings and specials shall be fabricated to the dimensions and wall thicknesses as shown on the drawings, from pipe manufactured to SABS 719 unless otherwise indicated or specified. All material certificates of pipes used for the fabrication shall be made available to the Engineer.

All fittings and specials are to be coated and lined as specified in PSL 3.4.3 unless otherwise indicated/specified on the drawings or Schedule of Quantities.

PSL 3.8 Jointing Materials

PSL 3.8.3 Flanges and Accessories

Where flanges are required they shall comply with SANS 1123 Tables 4000, 2500, 1600 as indicated on the drawings or as scheduled.
Gaskets for flanged joints shall be of the compressed asbestos fibre to BS 2815 Grade “A” and full faced with a minimum thickness of 3mm.

PSL 3.7 OTHER TYPES OF PIPES

PSL 3.7.2 Polyethylene pipes

Replace the contents of this sub clause with the following:

"Polyethylene pipes shall comply with SANS ISO 4427 PE 100, PN12.5 or as scheduled. All compression fittings shall have a minimum pressure rating of 1600kPa."

PSL 3.9 Corrosion Protection

PSL 3.9.2 Steel pipes

PSL 3.9.2.1 Steel pipes of nominal bore up to 150 mm

Add the following:

"Steel pipes and fittings shall be hot dip galvanised as per SANS 763 where shown the drawings. Application to be heavy duty.

Klambon (groove ended) Steel pipelines installed below ground shall be hot dip galvanised and TOSA wrapped whilst steel pipelines installed above ground pipes shall be hot dip galvanised only."

PSL 3.9.2.2 Steel pipes: Pipeworks to Reservoirs excluding Klambon (roll or cut groove ended) steel pipeline.

Add the following:

"Steel pipes and fittings shall be:

- hot-dip galvanized as per SANS 763 where shown on the Drawings and as specified in Subclause 3.9.2.1. Application to be heavy duty.

Note:

- Steel pipe specials to be cast into concrete at meter chambers and pressure reducing valve chambers shall be spirally wrapped with Denso Ultraflex 750, with a 55% overlap. The wrapping is to extend at least 500mm beyond the soil / concrete interface.

Replace SABS 1200L : 3.9.5:

PSL 3.9.5 Bolts, Nuts and Washers

All Bolts, Nuts and Washers shall be electro-plate galvanized.

PSL 3.9.7 Couplings and Flanges

Add the following:

Couplings or flanges shall be protected by using the "Denso" mastic blanket system, or equivalent as approved by the Engineer.

a) The unprotected portion of the pipe and the coupling components shall be cleaned of dust, rust and other foreign matter before application of "Denso" S105 paste or equivalent to the couplings and pipes to give a thin continuous coating over the area to be protected.

b) The Pipe Fitting will be primed with Denso Priming Solution / Denso S105 Paste.
Primer is applied to the fitting surface with a brush or paint roller. The primer will be thoroughly mixed prior to application onto the fitting. Primer container will remain covered when not in use. Primer coverage should be 8m²/lt (Priming Solution) & 3m²/kg (S105 Paste).
The primer will cover the entire fitting surface including the nuts and bolts and overlap onto the mill applied primary coating system by a minimum of 200mm.

c) Apply Denso Profiling Mastic to both sides of the fitting to form a generous fillet from the coupling onto the pipe barrel. The Denso Profiling Mastic is also used to cover the bolt heads and nuts to form a regular profile onto which the Denso Petrolatum Tape can be applied.

d) Apply one layer of the Denso Petrolatum Tape to the body of the fitting, ensuring that there is no air entrapped beneath the tape. The Denso Petrolatum Tape should be wide enough to cover the entire fitting and overlap onto the barrel of the pipe by no less than 50mm. If you are required to join the Denso Petrolatum Tape ensure that there is an overlap no less than 50mm between the strips. Use a 100mm wide Denso Petrolatum Tape to “lock” the barrel coating in.

e) Spirally apply the Denso PVC Outerwrap Tape to cover the entire Denso Petrolatum Tape System. Start at one pipe barrel and, wrapping with a 55% overlap, proceed to the other pipe barrel. Overlap in two layers to give a film thickness of four layers in buried conditions.

f) Care shall be taken at all times to prevent contamination of petroleum pastes and tapes by sand, soil or other foreign matter.

e) Where couplings are exposed "Denso Covercoat" or similar shall be applied to manufacturers requirements.

PSL 3.10 Valves

Add the following:

The definitions as contained in SANS 191 and 664 are applicable to this specification.

(a) General

Valve sizes to which reference is made in this specification are nominal bore sizes.

Lifting lugs are to be fitted to on all valves that have a mass in excess of 100kg, to be hot dipped galvanised to SANS 1461.

Each valve shall have a plate made of corrosion-resistant metal securely fixed to the body with corrosion-resistant fastenings, on which the following information shall be stamped:-

- The Manufacturer's name
- Size of valve
- Class of valve
- Arrow indicating the direction of flow, where relevant
- The material designations of the body and trim (see material specifications below).

In addition, all valves shall bear the SANS stamp of approval.

Each valve shall be so protected as to minimise the possibility of damage during transit and storage. The gates of wedge gate valves shall be placed in the closed position. The body ends of all new valves shall be effectively sealed to prevent entry of foreign matter. Valves of 150mm NB and smaller shall be individually wrapped. Larger valves shall be crated, individual crating of valves is dependent on size.

All valves will be issued with a relevant factory test certificate, which reflects the test pressure and valve serial number.

In addition, for all resilient seal and wedge gate valves the following requirements shall be met:

a) The valve class shall be at least equal to that of the pipework in which it is to be installed. All valves shall be rated for a working pressure at least that of 16 MPa (Class 16).

b) Valves shall have double flanged ends. Unless otherwise stated, the outside diameter, drilling and thickness and drilling of flanges shall, in the case of valves up to and including 500mm comply with the relevant requirements of SANS 1123. The flanges shall be drilled off centre and in accordance with SANS 1123/1977 Table 1600, 2500 or 4000 as specified in the schedule of quantities.

c) The valves shall be clockwise closing.

d) The valves supplied shall be of the non-rising spindle type and replacement of the spindle seal (gland packing) shall be possible under full working pressure. The spindle shall be stainless steel.

e) The spindle shall be threaded such that two full rotations of the valve cap or handwheel shall effect a movement of 25mm on the gate valve. This allows for easy identification of the valve diameter.

f) Unless otherwise stated valves shall be fitted with a cast iron cap attached to the spindle by means of a Stout Brass Screw with hexagonal head.

g) Valves shall only be fitted with a handwheel, where they are installed in chambers (e.g. air valve, meter and non return valve chambers).

h) Handwheels for Class 16 valves shall be manufactured from cast iron and for Classes 25 and 40 from cast steel. The direction of closing shall be indicated on the handwheel.
i) The design of the valve guides shall be such that the valves supplied can be mounted in any position.
j) Each valve shall be supplied with two full face rubber gaskets and the requisite number of bolts, nuts, washers to suit the valve. Sufficient bolts, nuts and washers shall be supplied for both faces of the valves. The cost of these items shall be included in the rates tendered.
k) Valves shall be capable of withstanding the working pressure of the valve and specified test pressure and shall have the capacity to seal drip tight bi-directionally.
l) Every valve shall be internally and externally fusion bonded epoxy powder coated ***to 250 micron DFT*** as standard***.***
m) An edge protecting ring shall permanently be fitted around the body and bonnet joint in order to protect the coating during transportation and installation.
n) Rates for all the 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 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.

PSL 3.10.1 Wedge Gate Valves

Wedge gate valves are acceptable in certain applications where they remain in "normally closed" positions (e.g. scour valves) and for valves in "normally open" positions (e.g. in-line valves less 250mm NB) where the maximum differential pressure across the valve is likely to exceed 16 Bar.

Wedge gate valves shall also be constructed according to the stipulations of the following specifications:

SANS 664: For valves operating under working pressures up to 2.5 MPa and of diameter up to 600 mm, these valves shall be constructed of ***cast iron***.

SANS 191: For valves operating with working pressures exceeding 2,5MPa, these valves shall be of cast steel and comply with the materials and construction requirements of SANS 191.

Valve-trim shall be either Type B (Gun Metal trim) or Type C (Stainless Steel trim) as specified in SANS 664 Clause 3.5.5. Trim rings shall be pinned into the body and plug. Bonding liquids are not acceptable as the primary means of security trim rings.

The stuffing box shall be of the conventional type with gland packing with a gland secured with 2 No. bolts and nuts. The nuts shall be of the Tee pattern and the gland stuffing box shall be capable of holding four rings of a standard size gland packing. The gland stuffing box shall be capable of being repacked under working pressure, preferable with the gate in the open position. The gland shall fit neatly and snuggl***y*** into the stuffing box. The base of the gland and stuffing box shall be chamfered to force the packing against the spindle.

Where Allen-type screws are used to fasten the stuffing box to the bonnet, and the bonnet to the valve body, these should be of stainless steel material. In addition they should be recessed and wax encapsulated to ensure corrosion resistance.

The lugs on the gate and the spindle are to conform to Clause 3.2.3 of SANS 664 and are to be machined to a good finish.

The valves shall be subjected to both the "closed end" test and the "open end" test. The test pressure for the open end tests shall be one and half times the rated working pressure of the valves, and for the body twice the rated working pressure. There shall be no leakage under any of the above test conditions

Each gate valve shall be capable of being opened and closed by one man using a tee key when the unbalanced head on the gate is equal to the open end test pressure. The total effort required to operate the valve shall not exceed 400N (representing a simultaneous push/pull of 200 N on the ends of a tee key 900mm long.

Position indicators shall be fitted to all valves larger than 200NB and shall clearly indicate the fully open and closed positions.

Every sluice valve shall be provided with substantial guides cast on each side of the gate preferably extending to the top of the nut box and operating along corresponding guides cast into the sides of the body.

The metal identification plate, permanently fixed to each valve shall also include the material designations for the body and trim (symbols used and their sequence to be as specified in SANS 664).

The design of the valves shall be such that the cast iron/steel sections are not subject to excessive tension by the tightening of connecting bolts, as can happen when the faces of the bonnet and the stuffing box flanges are not fully machined for a full faced gasket.

PSL 3.10.2 Resilient Seal Gate Valves

Resilient seal gate-valves are acceptable in certain applications e.g. where they remain in fully open position over an extended period of time or where the water contains undissolved solids or up to a pressure rating of 1,6MPa.

Resilient seal gate valves shall be constructed according to the stipulations of the following specifications:
SANS 664: For valves operating under working pressures up to 2.5 MPa and of diameter up to 600 mm, these valves shall be constructed of spheroidal graphite iron.

Gate Design

The gate shall be fully rubber encapsulated inside and outside therefore to ensure drip tight sealing and avoid corrosion. The gates shall be capable of being replaced without removing the valve body from the pipeline. The gate shall further have a drain hole, preventing stagnant water or impurities from collecting.

Rubber utilised in the coating of the wedge shall be inert and shall not impart odour, taste and colour and shall be suitable for drinking water applications.

The gate nut shall not be fixed to the wedge, thereby reducing opening torques.

Gate and Body Design

The gate shall have optimally placed guides of wear resistant plastic so as to reduce the torques as well as reduce wear between the rubber and the coating on the body.

The bore of the body shall be straight through design in order to allow cleaning with a badger.

Valve Bonnet

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

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

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

Spindle

Spindles shall be made of high tensile stainless steel and replacement of the spindle seal (gland packing) shall be possible under full working pressure. The stem threads shall be rolled to maintain steel structure and increase strength and to ensure smooth thread edges and consequently a low operating torque.

Body and Bonnet Assembly

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

PSL 3.10.3 Air release valves

Air release valves shall be double purpose "Vent-O-Mat" or similar approved (screwed type for 25mm diameter and 50mm diameter air valves and flanged type for 80mm diameter air valves and larger)."

PSL 3.10.4 Painting of Valves

After completion of the factory tests, all valves shall be thoroughly cleaned and painted in accordance with the following:

a) The cleaning and painting of valves as specified hereunder is to be carried out at the factory prior to despatch on site.

b) All cast iron surfaces of every valve shall be prepared for painting to a thoroughly clean condition free of all grease and deletrious matter. Steel surfaces shall be prepared in accordance with Swedish Standard SIS 05 5900 for a Sa 2.5 finish.

c) Internal surfaces shall then be treated with two coats of Copon Hicote 151E or other approved non-toxic epoxy resin paint to give a total minimum dry film thickness of 160 micrometres; both coats being applied within 48 hours of commencement of painting.

d) External surfaces shall, immediately after cleaning, be treated with one of the following alternative paint systems:

i) System 1 - for valves situated in underground chambers or exposed conditions.

Apply three coats of an approved epoxy coal tar paint to give a minimum total dry film thickness of 250 micrometres; all three coats being applied within 72 hours of commencing the first coat.

ii) System 2 - for valves situated in pump stations etc.

Apply once coat of zinc chromate primer followed by one coat of undercoat tinted where necessary, and a final coat of best quality gloss enamel. The total dry film thickness of the system shall be not less than 200 micrometres.

e) Non ferrous metal or stainless steel surfaces shall not be painted.

f) After erection on site all valves shall be cleaned and the paint work refurbished where necessary to restore the condition to that at the time of leaving the factory.

PSL 3.11 Manholes and Surface Boxes

Add the following:

"Manholes shall be constructed according to specifications as set out in the drawings."

PSL 4 PLANT

PLS 4.1 Handling and Rigging

Pipes shall be handled or slung into the trench and shall on no account be rolled or dropped into the trench. Valves are to be lifted with slings placed under the bodies of the valves; on no account are valves to be lifted by their handwheels.

Generally, every precaution must be taken to ensure that the material reaches the trench or other place of installation without damage. The Contractor will be held fully responsible should any damage occur.

PSL 7 TESTING

Pipes shall be tested in convenient lengths not exceeding 1000 m.

PSL 7.3 Standard hydraulic pipe test

PSL 7.3.1Test Pressure and Time of Test

The provisions of SANS 2001 - DP2: 2010 apply.

5.3.3.1.4 Subject to the provisions of 5.3.3.1.5 and 5.3.3.1.6, the test pressure for field testing is 1.25time the designated working pressure at any point on the longitudinal section of the pipeline up to a maximum of 1.0 MPa, above which it will be the designated working pressure plus 0.5 MPa.

5.3.3.1.5 Ensure that the test pressure applied over any section of pipeline under test, taking any differences in elevation along the pipeline into account, is such that the pressure at any point along the section is not less than the greater of 1.25 times the designated working pressures or 0.4 MPa, but not more than 1,5 times the designated working pressure at these points.

5.3.3.1.6 Ensure that the field test pressure does not exceed the appropriate of the values given in table 1.

5.3.3.1.7 Upon reaching the test pressure, sustain this pressure for a period of 1h. During this period, carry out an inspection for leaks or other anomalies. After 1h, release the pressure in the pipeline.

Table 1- Maximum field test pressures

1	2	3
Type of pipe	**Applicable materials standard**	**Maximum field pressure at any point in the pipeline**
Steel	SANS 62-1, SANS 62-2, SANS 719	50% of the hydraulic test pressure
Polyethylene	SANS 4427-1, SANS 4427-2, SANS 4427-3 and SANS 4427-5	1,5 times the rates pressure of the pipe
Polypropylene	SANS 1587-2 and SANS 15874-3	1,5 times the rates pressure of the pipe
PVC-U	SANS 966-1	1,5 times the rates pressure of the pipe
PVC-M	SANS 966-2 or SANS 1283	1,5 times the rates pressure of the pipe
PVC-C	SANS 16422	1,5 times the rates pressure of the pipe

5.3.3.2 Visible Leaks

Except as allowed in 5.3.3.1.4, maintain the specified test pressure for a period of at least 1h (or such longer period as is necessary for inspection of the pipeline) by means of a suitable pump, during which period carefully inspect all pipes, specials, joints, and fittings for leaks. Make good all visible leaks and remove and replace any pipe, special, or fitting found to be defective. Test such replacement material after installation.

5.3.3.3 Permissible make-up water

Maintain the test pressure for a further period of 1h after completion of the test period given 5.3.3.2, during which time measure the volume of water required to be pumped into the pipeline for maintenance of the pressure. Check that no additional water is required in the case of continuously welded steel pipes, and in other cases that the volume does not exceed the value, in litres, calculated from the applicable of the formulae give in table 2.

Table 2 - Formulae to calculate permissible volume of make-up water

1	2
Type of pipe	**Formulae to calculate permissible volume of make-up water** **L**
Fibre cement and concrete-lined steel	0,105 x PD x TS x STP
Jointed pipes in steel, ductile iron, GRP, PE, PP and PVC	0,01 x PD x TS x STP
Reinforced and concrete pipes	0,63 x PD x TS x STP
PD = pipe diameter, in millimetres STP = square root of the test pressure, in megapascals TS = test section, in kilometres	

PSL 8 MEASUREMENT AND PAYMENT

PSL 8.1 General

Add the following:

The rates tendered for supplying, installing, laying and bedding and jointing of pipe, specials, couplings, valves and fittings shall include the cost of wrapping all bolted connections using the "Denso" mastic blanket system.

PSL 8.2 Scheduled Items

PSL 8.2.1Supply, lay and bed pipes complete with couplings.

Add the following: “Payment for all pipelines will be as follows”

- 70% of payment will be made once the pipeline is installed, complete with all fittings;
- 30% of payment will be made on completion of testing. The rate tendered shall include for all temporary fittings which may be required to facilitate testing operations up to a maximum length per test of 1km.

PSL 8.2.13 Chambers

Add the following:

“Payment will be per completed unit. No part payment will be made.”

PSLB BEDDING (SANS 1200LB)

PSLB 3 MATERIALS

PSLB 3.1 Selected Granular Material

Bedding shall be sourced from borrow pits, registered in terms of the requirements of the DMR, or from excavations on site, subject to the material complying with the relevant specifications of SANS 1200LB.

The Schedule of Quantities makes provision for the supply of bedding from trench excavation, borrow pits and commercial sources.

PSLB 3.2 Selected Fill Material

Notwithstanding the terms of Sub-Clause 3.2, the selected fill material is not to contain lumps and stones of diameter exceeding 13 mm.

It is envisaged therefore that the Contractor will either have to obtain the selected fill material from trench excavations, borrow pits (as detailed above) or from a commercial source. The Contractor will have to select, screen, stockpile, transport and place suitable material obtained from the trench excavations.

The rate tendered for selected fill material must therefore allow for all costs involved in whatever alternative is chosen for the provision of selected fill material.

PSLB 3.4 Selection

PSLB 3.4.1 Contractor required to excavate selectively

Notwithstanding the requirements of Sub-Clause 3.7 of SANS 1200 DB and Sub-Clause 3.4.1 of SANS 1200 LB regarding use of selective methods of excavating, the Contractor shall use selective methods of excavating and shall provide and use plant that will enable him to avoid burying or contaminating material that is suitable and is required for bedding.

PSLB 3.4.2 Suitable material not available from trench excavation

Where suitable material is not available from the excavated trench material, the Contractor must obtain suitable bedding material from a commercial or other approved source.

The tendered rates for material obtained from commercial sources are to include for all haulage irrespective of distance.

The tendered rates for material obtained from borrow pits shall include a 5km freehaul distance. A separate item is included for overhaul of material from borrow pits in excess of the 5km;

PSLB 5 CONSTRUCTION

PSLB 5.1.2 Details of Bedding

Flexible pipe bedding is required for all HDPE and uPVC pipelines unless otherwise indicated on the drawings or the Schedule of Quantities.

All steel and concrete pipes shall be bedded as per the requirements for rigid pipes as detailed on the drawings.

PSLB 8 MEASUREMENT AND PAYMENT

PSLB 8.1.3 Volume of bedding materials

Notwithstanding the provisions of Sub-Clause 8.1.3, the volume of bedding materials shall be computed from

(a) the dimensions of the trench as specified under the Project Specification dealing with Earthworks (Pipe trenches) and the actual dimensions of the pipe.

(b) The depth of bedding and selected fill blanket as specified.

(c) the volume of the void formed by the pipe shall be subtracted from these computations.

(d) No payment will be made for any bedding material required to backfill overbreak beyond the widths or depths specified.

PSLB 8.1.6 Freehaul

A freehaul distance of 5km shall be applicable to all selected granular material and selected fill operations.

PSLB 8.2.5 Overhaul of material for bedding cradle and selected fill blanket

Notwithstanding the provisions of Sub-Clause 8.2.5, overhaul will be calculated for distances in excess of 5km

PSLC CABLE DUCTS

PSLC 3 MATERIALS

PSLC 3.1 DUCTS (ELECTRICAL)

Add the following:

"(e) SANS 4427: 1996 in the case of HPDE cable ducts.

PSLC 3.4 CABLE DUCT MARKERS

Add the following:

"A cable duct marker shall consist of a 300 mm x 300 mm x 100 mm deep, class 15 MPa/19 mm concrete block, connected by means of a non-ferrous metal strip to a temporary plug to seal the end of the duct. The plug shall prevent moisture or soil from entering the duct. The metal strip shall be firmly connected to both the plug and the concrete block. The concrete block shall be positioned not further than 0,5 m horizontally from the end of the cable duct. The face of the concrete block shall be clearly marked "E" to indicate electricity cables."

PSLC 5 CONSTRUCTION

PSL 5.3 DUCT LAYING

PSLC 5.3.1 Straight laying

Delete the first two sentences of the Clause and replace with:

"HDPE cable ducts may be laid such that any curves in the duct are no tighter than 30m radius."

PSLC 5.3.2 Curved laying

Delete the rest of the Clause after the words:

"……..is permissible"

Add the following subclauses:

PSLC 8 MEASUREMENT AND PAYMENT

PSLC 8.2 SCHEDULED ITEMS

PSLC 8.2.5 Supply, lay, bed and prove duct

Replace the payment paragraph with the following:

"Separate items are scheduled for each diameter of duct.

The rates shall cover the cost of providing all the materials and the cost of laying the ducts, installing the draw wire, jointing, bedding and providing all as specified."

PSLE STORMWATER DRAINAGE

PSLE 3 MATERIALS

PSLE 3.1 CULVERT UNITS AND PIPES

(d) Skewed ends

Add the following:

"Skewed ends for pipe culverts may be cut on Site."

PSLE 3.4 MANHOLES, CATCHPITS, AND ACCESSORIES

PSLE 3.4.1 Bricks

Add the following:

"Bricks shall be engineering bricks complying with the requirements of SANS 227."

Add the following subclause:

"PSLE 3.6 MATERIALS FOR SUBSURFACE DRAINS

(a) Pipes and fittings

Pipes for subsurface drains shall be normal duty, perforated or slotted uPVC pipes complying with SANS 791. Fittings shall be heavy duty and shall also comply with SANS 791.

The size of the perforations in perforated pipes shall in all cases be 8 mm in diameter ± 1,5 mm, and the number of perforations per metre shall not be less than 26 for 100 mm pipes and 52 for 150 mm pipes. Perforations shall be spaced in two rows for 100 mm pipes and in four rows for 150 mm pipes, as shown on the Drawings.

Slotted pipes shall have a slot width of 8 mm with a tolerance of 1,5 mm in width. The arrangement of the slots is subject to the Engineer's approval, but the total slot area shall not be smaller than that specified for perforations.

(b) Crushed stone

Crushed stone shall be 19 mm single-sized and shall comply with the requirements of SANS 1083.

(c) Geotextiles

Geotextiles shall be a non-woven, spun or thermic-bonded continuous filament fabric consisting of at least 85% by mass of polypropylene, polyester or other approved material and manufactured for civil- engineering applications by a recognised manufacturer."

PSLE 5 CONSTRUCTION

PSLE 5.2 BEDDING AND LAYING

PSLE 5.2.2 Pipe culverts

Add the following:

"The class of bedding required for the various pipe culverts is Class C."

Add the following subclause:

"PSLE 5.8 CONSTRUCTION OF SUBSURFACE DRAINS

After the completion of the excavations, the bottom portion of the trench shall be lined with geotextile sheeting as shown on the Drawings. The top edges of the vertical portions of the geotextile sheeting shall be tacked to the sides of the excavations with nails or by another suitable approved means. An overlap of at least 200 mm shall be provided at each joint. Geotextile sheeting damaged during the installation or construction shall be replaced at the Contractor's cost.

A layer of crushed stone of the thickness shown on the Drawings shall be placed on the geotextile sheeting and lightly tamped and finished to the required gradient.

Pipes of the required size shall be firmly bedded on the permeable material, true to level and grade, and coupled where required. The trench shall then be backfilled with crushed stone to the height above the pipes shown on the Drawings or as directed by the Engineer.

Crushed stone shall be placed in layers of not more than 300 mm at a time and shall be lightly compacted. Care shall be taken to prevent the contamination of crushed stone during construction of the subsurface drains and all material contaminated by soil or silt shall be removed and replaced by the Contractor at his own expense.

Perforated and slotted pipes shall be joined by couplers. Perforated pipes shall be laid with the perforations at the top or at the bottom, as directed. The higher end of subsurface drain pipes shall be sealed off with a loose concrete cap of class 20/19 concrete, as shown on the Drawings and at the lower end of the pipe shall be built into a concrete head wall providing a positive outlet, or it shall be connected to the stormwater pipes or culverts.

After all the crushed stone filter material and the protruding vertical filter material have been placed, the protruding vertical sections of the geotextile sheeting shall be folded back across the filter material so
that the filter material will be completely enwrapped in the geotextile. An overlap of at least 200 mm shall be provided between the portions folded back.

The remainder of the trench shall be immediately backfilled with approved impermeable material preferably obtained from the excavations, in layers not exceeding 150 mm and compacted to 90% of modified AASHTO density, unless otherwise ordered by the Engineer. The trench shall be specially protected against the ingress of water, soil and silt until the backfilling with impermeable material has been completed.

Permeable material in subsoil drains shall not be taken to the surface but shall be discontinued at such heights as will be determined by the Engineer.

Any section of a subsurface drain constructed with pipes without perforations or slots shall be backfilled with impermeable backfill material as described above. Suitable excavated material may be used for backfilling. Payment for excavations as well as for backfilling with impermeable material will be made under SANS 1200 DB."

PSLE 8 MEASUREMENT AND PAYMENT PSLE 8.2 SCHEDULED ITEMS

Add the following items:

"PSLE 8.2.14 Pipes in subsurface drains:

(a) Normal duty uPVC pipes complete with couplings:

(i) (Diameter and whether perforated or not, indicated)..... Unit: m

(ii) Etc. for other diameters

The tendered rates per metre of pipe measured in place along its centre line including the length of fittings shall include full compensation for procuring, furnishing, laying and jointing the pipes as specified.

The tendered rates for fittings shall include full compensation for procuring, furnishing, laying and jointing the fittings as specified, irrespective of the type of fitting.

PSLE 8.2.15 Geofabric (description of type, grade, etc.).....Unit: m²

The filter fabric will be measured in place after installation.

The tendered rate shall include full compensation for procuring, supplying, cutting, overlapping, jointing, placing and protecting the filter fabric as specified, as well as for wastage.

PSLE 8.2.16 Crushed stone in subsurface drains:..... Unit: m³

The tendered rate shall include full compensation for procuring, supplying, transporting and placing the material as specified. The quantity shall be calculated from the authorised dimensions.

Impermeable material will be paid under SANS 1200 D.

PA : PARTICULAR SPECIFICATION FOR HEALTH AND SAFETY

PA1 SCOPE

This section covers health and safety matters applicable during construction.

PA2 PREAMBLE

All the work included in this Contract shall, for the purpose of complying with the OHS Act and the Construction Regulations, be deemed to be “construction work”.

This Health and Safety Specification is governed by the Occupational Health and Safety Act no. 85 of 1993 here within referred to as “The Act”, notwithstanding this, cognisance should be taken of the fact that no single act or its Regulations can be read in isolation.

This specification covers the requirements for eliminating and/ or mitigating safety risks, injuries, accidents and incidents on site. It addresses legal compliance, hazard identification and risk assessment, risk management and promotion of health and safety culture within the project. This specification also makes provision for the protection of personnel other than the employees.

The purpose of this specification is to assist in achieving compliance with The Act and the Construction Regulations in order to reduce incidents and in juries. Its set recommendations should be followed so that Health Safety of all persons potentially at risk, and the potential risks to the environment may receive the same priority as other facets of the project such as Time, Quality and Costs.

PA3 DESCRIPTION OF THE CONSTRUCTION WORK

The temporary and permanent Works required under this Contract are described in the following:

- The Project Specification;
- The Standard Specifications;
- The Drawings;
- The Schedule of Quantities;

The Contractor, in complying with the OHS Act and the Construction Regulations, shall consider all aspects of the Works described and take into account the construction methods and materials to be used.

PA4 EXISTING CONDITIONS

The Contractor shall take into account, inter alia, the following existing conditions when complying with the OHS Act:

- Existing utility services;
- Existing ground and foundation conditions;
- Traffic accommodation requirements;
- Surrounding land use;
- Anticipated weather conditions.

The existing conditions on this Contract are described in the following:

- The Project Specification;
- The Drawings;

PA5 LEGAL FRAMEWORK

- Occupational Health and Safety Act no.85 of 1993 and its Regulations
- Compensation for Occupational Injuries and Disease act no. 130 of 1993
- National Environmental Management Act no. 107 of 1998
- Bhekuzulu- Epangweni Community Water Supply Scheme: Environmental Management Programme
- By-Laws

PA6 DEFINITIONS

Definition listed in The Act, its Regulation and all related legislation shall apply unless otherwise stipulated.

PA7 MINIMUM ADMINISTRATIVE REQUIREMENTS

PA7.1 Health and Safety Plan

The contractor shall prepare a documented Health and Safety Plan as per Construction Regulations 2014, Section 7(1) (a). The contractor shall have a risk assessment conducted by a competent as required by Construction Regulations 2014, Section 9. The health and safety plan shall be compiled with due consideration of all legislative requirements and the Client and Contractors risk assessment for the scope of works and conditions on site

PA7.2 Health and Safety File

The Contractor shall, in terms of Construction Regulation 7(1) (b) compile and keep a health and safety file on site at all times that must include all documentation required in terms of the Act and Regulations and this specification. It must also include a list of all Sub-Contractors on site that are accountable to the Principal Contractor and the agreements between the parties and details of work being done. The Principal Contractor health and safety file shall after compilation be submitted to the Health and Safety Agent for approval before the commencement of any work on site. Sub-Contractors shall fall under the Principal Contractors Health and Safety File.

PA7.3 Notification of Construction Work

The Contractor shall notify the Department of Labour Office nearest to site within Uthukela District Municipality area in writing before construction work commences in the format of Annexure 2 of Construction Regulations 2014. A stamped form must be kept in the Health and Safety File.

PA7.4 Health and Safety Policy

The Contractor must have a Health, Safety and Environment Policy that is signed by the Chief Executive Officer of the Contractor. The policy must outline objectives and set out how they will be achieved and implemented.

PA7.5 Assignment of Contractors Responsible Person to Supervise Health and Safety Management on Site

The Contractor must submit proof / CV and certificates of the OHS Officer for the site. The appointments shall be structured or guided by the scope of works to be performed by the contractor.

It is acknowledged that the Contractor may need to allocate more than one appointment to certain staff members. This practice may only take place if OHS Standards would not be negatively affected. Should the Health and Safety Agent deem such practice as having a negative effect on OHS Standards, and then alternative arrangements will have to be made.

A permanent OHS Officer that shall be appointed by the successful bidder shall be:

- The person either have completed a SAMTRAC (Safety Management Training Course) which is administered by NOSA or a 3 Week SHE Management Course which is administered by Lexis Nexus or other course approved by Client's Agent as a minimum requirement.

- The person must be registered, or provide proof of application for registration, as a Construction Health and Safety Officer with the South African Council for Project and Construction Management Professions.

On the following page is the table containing the legal appointments that the Contractor shall appoint on site where relevant.

PA7.6 Competency of Contractor's Appointed Competent Personnel

Contractor's competent persons for the various risk management portfolios shall fulfil the criteria as stipulated under the definition of Competent Person in accordance with the Construction Regulations and The Act.

PA7.7 Health and Safety Organogram

An organogram outlining the Health and Safety Management structure including relevant appointments/ competent persons shall be provided by the Contractor and be kept in the health and safety file.
The site Health and Safety Management Organogram shall be updated by the Contractor when there are any changes in the Site Management Structure.

PA7.8 Compensation for Occupational Injuries and Diseases Act 1993 (Act No. 130 of 1993) (COID Act) requirements

The Contractor must warrant that all employees are fully covered in terms of the COID Act and that such cover shall remain in force for the duration of the project.
The Contractor must supply proof of such insurance cover to the Client at the time of the bid.

The Contractor must ensure that all Sub-Contractors appointed by him are covered in terms of the COID Act, and that such cover shall remain in force for the duration of their contractual relationship with the Principal Contractor. The Principal Contractor must also maintain additional insurance cover that will adequately make provisions for any losses and/or his employee's acts and/or omissions whilst working on the Client's premises.

Item	Regulation	Appointment	Responsible Person
1.	CR 5(1)(k)	Principal contractor for the project	Client
2.	CR 8(1)	Construction Manager	Principal Contractor
3.	CR 8(2)	Assistant Construction Manager	Principal Contractor
4.	CR 8(5)	Health and Safety Officer	Principal Contractor
5.	CR 8(7)	Construction Supervisor	Principal Contractor
6.	CR 8(8)	Assistant Construction Supervisor	Principal Contractor
7.	CR 9(1)	Risk Assessor	Principal Contractor
8.	CR 10(1)(a)	Fall protection planner	Principal Contractor
9.	CR 12(1)	Temporary works inspector	Principal Contractor
10.	CR 13(1)(a)	Excavation supervisor	Principal Contractor
11.	CR 14(1)	Supervisor demolition work	Principal Contractor
12.	CR14(2)	Demolition expert	Principal Contractor
13.	CR 16(2)	Scaffold supervisor	Principal Contractor
14.	CR 17(1)	Suspended platform supervisor	Principal Contractor
15.	CR 19(8)(a)	Material hoist inspector	Principal Contractor
16.	CR 20(1)	Bulk plant supervisor	Principal Contractor
17.	CR 21(2)(b)	Power tool expert	Principal Contractor

Item	Regulation	Appointment	Responsible Person
18.	CR 21(2)(i)	Power tool controller	Principal Contractor
19.	CR 23(1)(d)	Construction vehicle and mobile plant operator	Principal Contractor
20.	CR 23(1)(k)	Construction vehicle and mobile plant inspector	Principal Contractor
21.	CR 24(d)	Temporary electrical installations inspector	Principal Contractor
22.	CR 28(a)	Stacking and storage supervisor	Principal Contractor
23.	CR 29 (h)	Fire equipment inspector	Principal Contractor
24.	EMR 9	Portable electrical inspector	Principal Contractor
25.	GAR (9)2	Accident/ Incident Investigator	Principal Contractor
26.	GRS 3(4)	First aid attendant	Principal Contractor
27.	GSR 9	Welding flame/ cutting equipment inspector	Principal Contractor
28.	GSR 13 (a)	Ladder inspector	Principal Contractor
29.	HCSR 3(3)	Hazardous chemical substances supervisor	Principal Contractor
30.	OHS 8(2)(a)	Hand tools inspector	Principal Contractor
30.	OHS 17	Health and Safety Representative	Principal Contractor

PA7.9 Hazard Identification and Risk Analysis and Progress Hazard Identification and Risk Analysis

The Contractor shall allow for and cause his task specific Hazard Identification and Risk Analysis exercise to be performed by a Competent Person before commencement of construction work, and the assessed risks shall form part of the Construction Phase Health and Safety Plan submitted by the Contractor for approval by the Health and Safety Agent. The Risk Assessment must include:

1. A list of hazards identified as well as potentially hazardous tasks;
2. A documented risk assessment based on the list of hazards and tasks;
3. A set of safe working procedures intended to eliminate, reduce and/or control the risks assessed;
4. A monitoring and review procedure of the risk assessment as the risks change.

The Contractor shall allow for and ensure that all Sub-Contractors are informed, instructed and trained by a Competent Person/s regarding hazards, risks and related safe work procedures before any work commences and thereafter at regular intervals as the risks change and as new risks develop. Sub-Contractor's risk assessment for the tasks they be performing must be performed by the Principal Contractor as they fall under his / her safety.

The Contractor shall allow for and be responsible for ensuring that all persons who could be negatively affected by construction operations are informed and trained according to the hazards and risks and are conversant with the Safe Work Procedures, control measures and other related rules (for example "tool box talk" strategy to be implemented).

Should the Health and Safety Agent or other Clients Representative identify alternative hazardous activities performed by the Principal Contractor or its Sub-Contractors on site for which a Risk Assessment was not performed, then the Principal Contractor will be required to perform such an exercise before continuing such work.

PA7.10 Safety, Health and Environmental Representative(s)

The Contractor shall allow for and ensure that Safety, Health and Environmental Representative(s) who, after consultation, as per Section 17 of The Act, have been appointed and trained to carry out their functions as per Section 18 of The Act.

The appointments must be in writing and the Safety, Health and Environmental Representative shall carry out regular inspections, keep records and report all findings to the Responsible Person forthwith and at Safety, Health and Environmental meetings.

PA7.11 Safety, Health and Environmental Committees

When there is more than one health and safety representative on site a health and safety committee shall be developed as per the requirements of The Act. The Principal Contractor shall ensure that project Safety, Health and Environmental Meetings are held monthly or as deemed necessary by the project requirements.

- Minutes must be kept on record and filed in the Site Health and Safety File.
- Meetings must be organized and chaired by the Principal Contractor's Responsible Person.

PA7.12 Medical Fitness

The Principal Contractor and all Sub-Contractors shall ensure that every employee on site has a valid medical certificate of fitness specific to the construction work to be performed and issued by an Occupational Health Practitioner in the form of Annexure 3 of Construction Regulations 2014.

PA7.13 Health and Safety Training

Induction
The Contractor shall allow for and ensure that all site personnel undergo a site-specific Safety, Health and Environmental Induction Training Session before starting work. A record of attendance shall be kept in the Health and Safety file. Induction training shall also include training on the risks associated with the works to be executed, safe work procedures and emergency procedures.
All visitors to the site must also be subjected to site-specific induction training highlighting items such as steps to follow in the event of emergency, restricted areas and on the site health and safety rules.

Awareness
The Contractor shall ensure that, on site, regular Toolbox Talks take place at least once a week. These talks must deal with risks relevant to the construction work at hand.

Competency
All Competent Persons shall have the knowledge, experience, training, and qualifications which are specifically applicable to the work they have been appointed to supervise, control, and execute.
The abovementioned competency requirements will be assessed on a regular basis by the Health and Safety Agent by means of Audits.
The Principal Contractor is responsible for ensuring that competent Sub-Contractors are appointed to carry out construction work.

PA7.14 General Record Keeping

The Contractor shall keep and maintain Safety, Health and Environmental records to demonstrate compliance with this Specification, The Act and with the Construction Regulations on the site health and safety file kept in the site office.

The Principal Contractor must ensure that all records of incidents/accidents, training, inspections, audits, and the like are kept in a site health and safety file held in the Site Office.

PA7.15 Safety, Health and Environmental Audits, Monitoring and Reporting

The Client's Health and Safety Agent shall at least once a month during the duration of the contract conduct Safety, Health and Environmental audits of the work operations, including a full audit of physical site activities, as well as an audit on the administration of health and safety. Copies of the audit reports will be forwarded to the Principal Consultant and the Principal Contractor within seven days and must be kept in the Site Health and Safety File.

The Principal Contractor must allow for and conduct similar audits on all Sub-Contractors appointed by the Principal Contractor and forward copies of all reports to the Health and Safety Agent within seven working days of completion of the audits and file copies on the Site Health and Safety File.

PA7.16 Emergency Procedures/Plans

The Contractor shall allow for and submit a detailed Emergency Procedure/Plan for approval by the Client prior to commencement of work on site. The procedure shall detail the response plan/s including the following key elements:

- List of key competent personnel;

- Details of emergency services;
- Actions or steps to be taken in the event of the specific types of emergencies;
- Information on hazardous material/situations.

Emergency Procedures/Plans shall relate to, but shall not be limited to events such as fire, collapse of structure, bomb threats, major and minor incidents/accidents and any other anticipated emergencies. Emergency Procedures/Plans must be developed by a competent person such as a Health and Safety Officer.

Emergency Procedures/Plans must form part of the Agenda of monthly safety meetings as the Procedures/Plans would have to be revisited on a continuous basis due to the changing environment on construction sites.

A contact list of all service providers near the site and their contact details (Fire Department, Ambulance, Police, Medical and Hospital, etc.) must be maintained and be available to site personnel.

The Contractor shall advise the Health and Safety Agent in writing, immediately after the event, of any emergencies, together with a record of action taken.

PA7.17 First Aid Boxes and First Aid Equipment

The Contractor shall appoint in writing a First Aider in terms of Regulation 3 of the General Safety Regulations under the Occupational Health and Safety Act. The appointed First Aider(s) must have completed accredited first aid training. Valid certificates to be kept on site in the site health and safety file.

The Contractor shall allow for and provide an on-site First Aid Station with first aid facilities, where required, including first aid boxes which must be kept adequately stocked at all times. A first aid box should be readily available at employees work stations; should be kept on a construction vehicle or any dedicated position in the workstation.

In the event of hazardous chemical substances being present on site, first aiders must be trained to address any incidents of accidental exposure and their first aid kits be stocked accordingly.

PA4.18 Accident / Incident Reporting and Investigation

Injuries sustained on the site are to be categorized into the following categories:

- first aid;
- medical attendance (Doctor);
- disabling; and
- fatal injuries

All Sub- Contractors have to report on any of the four categories of injuries to the Principal Contractor as soon as is reasonably practicable after the event causing injury.

First aid cases must be recorded in the safety files dressing register
Medical Attendance accidents must be recorded on the safety file as per annexure 1, the Principal Contractor's competent person must investigate these accidents and forward a copy of the report to the Health and Safety Agent without delay within seven days for further investigation.

Disabling and fatal accidents must immediately be reported to the Health and Safety Agent telephonically after they occur. These accidents shall be investigated by the Health and Safety Agent.

The Contractor shall on monthly basis report all injuries sustained on site to the Client in the form of a detailed injury report.

All incidents as described in Section 24 of the OHS Act must be reported in the prescribed period and manner to the National Department of Labour. Copies of Section 24 reports, including WCL 1 & 2 forms must be forwarded to the Client.

PA8. PHYSICAL REQUIRMENTS

PA8.1 Site Establishment

During establishment of the site camp the Contractor shall ensure the following:

- Proper layout of the site camp taking into high consideration sufficient space for construction vehicle and plant movement, lay down, stacking and storage of material.
- Diesel tanks should be a minimum distance of 10 metres away from any building and parking area; and should be placed on a slab, with a bund wall, capable of carrying 110% of the tank capacity. Fire extinguishers to be readily available near diesel tank storage area.
- All electrical installations for the site must be conducted by a certified electrician. All cables from distribution board to offices, stores and for security to be underground. Certificate of Compliance for electrical installations to be provided.
- Site camp should be secured with a fence of a minimum of 1.6 metres high and a lockable gate.
- Construction safety warning signs must be placed at the entrance of the site and indicate type of Personal Protective Equipment (PPE) required for the site i.e. safety boots, helmets; they must also instruct visitors to report to the site office.
- Welfare facilities which includes sheltered eating areas, first Aid boxes, drinking water and ablutions for males and females employees should be provided.

Hoarding

The Principal contractor must hoard the site office and reservoirs construction areas to prevent unauthorised entry and ensure public safety. The hoarding shall be as follows:

- A fence with a height of 1, 6 to 1, 8 meters high; a shade cloth of equal length and height to the fence must be provided.
- A lockable gate must be provided to control access.
- During site layout planning the Principal Contractor must take into consideration provision of adequate space for placing of temporal offices, safely stacking, storing and lay down of material on site, construction vehicle and plant movement space, delivery bays, parking bays, employees resting areas and adequate working and movement areas. These safety factors must be highly considered when determining the parameters of the security fence.

Warning / informative signs

The entrance of the site must have construction safety warning signs which should contain a minimum of the following information:

- Construction activities ahead
- No unauthorised entry
- Type of Personal Protective Equipment required for the site as per risk assessment
- Speed limit
- Visitors to report to the site office

Warning signs shall also be posted in different locations of the site to create awareness of danger. These include the following:

- Traffic control signage (construction activities ahead, speed limit requirements, stop and go signs).

Informative signs indicating the assembly point, location of fire extinguisher and first aid kit should also be provided on site.

Diesel tanks
Diesel tanks should be a minimum distance of 10 metres away from any building and parking area; and should be placed on a slab with bund wall, capable of carrying 110% of the tank capacity. Fire extinguishers to be readily available near diesel tank storage area.

Electrical installations
All electrical installations for the site must be conducted by a certified electrician. All cables from distribution board to offices, stores and for security to be underground. Certificate of Compliance to be provided for electrical installations.

Welfare Facilities
The Contractor shall provide the following:

- Two ablution facilities for males and females at the site office; and two ablution facilities at the employees work stations. Plans to ensure that ablutions are at a reasonable and effective distance from the work station must be in place. The contractor must ensure that ablutions are serviced regularly and maintained in a hygienic manner. Service slips must be kept in the safety file.
- Safe drinking waters must be available at the site camp and workstations. Water to be utilized for drinking purposes may only be drawn from taps designated for drinking water purposes.
- Sheltered eating areas.

Firebreaks
Burning of firebreaks must comply with the requirements of the EMPr. Burning of fire breaks shall be done under supervision of the site supervisor. Emergency plans shall be readily available; trained fire fighters and fire extinguisher must be readily available during the activity.

PA8.2 Personal Protective Equipment (PPE) and Clothing

The Principal Contractor and all Sub-Contractors shall allow for and ensure that all site employees are issued and wear the following PPE where specified by the risk assessment of the task to be undertaken:

- Safety Boots
- Overalls
- Reflector vests
- Gloves
- hard hats
- Any other required PPE.

The Principal Contractor and all Sub-Contractors shall allow for and make provision and keep adequate quantities of SABS approved, EPWP compliant PPE on Site at all times.

The Principal Contractor and all Sub-Contractors shall clearly outline procedures to be taken when PPE or Clothing is:

- Lost or stolen;
- Worn out or damaged.

The Contractor must at all times ensure that no person enters the site without the required PPE. Visitors to the Site must be provided by the Contractor with the required PPE such as Hard Hats, Earmuffs and Eye Protection.

Records of all PPE issued to staff must be kept on site in the health and safety file.
Employees are to be made conversant with the purpose of PPE and where and when it is required to be used by employees.

All employees working in an elevated position (2m or higher) or where the potential exists that such employees may fall, each such employee must be provided with a suitably secured safety harness.

Safety belts are not to be allowed on Site only double lanyard safety harnesses are permitted. Risk assessment for their length shall be conducted to specify length to ensure they do not allow employees to hit the grown.

Suitable eye protection must at all times be worn by employees when performing, for example, grinding, chipping, chasing and all activities which result in flying objects.

In the event that onlookers may be struck by flying objects as a result of work being performed, allowances must be made for the provision of suitable temporary screens.

Any person performing welding or brazing work must wear suitable eye protection, gloves, aprons, and spats. Suitable screens are to be allowed for and be provided to protect onlookers from the harmful rays associated with such activities.

When employees are required to work with corrosive liquids, allowance must be made for suitable eye protection, gloves and acid resistant overalls to be provided.
Ear protection must be worn in designated noise zones (in excess of 85dB).

Suitable respirators must be provided to all employees and visitors required to be working in or entering areas where toxic vapours could be present.

Any person refusing to wear Personal Protective Equipment must be removed from the premises.

PA8.3 Construction Vehicle, Mobile Plant and Machinery

Construction Plant and Vehicle

All Construction Plant must comply with and be used in conjunction with the requirements of Regulation 23 of the Construction Regulations and in particular all records of inspections rendering such plant safe must be kept on site.

Hired Construction Vehicles Plant and Machinery

The Principal Contractor and Sub-Contractors shall ensure that any hired plant and machinery used on site is safe for use. The requirements as stipulated by The Act and Construction Regulations shall apply.
The Principal Contractor shall ensure that operators hired with machinery are competent and that certificates are kept on site in the Site Health and Safety File. All relevant Sub- Contractors must ensure the same.

Vessels under Pressure (VUP)

The Principal Contractor and Sub- Contractors shall comply with the Vessels under Pressure Regulations as published in Government Notice No. R. 1625 dated 4 October 1996 and amendments thereto including:

- Allowing for and providing competency and awareness training to the operators;
- Allowing for and providing PPE;
- Inspecting plant and construction vehicle daily and keeping records of inspections;
- Allowing for and providing appropriate firefighting equipment.

PA8.4 Transportation of Employees

The Principal Contractor and Sub -Contractors shall the following:

- The construction vehicle transporting employees is suitable fitted with a canopy (properly covering the back and top) with suitable sitting area.
- The construction vehicle has fixed and firmly secured seats – with belts, adequate for the number of passengers being transported.
- The drivers of construction vehicles transporting employees have drivers licenses and medical fitness certificates.

The Contractor and sub-contractors shall ensure that the following is not done on site:

- Transport persons together with goods or tools unless there is an appropriate area or section to store the tools or equipment
- Riding on the back of construction mobile plant.
- Leaving vehicles unattended with the engine running, or with the key left in the ignition.
- Parking vehicles in unauthorised zones/areas.

PA8.5 Transportation of Material

The Contractor shall ensure safe handling, loading, securing, transporting and unloading of goods and equipment. The contractor must ensure that truck operators are adequately trained on loading, load securement and unloading instructions.
Safe loads must be loaded on trucks as per specified maximum capacity.
Safe working procedure for transporting material should be developed and be adhered to mitigate the risks.

PA8.6 Hazards and Potentially Hazardous Situations

The Principal Contractor must immediately notify other Sub-Contractors as well as the Health and Safety Agent of any hazardous or potentially hazardous situations that may arise during performance of construction activities.
Should a hazardous situation require work stoppages, the work must be stopped and corrective steps taken such as the issue of Written Safe Work Procedures and the issue of Personal Protective Equipment.

PA8.7 Excavations

Prior conducting any excavation, a detailed risk assessment taking into consideration the depth and the type of soil as per Geotechnical Reports shall be conducted. Prescribed control measures such as shoring should be implemented.
All excavations shall be carried out as per requirements of Construction Regulations section 13.

<u>Excavations in the vicinity of underground electrical cables</u>
Underground electrical cables are particularly hazardous because they often look like pipes. As it is impossible to tell if they are live just by looking at them, the contractor should ensure that excavation works are properly managed to control the risk.

- Planning the works: The position of underground cables in or near proposed work must be identified and clearly marked. The cables should be pin pointed as accurately as possible using plans and locating devices.
- Safe digging practise: Excavation work should be carried out carefully and follow recognised safe digging practise. Trial pits should be dug using suitably insulated tools to confirm the path. The contractor should ensure that excavations are done along/ alternative routes from the service rather than directly above. Only insulated tools should be used when hand digging near electrical cables.

<u>Open excavations safety</u>
The Contractor must ensure that proper planning of excavation works is done. The contractor should aim to have a team that is able to open, complete pipe laying activities and backfill the excavations within the same day.

In cases where open excavation are left unattended whether it's during the day or night plans to barricade the trenches should be in place. A suitable net should be used to barricade trenches on both sides to eliminate the risk of public falling into open excavations. Danger tape will not be recognised as a form of barricading.

The contractor must provide a method statement for all excavation works before they are carried out and submit it to the Health and Safety Agent for approval.

PA8.8 Boulders and Blasting Work

When boulders are encountered along the pipeline route and require blasting, the contractor must ensure that the blaster is competent and has a Blaster's certificate.
A risk assessment for the works must be conducted before execution and risk management procedure should be developed and filed.

Notification to the neighbouring community must be done within a reasonable period of time before blasting is done.

The Contractor and the blaster must ensure the following:

- That any equipment used in connection with explosives is used in accordance with the manufacturer's instructions.
- Explosives are handled and stored in accordance with the manufacturer's instructions.
- No person primes a charge in an area where explosives are stored.
- Detonators are stored in accordance with the manufactures instructions.
- Only tools made of non-sparking material are used to open a container of explosives.

A comprehensive method statement, safe working procedure and emergency procedures for blasting must be developed and be submitted to the Health and Safety Agent before execution of the works.

Blasting must comply with all the requirements of the EMPr.

PA8.9 Road Crossings

During road crossing construction activities the Contractor should ensure adherence to Department of Transport specification. The following safety signage must be in place to control traffic:

- Construction activities ahead sign
- Speed limit requirements sign
- Flag man
- Stop and go signs
- Radio communication
- Sign indicating direction traffic should take (detour sign)
- Cones/ barricades for the area where excavation is taking place

The above mention sign requirements should be applicable on both ends of the road.
A method statement and safe working procedure should be developed for tar and gravel road crossing and must be submitted to the Health and Safety Agent for approval.

PA8.10 Stream Crossings and Wetlands

The contractor must adhere to the EMPr requirements for construction activities conducted during stream crossings and wetlands. A safe working procedure to be followed during stream crossing and working on wetlands should be developed and be approved by the Health and Safety Agent.

PA8.11 Edge Protection

All open edges of heights/ depths above / below 1.5 meters shall be guarded with suitable guards that are strong enough to restrain a fully grown human from falling. Open edge protection must be a minimum of 750mm high.
All edges that may be deemed by the Health and Safety Agent pose safety risks shall be provided with protection.

PA8.12 Stacking of Materials
Stacking and storage of materials must be performed under the supervision of a Competent Person who has been appointed in writing as required Construction Regulations.

Storage areas must be designated, kept neat and under control. In addition to the abovementioned the requirements of General Safety Regulations published in Government Notice No. R.1031 dated 30 May 1986 and amendments thereto must be complied with.

Adequate space stacking, storage and lay down areas must be provided on site.
In the event that unauthorized persons enter an area where materials are stacked, such area must be barricaded off to prevent access to such area.
Hazardous chemical substances shall be stored in dry storeroom as per specifications of their material safety data sheets.

PA8.13 Hazardous Chemical Substances (HCS)

All employees required to use Hazardous Chemical Substances or products containing Hazardous Chemical Substances must be adequately and comprehensively trained with regard to the requirements of the Hazardous Chemical Substances Regulations as published in Government Notice No. R. 1179 dated 25 August 1995 and amendments thereto, the potential sources of exposure and the potential risks to their health caused by exposure.
In addition to the abovementioned, Material Safety Data Sheets must be kept on site for all materials, which may contain hazardous chemical substances.

PA8.14 Fire Extinguishers and Fire Fighting Equipment

The Contractors shall allow for and provide or ensure adequate provision of regularly serviced temporary firefighting equipment located at strategic points on site, specific for the classes of fire likely to occur.
The appropriate notices and signs must be allowed for and be erected as required.

PA5.15 Working at Heights

Working at heights includes any work that takes place in an elevated position in excess of 1.5 m above the level below.

The Contractor must allow for the preparation of and submit a risk-specific fall prevention plan in accordance with the Construction Regulations before this work is undertaken. The fall prevention plan must be approved by the Health and Safety Agent before work may commence.

Heights above 1.5 meters high must accessed using a scaffolding
Heights less than 1.5 meters high must be accessed using a ladder
Depths more than 1.5 meters deep must be accessed using a ladder

<u>Scaffolding</u>
Risk assessment for scaffolding shall be carried out before it is used on site.
Competent persons appointed in writing shall erect scaffolding (Scaffold Erector/s), Supervise Scaffold and Inspect Scaffolding after erecting, weekly and after inclement weather (Scaffold Inspector/s). Inspection registers shall be kept on the safety file.

Scaffolding used on site shall comply with the requirements of SANS 085 and the copy of these standards must be available on site

<u>Ladders</u>
A risk assessment for ladders must be done.
Ladders used on site must be safe and fitted with nonslip devices. They must be of correct height for the task, fastened and secured and are placed at a safe angle.
Competent person appointed in writing to inspect Ladders. Ladders inspected at arrival on site and weekly thereafter. Inspections register kept.

PA8.16 Formwork and Support Work for Structures

The Contractor shall ensure that the provisions of Regulation 12 of the Construction Regulations are adhered to.
These provisions include but are not be limited to ensuring that all equipment used is examined for suitability before use; that all Formwork and Support Work is designed and inspected by a “Competent Person” immediately before, during and

after placement of concrete or any other imposed load and thereafter on a daily basis until the Formwork and Support Work has been removed.

Records of all inspections must be kept in a register on site.

PA5.17 Lifting Machines and Tackle

The Principal Contractor and Sub-Contractors shall ensure that lifting machinery and tackle is inspected before use and thereafter in accordance with the Driven Machinery Regulations as published in Government Notice No. R. 298 dated 26 February 1988 and amendments thereto and Section 20 of the Construction Regulations.

There must be a competent appointed Lifting Machinery and Tackle Inspector on site who must inspect the equipment daily or before use, taking into account that:

- All lifting machinery and tackle has a safe working load clearly indicated;
- Regular inspection and servicing must be carried out;
- Records are kept of inspections and of service certificates;
- There is proper supervision in terms of guarding the loads that includes a trained banks man to direct lifting operations and check lifting tackle;
- The tower crane bases have been approved by a professional engineer;
- The operators are competent as well as physically and psychologically fit to work and be in possession of a medical certificate of fitness which must be available on site.

PA8.18 Concrete works

The Contractor shall ensure that safety measures are implemented as per risk assessment during concrete works. Pouring of concrete should been done under supervision of a competent person and all employees involved in the activity should take reasonable care of their health and safety.
When concrete is being mixed on site, correct PPE as per risk assessment should be worn by employees. EMPr requirements for mixing cement on site should be implemented.

PA8.19 General Machinery

The Contractor shall ensure compliance with the Driven Machinery Regulations as published in Government Notice No. R. 298 dated 26 February 1988 and amendments thereto, which include inspecting machinery regularly, allowing for and appointing a “Competent Person” to inspect and ensure maintenance, allow for supplying and issuing PPE and allowing for training those who use machinery.

PA8.20 Temporal Power Supply

The Principal Contractor shall ensure proper planning for temporal power supply taking into account unforeseen load requirements.
Only competent electricians shall be authorised to install or modify temporal supplies.
A Certificate of Compliance shall be obtained for temporal power supply before it can be used.

PA8.21 Portable Electrical Tools and Explosive Powered Tools

The Principal Contractor shall ensure that use and storage of all explosive powered tools and portable electrical tools are in compliance with relevant legislation.
The Principal Contractor shall ensure that all electrical tools, electrical distribution boards, extension leads, and plugs are kept in a safe working order.

The Principal Contractor shall allow for and ensure the following:

- That a Competent Person undertakes routine inspections and records are kept on site.

- That only authorized trained persons use the tools.
- That safe working procedures apply.
- That awareness training is carried out and compliance is enforced at all times.
- That PPE is provided and used.
- That a register recording the issue and return of all explosive rounds is implemented and maintained, and
- That signs are erected in the areas where explosive powered tools are being used.
- PPE required for using the tools is provided and used

PA8.22 High Voltage Electrical Equipment Installations

All Contractors shall be made aware of the presence and location of High Voltage Equipment such as underground cables and overhead lines, and ensure that the necessary precautionary steps are taken where work has to be executed in the vicinity of such equipment.
Precautionary measures such as Isolation and Lock-Out of electrical systems or the use of electrically isolated tools must be used.

PA8.23 Hand Tools

Hands tools shall be free from cracks and splinters. Their handles shall fit securely. Working ends shall be sharp and true.
Hands tools shall be inspected by a competent person before use. Hand tools that are not safe for use should be replaced.

PA8.24 Housekeeping and waste disposal

All items of scrap, unsuitable of cuts and rubble are removed from working areas on regular basis.
All hand tools and working material are properly store in designated areas
The contractor shall allow time/ personnel for continuously maintaining good housekeeping.
An area should be designated for temporal storage of rubble and it should be demarcated.
Large quantities of waste shall not be allowed to accumulate on site. Waste shall be disposed of in an approved land fill site.
Housekeeping and waste removal shall comply with the requirements of the EMPr.

PA8.25 Environmental Management

The Contractor shall take all precautionary steps to prevent any pollution of the Environment. Any material which may have a harmful effect when disposed of by normal means must be disposed of in an appropriate manner to eliminate its harmful effect on the environment after disposal.

The Contractor must allow for and ensure that adequate procedures are implemented and maintained to ensure that waste generated is placed in suitable receptacles and removed from the site promptly. Plans to deal with spillages must be in place and maintained.

No waste materials (liquid or solid) may be disposed of in drains.
No burning of waste material may take place where such material being burned may result in pollution of the air or give off toxic vapours which could be harmful to the health of employees or any other person present on site.
Environmental management shall comply with the requirements of the EMPr.

PA8.26 Alcohol and other Drugs

No alcohol and other drugs will be allowed on site.
No person may be under the influence of alcohol or any other drugs while on the construction site.
Any person on the construction site who is on prescription drugs must inform the safety officer or the safety representative accordingly
Any person on the construction site who is suffering from any illness/condition that may have a negative effect on his/her safety performance must report this to the safety officer or safety representative.

Any person on the construction site who is suspected of being under the influence of alcohol or other drugs must be sent home immediately and the instructed to report back the next day for a preliminary inquiry. A full disciplinary procedure must be followed by the Contractor concerned and a copy of the disciplinary action must be forwarded to the Principal Contractor for his records.

PA9 CONTRACTUAL OBLIGATIONS.

(1) Due to fact that this document is based on legislative requirements, the Client requires that all Contractors comply with the requirements of this document and all other relevant legislative requirements not covered by this document.

(2) The Client or its duly appointed representative reserves the right to stop any Contractor or Sub-Contractor from working whenever Safety, Health or Environmental requirements are being violated. Any resultant costs of such work stoppages will be for the relevant Contractor's account.

(3) The requirements as specified by the Client in this document must not be deemed to be exhaustive and the Client reserves the right to make changes as and if the Client deems fit.

(4) The Client will not entertain any claim of any nature whatsoever which arises as result of costs incurred or delays being experienced due to the Contractor not complying with the requirements of this document and/or any other applicable legislative requirements imposed on the Contractor.

PA10 AUDITS BY THE EMPLOYER

The Contractor shall permit the Employer to regularly audit, at an agreed interval, the implementation and maintenance of the approved health and safety plan and shall co-operate and provide all the required documentation, as may be required, in this regard.

PA11 VARIATIONS

Should any variations be ordered or design amendments issued the Engineer shall inform the Contractor of all the associated potential hazards to ensure that the health and safety aspects of the work ordered are taken into account.

PA12 MEASUREMENT AND PAYMENT

Rates and prices tendered shall be deemed to cover the Contractor's cost for compliance with the OHS Act and the Construction Regulations 2014.

PB : EPWP LABOUR INTENSIVE SPECIFICATION

PB1 LABOUR INTENSIVE COMPETENCIES OF SUPERVISORY AND MANAGEMENT STAFF

Contractors shall only engage supervisory and management staff in labour intensive works who have completed the skills programme outlined in Table 1.

Table 1: Skills programme for supervisory and management staff

Personnel	NQF Level	Unit Standard Titles	Skills Programme description
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 Drainage	Any one of these 3 unit standards
		Use Labour Intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour Intensive Construction Methods to Construct, Repair and Maintain Structures	
Site Agent / Manager (i.e. the contractor's most senior representative that is resident on the site)	5	Manage Labour Intensive Construction Processes	Skills programme against this single unit standard

PB2 EMPLOYMENT OF UNSKILLED AND SEMI-SKILLED WORKERS IN LABOUR INTENSIVE WORKS

PB2.1 Requirements for the sourcing and engagement of Labour

PB2.1.1 Unskilled and semi-skilled labour required for the execution of all labour intensive works shall be engaged strictly in accordance with prevailing legislation in accordance with the Code of Good Practice for the Expanded Public Works Programme.

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.

PB2.1.2 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 PB2.1.3.

PB2.1.3 The Contractor shall, through all available community structures, inform the local community of the labour intensive works and the employment opportunities presented thereby. Preference must be given to people with previous practical experience in construction and / or who come from households:

a) where the head of the household has less than a primary school education;
b) that have less than one full time person earning an income;
c) where subsistence agriculture is the source of income.
d) those who are not in receipt of any social security pension income

PB2.1.4 The Contractor shall endeavour to ensure that the expenditure on the employment of temporary workers is in the following proportions:

a) 55 % women;
b) 40% youth who are between the ages of 16 to 35; and
c) 2% on persons with disabilities.

PB3 SPECIFIC PROVISIONS PERTAINING TO SANS 1914-5

PB3.1 Definitions

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

PB3.2 Contract participation goals

PB3.2.1 There is no specified contract participation goal for the contract. The contract participation goal shall be measured in the performance of the contract to enable the employment provided to targeted labour to be quantified.

PB3.2.2 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.

PB3.3 Terms and conditions for the engagement of targeted labour

Further to the provisions of Sub-Clause 3.3.2 of SANS 1914-5, written contracts shall be entered into with targeted labour.

PB3.4 Variations to SANS 1914-5

PB3.4.1 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.

PB3.4.2 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.

PB3.5 Training of targeted labour

PB3.5.1 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.

PB3.5.2 Accredited training may be provided before the commencement of a project.

PB3.5.3 The cost of accredited training of targeted labour will be funded through various funding sources such as National Skills Fund from the Department of Higher Education and Training, funds from the Implementing Public body, funding from SETAS etc. This training should take place as close to the project site as practically possible. The Public Body implementing the project must ensure that training applications for beneficiaries are made by its relevant project manager assisted by relevant training officials from the National Department of Public Works

PB3.5.4 The Public Body must ensure that preference of the training of beneficiaries in technical skills over life skills is made. In addition, the Public Body is required to maximise opportunities for training to beneficiaries to be carried out before the implementation of projects.

PB3.5.5 The Public Body must ensure that workers who have received training will be placed on the project to work after receiving the training.

PB3.5.6 If a provisional sum for training is made in the contract the contractor shall pay an allowance equal to 100% of the daily wage rate to workers who attend accredited training.

PB3.5.7 Proof of compliance with the requirements of 3.5.2 to 3.5.6 must be provided by the Contractor to the Employer prior to submission of the final payment certificate.

PB4 GENERIC LABOUR-INTENSIVE SPECIFICATION

The Generic Labour-intensive specification below is the same as SANS 1921-5, Construction and management requirement for works contracts- Part 5: Earthworks activities which are to be performed by hand and should be included in the scope of works without amendment or modification as set out below.

Scope

This specification establishes general requirements for activities which are to be executed by hand involving the following:

a) trenches having a depth of less than 1.5 metres
b) stormwater drainage
c) low-volume roads and sidewalks

Precedence

Where this specification is in conflict with any other standard or specification referred to in the Scope of Works to this Contract, the requirements of this specification shall prevail.

Hand excavateable material

Hand excavateable material is material:

a) granular materials:

i) whose consistency when profiled may in terms of table 1 be classified as very loose, loose, medium dense, or dense; or
ii) where the material is a gravel having a maximum particle size of 10mm and contains no cobbles or isolated boulders, no more than 15 blows of a dynamic cone penetrometer is required to penetrate 100mm;

b) cohesive materials:

i) whose consistency when profiled may in terms of table 1 be classified as very soft, soft, firm, stiff and stiff / very stiff; or
ii) where the material is a gravel having a maximum particle size of 10mm and contains no cobbles or isolated boulders, no more than 8 blows of a dynamic cone penetrometer is required to penetrate 100mm;

Note:

1) A boulder, a cobble and gravel is material with a particle size greater than 200mm, between 60 and 200mm.
2) A dynamic cone penetrometer is an instrument used to measure the in-situ shear resistance of a soil comprising a drop weight of approximately 10 kg which falls through a height of 400mm and drives a cone having a maximum diameter of 20mm (cone angle of 60° with respect to the horizontal) into the material being used.

Table 1: Consistency of materials when profiled			
GRANULAR MATERIALS		**COHESIVE MATERIALS**	
CONSISTENCY	**DESCRIPTION**	**CONSISTENCY**	**DESCRIPTION**
Very loose	Crumbles very easily when scraped with a geological pick.	Very soft	Geological pick head can easily be pushed in as far as the shaft of the handle.
Loose	Small resistance to penetration by sharp end of a geological pick.	Soft	Easily dented by thumb; sharp end of a geological pick can be pushed in 30-40 mm; can be moulded by fingers with some pressure.
Medium dense	Considerable resistance to penetration by sharp end of geological pick.	Firm	Indented by thumb with effort; sharp end of a geological pick can be pushed in upto 10 mm; very difficult to mould with fingers; can just be penetrated with an ordinary hand spade.
Dense	Very high resistance to penetration by the sharp end of geological pick; requires many blows for excavation.	Stiff	Can be indented by thumb-nail; slight indentation produced by pushing geological pick point into soil; cannot be moulded by fingers.
Very dense	High resistance to repeated blows of a geological pick.	Very stiff	Indented by thumb-nail with difficulty; slight indentation produced by blow of a geological pick point.

Trench excavation

All hand excavateable material in trenches having a depth of less than 1,5 metres shall be excavated by hand.

Compaction of backfilling to trenches (areas not subject to traffic)

Backfilling to trenches shall be placed in layers of thickness (before compaction) not exceeding 100mm. Each layer shall be compacted using hand stampers.

a) to 90% Mod AASHTO density;
b) such that in excess of 5 blows of a dynamic come penetrometer (DCP) is required to penetrate 100 mm of the backfill, provided that backfill does not comprise more than 10% gravel of size less than 10mm and contains no isolated boulders, or
c) such that the density of the compacted trench backfill is not less than that of the surrounding undisturbed soil when tested comparatively with a DCP.

Excavation
All hand excavateable material including topsoil classified as hand excavateable shall be excavated by hand. Harder material may be loosened by mechanical means prior to excavation by hand.

The excavation of any material which presents the possibility of danger or injury to workers shall not be excavated by hand.

Clearing and grubbing
Grass and small bushes shall be cleared by hand.

Shaping
All shaping shall be undertaken by hand.

Loading
All loading shall be done by hand, regardless of the method of haulage.

Haul
Excavation material shall be hauled to its point of placement by means of wheelbarrows where the haul distance is not greater than 150 m.

Offloading
All material, however transported, is to be off- loaded by hand, unless tipper-trucks are utilised for haulage

Spreading
All material shall be spread by hand.

Compaction
Small areas may be compacted by hand provided that the specified compaction is achieved.

Grassing
All grassing shall be undertaking by sprigging, sodding, or seeding by hand.

Stone pitching and rubble concrete masonry
All stone required for stone pitching and rubble concrete masonry, whether grouted or dry, must to be collected, loaded, off loaded and placed by hand.

Sand and stone shall be hauled to its point of placement by means of wheelbarrows where the haul distance is not greater than 150m.
Grout shall be mixed and placed by hand.

Manufactured Elements
Elements manufactured or designed by the Contractor, such as manhole rings and cover slabs, precast concrete planks and pipes, masonry units and edge beams shall not individually, have a mass of more than 320kg. In addition the items shall be large enough so that four workers can conveniently and simultaneously acquire a proper hand hold on them.

PC : ELECTRICAL AND MECHANICAL WORKS SPECIFICATION

PC1 SCOPE OF WORKS

1. General

Refer to Drawing No. 6055/2/GA1: General Arrangement of the abstraction works and water treatment works.

2. Engineering Services

The contractor is responsible for the design of the mechanical, electrical and related equipment to achieve the duties and functions specified.

He shall provide the Process and Instrumentation Diagrams, to indicate the detail of the equipment supplied by him.

The Contractor is required to submit details of the pipework and fitting arrangements within the high lift pump station, scour valve and meter chambers. He is also required to design his equipment and layout to fit into the pump station and chambers designed by the Engineer.

3. Scope of works:

The works to be executed comprises the following:

3.1 New Intermediate Pump Station

3.1.1 Functional Description and Equipment required:

A new intermediate pump station is required to deliver water firstly from the 300kl intermediate storage reservoir to the existing 10ML bottom pond. Refer to Drawing No.'s 6055-9B2-GA2: General Arrangement and Drawing No.'s 6055-9B2-IPS1 for the intermediate pump station details.

Water enters the 300kl reservoir from the 200mm diameter GMS rising main from the abstraction pump station. Water exits the 300kl intermediate storage reservoir via the 250mm diameter GMS pipework connecting to the suction pipework of the intermediate pump station. The discharge pipework connects to the 200mm diameter GMS rising main to supply the 10ML bottom pond, approximately 2.65 km away.

The high lift intermediate pumps will operate on an alternating 1 x duty / 1 x standby basis and shall operate automatically. ALC (Automatic level control) measured at proposed 300kl reservoir will switch the pumps 'on' at high level, and pumps 'off' at low level.

The motor control panels will be situated within the intermediate pump station.

The contractor shall be responsible for design, manufacturing, supplying, installing, and commissioning all equipment.

The equipment to be housed in the intermediate pump station comprises the following:

- 2 No. alternating 1 No duty / 1 No standby end suction centrifugal highlift pumps and associated pipework and fittings and fixings and GMS chain hoist as per the general arrangement given on the pump station drawing;
- Associated suction and delivery manifolds and associated fittings and pipe supports. Pipework to terminate just outside of the intermediate pump station on both the suction and discharge sides.
- Tie in points:
  - Suction pipework will tie into the supply pipework from the 300kl reservoir (constructed by

others).
- Discharge pipework will tie into the proposed rising main to the existing 10ML bottom pond.

- Scour pipework discharging as detailed on site.
- Lighting, instrumentation, cabling and cable racks
- Motor control centres (MCC), and cabling.

3.1.2 Design, Materials and Manufacture

3.1.2.1 Intermediate High Lift Delivery Pumps – End Suction Centrifugal

Design data is as follows:

Design data is as follows:

a) Liquid to be pumped: Pre-treated de-silted water (water still silty as pre-treatment designed to remove approx. 50% of the silt

b) Duty Point: 27.5l/s to a total head of 240m head.

c) Static Lift: 210m

d) Rising Main: 200mm NB GMS pipe, Class 26 – 55 (4.5mm wall thickness) pipe approximately 2650m long

e) Suction: Flooded

f) Discharge: Through Bermad Level Control valve into existing 10ML pond
g) Reservoir TWL Supply: 1325 masl
h) Reservoir LWL Supply: 1321.8 masl
i) Crest Level (Pond): 1531.5 masl

The high-lift delivery pumps offered shall have the following characteristics:

a) Designed for pumping silt laden raw water with some fibrous vegetation matter.

b) Suitable for continuous operation.

c) Motor and pump mounted on fabricated Channel Iron GMS base plate.

d) Each pump shall be supplied with a factory pumping certificate carried out in accordance with ISO 9906.
e) The pumps are to be close coupled with standard flange mount motor and pumps should not exceed 15kW. Pumps are to be of C.I. construction with cast steel impellers and mechanical seal. Motor standard efficiency to be to IE1

3.1.2.2 Suction and Delivery Manifolds

a) All pipework within the pump station shall be fabricated using a combination of ASTM A106 Schedule 40 (Std) steel pipe and ASTM A234 Std butt weld fittings. All pipe sections and butt weld fittings to be media blast prior to welding and hot-dip galvanizing.

b) The suction manifold shall comprise GMS flanged pipework and fittings including medium-radius

forged steel bends, swept tees and eccentric reducers. Isolating valves are required to each pump. All flanges and fittings to be PN16 rated. Allowance to be made for installation of pressure switch and pressure gauges.

c) The delivery manifold shall comprise GMS flanged pipework and fittings including medium- radius forged steel bends, swept tees and concentric reducers. Isolating valves, coaxial type non return valves, and a flow meter are also required. All flanges and fittings to be PN40 rated. Fabricated steel pipework to make allowance for suitably sized for the installation of the pressure switch and pressure gauge.

d) Fabricated steel pipework to make allowance for suitably sized sockets for the installation of the pressure switch and pressure gauge on the discharge pipework.

e) Glycerine filled 100mm dia. Pressure Gauges with isolation / bleeder valves to be mounted on both suction and delivery pipework are also required.

f) Double flanged lever operated isolating butterfly valves will be positioned on the vertical legs of the pipework with non-return valves of the coaxial type, mounted between the butterfly valve and the tee, immediately upstream of the tee. The non-return valve shall be the Gestra type or similar approved (for wastewater applications).

g) Air release valves shall be “Variant” or “Vent-O-Mat RBX” double acting type with anti-shock design features or similar approved.

h) Flow Meter and air release valve
In addition to all GMS welded-flanged steel pipework and fittings, a flow meter and air release valve will be required. These are to be located on the delivery pipework inside the pump station

The contractor shall be responsible for supplying and installing all pipework, fittings and supports within the intermediate pump station. All pipes provided through the wall box outs, shall be cast into the wall. All dimensions, pipe sizes and flange drilling shall be verified on site prior to manufacture.

The suction pipework will terminate at the flanged end of the flanged puddle pipe through the wall and above ground level for connecting the suction pipework from the 300kl intermediate reservoir 200mm NB Steel pipeline.

The delivery pipework will terminate at the flanged end of the flanged puddle pipe through the wall and above ground level for connecting the discharge pipework to the 200mm dia. GMS steel pipework to the non-return valve chamber supplying the 200mm dia. GMS supply rising main to the existing 10ML bottom pond.

3.1.2.3 Electrical

The design of the electrical supply shall be such that the voltage drop due to the length of cable is mitigated. The design shall also allow for easy removal all pumps from the pump station. All cables and Junction boxes within the river flood zone shall be suitably IP rated to operate under flooded conditions.

Domestic lighting shall be mounted on the inside of the pump station and shall be operated from the main MCC.

3.1.2.4 MCC

The MCC shall be of the indoor type, IP65 rated, wall mounted orange FBE coated mild steel cabinet conforming to SANS 1180 and shall contain the following:

- Incomer Section

  The Incomer section comprises the incoming power isolation switch, earth leakage, circuit breakers (15A Plugs & Lights) and phase failure relay and voltmeter with selector switch.

- Starter Pump sections:

    - Individual VSD drives will be provided for each motor that is:

        - adjustable for controlled start-ups and shut-downs to reduce water hammer;
        - of suitable power rating and functionality for driving the offered pump motor;
        - incorporates 'power smoothing' where phase voltage differences and high and low supply voltages are automatically 'corrected' for driving the pump;
        - incorporates other motor protection measures (under / over current, dropped phase protection etc).
        - of robust design with respect to operating reliably inside an unmanned small pumpstation building (humid, warm, not dust-free, exposed face splash-resistant);
        - User-friendly keypad operation in the face of the MCC to set-up and adjust.
        - Does not need forced ventilation for cooling although inside MCC panel (panel to be generously sized and designed to limit heat build-up inside the panel without relying on external ventilation slots which would allow the inside of the panel to become dusty).
        - Self-diagnosis and Auto-Reset
        - Slip compensation (V/F control)
        - Manual and automatic torque boost
        - Adjustable V/F curve
        - Self-tuning (sensorless vector control)
        - Dynamic braking
        - Rejection of critical or resonant frequencies (Skip Frequency)
        - Operation during transitory line loss (Ride-through
        - Rapid blow fuses will be installed as protection to all VSD's.

<u>Intermediate High Lift Delivery Pumps – Centrifugal (2 No for new pump station)</u>

- Panel Isolating Switch with overload relay,
- Ammeter and run hour meters for each pump,
- On / Off push-button switches for each of the pumps,
- Power On and Pump Run indicator lamps,
- Overload and Low water level indicator lamps,
- ALC (Automatic level control) measured at 300kl reservoir, i.e. pumps 'on' at high level, and pumps 'off' at low level.
- Low level, protection in pump sump
- Pressure lockout/ auto restart indicator lamps
- Stop / Trip indicator lamps for each pump
- Trip / Reset push-button switches for each pump
- Power to pumps to be isolated during maintenance
- Max 10 min timer for pump operation with push-button reset.

PD: MECHANICAL SPECIFICATION

TABLE OF CONTENTS

1. SCOPE

Aur 0001 specifies general technical requirements for mechanical engineering projects in whichthe contractor is responsible for the detailed design.

2. NORMATIVE REFERENCES

The following South African National Standards are referred to in this specification:

- SANS 62
- SANS 200
- SANS 533
- SANS 719
- SANS 936/7
- SANS 989/992
- SANS 1034
- SANS 1062
- SANS 1123
- SANS 1186
- SANS 1200H
- SANS 1217
- SANS 1315
- SANS 1465
- SANS 1700
- SANS 1804
- SANS 10044
- SANS 10104
- SANS 10160
- SANS 10108
- SANS 50025
- SANS 60034-5
- SANS 61241

The following British Standards are referred to in this specification:

- BS 970
- BS 1400
- BS 1452
- BS 1490
- BS 2789
- BS 3100
- BS 3790
- BS 4515
- BS 4872
- BS 7854
- BS EN 681
- BS EN 1092
- BS EN ISO 23936

The following ISO standards are referred to in this specification:

- ISO Sa3
- ISO 4184
- ISO 8501
- ISO 10816

3. MATERIALS

3.1 GENERALLY

All materials used in the manufacture and construction of plant and equipment shall be new, unused and shall be the best of their respective kinds. The Contractor shall ensure that the materials are selected in accordance with the best engineering practice to suit the working conditions and the extremely corrosive environment.

3.2 STEEL

Structural steel shall comply with the requirements of SANS 50025 for grade S 355 JR or for grade S 355 JO and shall be legibly marked with the maker's name or trade mark and identification marks.

3.3 STAINLESS STEEL

The grade of stainless steel to be used shall be as specified. Unless otherwise specified, rolled material shall be supplied with a matt, annealed and pickled or otherwise de-scaled surface finish. For wrought steels, the equivalent BS 970 grade may in each case be used.

A manufacturer's test certificate shall be provided for each batch of stainless steel giving details of the material analysis and any mechanical tests carried out on the material. Each stainless steel item supplied shall be clearly and permanently marked with the grade of stainless steeland cross referenced to the applicable test certificate.

Where grades EN Grade 1.4401 (316) and EN Grade 1.4301 (304) are specified, these shall be taken synonymously with the low carbon grades for welding.

3.4 3CR12

This is the titanium stabilised, 12 % chrome steel as produced by Columbus Stainless, South Africa.

3CR12 shall always be supplied with an annealed and pickled finish. 3CR12, in cases where itis to be coated, shall be suitably abrasive blasted to ensure adherence of the prime coat.

3.5 PLASTICS

Thermoplastics and fibre reinforced polymers shall be UV resistant, have adequate tensilestrength and high impact strength and generally suit the application.

PVC is regarded as too brittle and shall not be used unless called for in this Specification orapproved in writing by the Engineer before supply.

4. CASTINGS

Castings shall comply with the relevant South African or international standard for the material used, including the following:

Grey Cast Iron	SANS 1034; BS 1452
S. G. Iron	SANS 936/7; BS 2789
Steel (General Purpose)	SANS 1465; BS 3100
Aluminium	SANS 989/992; BS 1490
Stainless Steel	DIN 17 445
Copper and Copper Alloy	SANS 200; BS 1400

Castings shall be clean and sound and shall be neatly fettled and dressed. Surfaces shall be smooth and irregularities caused by mould washaways, and the presence of porosity, inclusions and sharp edges will not be tolerated. Areas under bolt heads, nuts and washers, shall be machined or spot faced to ensure a flat and smooth pressure bearing area, and sufficient space shall be provided for the use of ring or socket spanners.

All pressure retaining castings shall be hydrostatically tested to not less than 1,5 times the maximum working pressure after machining and shall be pressure tight.

No repairs shall be undertaken to castings without the written permission of the Engineer. Cast iron castings shall not be welded.

Castings shall be heat treated to provide optimum corrosion resistance and toughness combined with reasonable machinability. In particular stainless steel castings shall be heat treated so as to ensure that all carbides are in solution, to ensure optimum grain size, and to provide maximum corrosion resistance.

The Contractor shall provide a test certificate for each casting or batch of castings, except for those made of grey cast iron, giving details of the material analysis, the heat treatment and any mechanical tests carried out.

5. FABRICATION OF STEELS

5.1 GENERAL

Steelwork shall generally be constructed, fabricated and erected in accordance with theapplicable requirements of SANS 1200 H.

Welding shall comply with the clause “Welding”.

Sharp edges, pits, inclusions, weld spatter, undercuts, indentations or other surface defects arenot acceptable.

Edges shall be rounded to a radius of at least 2 mm. Designs shall avoid inaccessible pockets and hollows.

Sharp edges on items fabricated from thin sheets will not be acceptable and sharp edges shallpreferably be avoided by good design.

Inspection of fabrications shall generally be done after fabrication is complete.

5.2 CARBON STEELS

Structural steelwork shall be of grade S 355 JR or of grade S 355 JO in accordance withSANS 50025.

The requirements of the Hot Dip Galvaniser’s Association of South Africa shall be complied with if the item is to be hot-dip galvanised. Designs shall provide proper access for safe and proper entry of the molten zinc into open spaces so that subsequent drilling at the galvaniser’s yard is avoided.

Surfaces to be coated shall be accessible by blast and spray equipment. Inaccessible pockets, such as bad weld profile as well as hollow structures, are unacceptable and the angle of impact of blast material and sprayed coatings shall not be less than 45 degrees. Edges shall be rounded so as to be suitable for the coating system to be applied.

5.3 AUSTENITIC STAINLESS STEELS

Fabrication of austenitic stainless steels shall comply with the recommendations in "The Stainless Steel User Manual" issued by Columbus Stainless. Compliance with publications fromequivalent authorities will be acceptable.

Stainless steel fabricators shall use permanently dedicated storage and fabrication areas and shall use machines, tools and handling equipment which are suited and permanently dedicated to this type of material.

Fabrications shall be pickled and passivated over their full surface to achieve an even colour. If grinding is required before pickling, the final grinding shall be done with a fine disc in order to remove coarse grinding marks.

5.4 43CR12

Fabrication of 3CR12 shall comply with the requirements for austenitic stainless steels except that the recommendations in "The 3CR12 Fabrication Guide" issued by Columbus Stainlessshall be used. Compliance with publications from equivalent authorities will be acceptable.

5.5 DUPLEX AND HIGHLY ALLOYED STAINLESS STEELS

Fabrication of duplex, super austenitic and other highly alloyed stainless steels shall follow the metal producer’s own guidelines.

Welding of duplex stainless steel pipework shall be in accordance with BS 4515 Part 2 or equivalent.

6. WELDING

6.1 STANDARDS

Standards complying with good modern practice, and acceptable to the Engineer, shall beadopted. These include the following:

BS EN 1011 Arc welding carbon and carbon manganese steelwork. BS 4677 Arc welding austenitic stainless steel pipework.

BS 2633 Class 1 Arc welding of steel pipework.

BS 2971 Class II Arc welding of steel pipework.

BS 806 Design and construction of ferrous piping in connection with land boilers(used for arc welding specification of all pipe flanges).

Welders shall be experienced artisans approved in accordance with BS 4872 or equivalent.

6.2 CONTINUOUS WELDING AND ELIMINATION OF CREVICES

Welding shall be continuous on all sides of any joint.

Crevices, including those arising from welding on one side only, shall be eliminated. This requirement applies to the welding of all metals and welding procedure shall be designed to prevent unacceptable deformation.

Welds which are only accessible from one side shall be prepared so that the root run provides an acceptable profile and prevents the formation of crevices. Pipework shall be designed so that such welds can be inspected and, where applicable, pickled and passivated.

In special cases only, non-continuous welding might be approved in writing by the Engineer.The resulting crevices shall be sealed with a two part solvent free epoxy which can be applied atthicknesses of up to 600 µm and above such as Sigmaline 523 or Corrocoat Zip E or Sigmacover 1000 or equivalent.

6.3 WELD APPEARANCE

Welding shall be free of blowholes, projections, pinholes, splatter and undercuts and all welding flux, weld spatter and other sharp imperfections shall be removed. Weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground.

6.4 SITE WELDING

Site welding shall be kept to a minimum and shall only be undertaken with the approval of the Engineer.

6.5 WELDING OF STAINLESS STEEL AND 3CR12 – ADDITIONAL REQUIREMENTS

Fabrication of austenitic stainless steels and 3CR12 shall comply with the recommendations in "The Stainless Steel User Manual", "The 3CR12 Fabrication Guide" and the general welding requirements in “Pocket Guide – Stainless Steels” issued by Columbus Stainless. Compliance with publications from equivalent authorities will be acceptable.

Stainless steels to be welded shall be of the low carbon grade; e.g. 1.4306 rather than 1.4301 and 1.4404 rather than 1.4401.

The welding rods used shall be the most suitable for the metal and purpose.Only welders experienced with welding stainless materials shall be used.

Welds which are accessible from only one side shall be executed in a manner to prevent heat tint or shall be post-weld treated in order to remove all traces of heat tint.

Type 309 stainless steel welding rods shall be used for welding 3CR12 unless otherwiseapproved in writing. 3CR12 shall be welded as recommended in "The 3CR12 Fabrication Guide" issued by Columbus Stainless.

All possible steps shall be taken to ensure maximum corrosion resistance and strength of the welds and welded material. Special care shall be taken to avoid prolonged heating. Welds shall be passivated. Discolouration and steel contamination must be removed by pickling or electro cleaning as approved by the Engineer but should rather be avoided by taking the appropriate measures.

6.6 INSPECTIONS

The Contractor shall arrange for all fabrications to be inspected by the Engineer prior totransport from the fabrication workshop.

7. INSTALLATION

7.1 GENERAL

The Works shall comply with the following:

a) When erected and installed, the plant and equipment shall be of neat and workmanlike appearance, solidly and evenly supported, true to line, level, plumb and in proper workingorder.

b) The Contractor shall provide all foundation bolts, supports, hangers, brackets, etc. requiredfor the support and fixing of equipment.

c) The Contractor is responsible for grouting work associated with the equipment andpipework to be provided in terms of the Contract.

d) The use of more than three shims in the alignment of equipment will not be permitted. Machined spacers shall be prepared where necessary. Shims and spacers shall be of acorrosion resistant material such as stainless steel.

e) Corrosion protection requirements shall be carefully attended to and the relevant paragraphs of sub-clause "Paint Application" in the clause "Corrosion Protection") must benoted. All mating faces must be coated before and sealed after assembly.

f) A small amount of a nickel based, anti-seize compound shall be applied along the fulllength of fastener threads before the nut is applied.

g) Crevices which are formed between two metal surfaces shall, prior to final fastening, be filled with a suitable formable packing, Denso tape or equivalent, or with a suitable masticor sealant.

7.2 ALIGNMENT OF SHAFTS

Shafts for drives with an output above 150 kW shall be aligned to the driven shaft as follows:

a) Final alignment shall be done after installation and before commissioning and shall bechecked in the presence of and to the approval of the Engineer. Alignment shall be sufficiently accurate to ensure that no initial pre-load is placed on the shaft coupling.

b) Each motor shall be aligned to its pump by alignment specialists using laser aligningequipment with real time computer display.

c) The use of pourable epoxy resin chocks (Epocast 36, Chockfast or equivalent) shall be acceptable. If pourable chocks are used, the baseframe feet do not have to be machinedbut each machine foot shall be provided with a screw for vertical alignment. The chock thickness shall not be less than 20 mm.

8. CIVIL AND BUILDING WORKS

8.1 GENERAL DUTIES

The Contractor shall be responsible for building in of pipework required to pass through walls, for all equipment grouting work, anchoring of equipment and closing of apertures associated with equipment to be provided in terms of this Contract.

The Contractor's Documents shall indicate the civil and building details required to accommodate the equipment installation; subject to and in accordance with any details shownon the drawings provided by the Employer. These details shall include plinths, foundation blocks, rebates, pockets, sleeve ducts, holes, thrust blocks, anchor fasteners and openings/box-outs for pipework passing through walls.

The Contractor shall inspect and check the related structures constructed by others for accuracyand suitability of construction and for conformance with the Contractor's documents before commencing installation and construction. No payments shall be allowed for additional costs to the Contractor resulting from a failure to check such works timeously or to provide the related information in Contractor's Documents timeously.

8.2 CIVIL CONTRACTOR'S WORK

The main civil and building works will be completed by others and will be mostly completedwhen the Contractor is granted access to the Site.

8.3 PUDDLE PIPES

The Contractor shall install puddle pipes required by the design into concrete structures unless otherwise specified. For this purpose, the Contractor shall provide the details of box-outs required in the structure for the puddle pipes to the Engineer. As stated elsewhere, puddle flanges shall be of the same dimensions as standard flanges and the box-out shall be designed accordingly and with allowance for civil tolerances of $\pm$ 40 mm.

The structure will be constructed by others and, if required, it will be tested for water tightness bythe Engineer with the use of temporary closure of the box-outs.

Upon receiving access to the Site, the Contractor shall install the pipework and shall grout the puddle pipes into the structure using a suitable non-shrink grout to the approval of the Engineer. The Contractor shall provide a water tight installation and shall be responsible for rectifying any leakage at the puddle pipe.

8.4 BASEFRAMES, PIPE SUPPORTS, ETC.

The design requirements for baseframes and pipework supports are specified elsewhere inAur 0001.

The Contractor shall be responsible for grouting of baseframes, pipe supports, plinths, etc. required for installation of the equipment. This includes any metallic structure which is mounted onto a concrete surface.

The method proposed for anchoring baseframes, pipe supports, etc. to concrete shall be submitted to the Engineer for approval and shall incorporate the details of the non-shrink grout proposed. The material used for grouting shall be a non-shrink, cementitious grout such as ABE Duragrout 1000, or equivalent. ABE Epidermix 324, or equivalent, is acceptable if an epoxy grout is required

The design and grouting shall eliminate collection points for water or dirt.

If called for by the Engineer, the initial grouting shall be overseen by the grout supplier's technical representative.

Grout shall be applied only after each anchor fastener has been tested for integrity.

9. PIPEWORK SUPPORTS

Supports for steel pipework and for plastic pipework shall comply with Aur 7024.

10. STEEL PIPEWORK; DN 100 AND LARGER

10.1 GENERAL

This clause applies to carbon steel pipework and to stainless steel pipework.

Steel pipework ≥ DN 100 shall comply generally with Aur 7001: Design and Manufacture ofMedium Pressure Steel Specials.

The remainder of this clause specifies additional requirements for pipework associated withequipment installations.

10.2 PIPEWORK CONSTRUCTION AND CONFIGURATION

Pipework shall be joined using bolted flanges.

Stainless steel and 3CR12 pipes shall be to ASTM A312, ANSI B36.19 or ANSI B36.10 orequivalent.

Pipes and fittings shall be neatly installed, straight to line and level and adequately supported.

Pipework shall be supported above floor level on supports, racks or wall mounted and shall notbe installed directly on the floor.

Pipework shall be configured and shall be provided with couplings and/or bends to allow easydismantling and disassembly of all pipework without damage to the pipework or pipe supports.

Provision shall be made for draining all sections of pipework.Provision shall be made for venting high points of pipework.

Valves shall be mounted in horizontal pipework unless this is not feasible.Pipework shall be correctly anchored to withstand thrust.

If the physical configuration does not provide axial restraint of pipework couplings, then these couplings shall be provided with thrust restraints.

Bends shall preferably be of the long radius type. 90 degree “lobster back bends” shall have a minimum of five segments. Each flange shall be perpendicular to the segment to which it is welded.

Convergences shall preferably be of swept tee formation rather than tee pieces.

10.3 PUMP SUCTION PIPEWORK

Two mechanical couplings or one rubber tyre type coupling shall be provided on each pump’s suction pipework.

Pump suction pipework shall comply with good hydraulic design.

The pipework on the suction side of pumps shall be sized to ensure that the flow speed is nohigher than 1,5 m/s.

High points shall be avoided and suction pipework shall be level or shall slope upwards towardthe pump. Air leaks shall be prevented.

Flow straighteners shall not be used if there is a probability that the straightener will capturesolids.

Bifurcations on the suction side of centrifugal pumps **shall** be of swept formation.

10.4 PUMP DISCHARGE PIPEWORK

Two mechanical couplings or one rubber tyre type coupling shall be provided on each pump’s suction pipework.

10.5 REDUCERS

Reducers shall have a maximum angle of divergence of 10º unless otherwise shown on the drawings.

Reducers shall not have more than two longitudinal weld seams.

The taper shall not be welded directly to the flange; i.e. a short cylindrical length of pipe shall be provided between the taper and each flange.

10.6 NOZZLES

Nozzles shall be provided for the installation of gauges, transmitters, drain pipes, cooling water take offs, air release valves, etc. These shall be designed so that the pipework corrosion prevention system can be applied to all wetted surfaces without compromise. Nozzles shall consist of a flanged, welded tee off of at least 100 mm diameter, coated internally and provided with a non-corrosive blank flange, e.g. EN Grade 1.4401 (316) stainless steel. The blank flange shall be provided with tapped holes, or similar, suitable for the installation.

Carbon steel pipework may be provided with small diameter, EN Grade 1.4401 (316) stainless steel nozzles/nipples which are welded into the pipework. These shall be designed so that the pipework corrosion prevention system can be applied correctly to the carbon steel surfaces and shall overlap onto the stainless steel surfaces.

Nozzles on the suction side of pumps shall be designed and positioned to provide minimum interference with the flow path.

10.7 SLUDGE PIPEWORK

Sludge pipework shall be provided with a rodding eye or similar arrangement at each bend in order to provide access to the inside of the pipe without dismantling the pipework.

10.8 PIPEWORK FLANGES

Flanges shall comply with SANS 1123 or BS EN 1092 unless required to match existing flanges.Raised face flanges shall be provided for pipework of PN 25 and higher.

Flange drilling shall be "off centre" unless required to match an existing flange which is drilled otherwise.

The jointing material used on flange joints shall be of a suitable rubber or compressed mineral fibre at least 3 mm thick complying respectively with BS EN 681 or BS EN ISO 23936, as applicable. Gaskets shall be full face. Properly designed O-ring seals are also acceptable.

10.9 PUDDLE PIPEWORK

Puddle pipes to be permanently cast into concrete shall be of EN Grade 1.4401 (316), or of EN Grade 1.4462 (2205 duplex), or of cast iron.

Puddle pipes shall be a straight length, flanged both ends and with a puddle flange. Adequate clearance shall be provided between the wall surface and the flanges for inserting flange bolts and for the handwheel/actuator of the isolation valve but the length shall be kept as short as feasible.

The puddle flange shall be of the same diameter of a normal flange and shall be positioned inthe central plane of the wall. It shall be of the same material as the pipe unless otherwise specified. Puddle flanges shall have a plate thickness of at least half the thickness of the standard flange.

The surfaces not directly protected by encasement in concrete shall receive the full corrosion protection system. The coating shall extend about 50 mm into the concrete but the area in contact with the concrete shall otherwise be uncoated. The uncoated area shall be abrasive blasted to promote bonding.

Puddle pipes shall be cast into structures only after the Engineer has approved the Contractor's proposed method statement for the grouting process.

10.10 PIPE COUPLINGS, ALIGNMENT AND FLEXIBILITY

Pipe couplings shall be provided where misalignment or dismantling must be allowed for and also for possible pipe movement from settlement or other cause. The coupling shall have the same or a higher pressure rating than the pipework in which it is installed.

Where the type of coupling is not indicated on the drawing, pipe couplings may be of the mechanical type (VJ coupling or flange adaptor), of the stainless steel bellows type or of the rubber bellows type.

Mechanical couplings shall be of the rubber ring compression type (i.e. VJ type flange adaptors or VJ type couplings) and shall be provided **in pairs** in order to accommodate axial misalignment and/or settlement. Where a restraint is required, this shall incorporate three tie bars or more. Stainless steel and 3CR12 pipework shall be provided with stainless steel couplings or, where approved by the Engineer, cast iron couplings protected with fusion bonded epoxy. Carbon steel pipework shall be provided with carbon steel or cast iron couplingsprotected by fusion bonded epoxy. All fasteners, including the studs welded to flanges of flange adaptors, shall be of stainless steel.

Suitably rated **rubber bellows type couplings** with metal backing flanges are acceptable for pipe diameters of DN 300 and below. The bellows shall be provided with two backing flanges drilled to match their mating flanges. Bellows for low carbon steel pipework shall be provided with hot-dip galvanised flanges (i.e. not zinc plated). Bellows for 3CR12 or stainless steel pipework shall be provided with matching flange material.

Stainless steel bellows type pipe couplings shall be of EN Grade 1.4401 (316), or better, and shall incorporate stainless steel fasteners. Flanges shall be of stainless steel.

10.11 PIPEWORK FOR FLOW METER CHAMBER

A flange adaptor shall be provided on the upstream flange of a flow meter and a flange adaptor shall be provided on the downstream flange.

The pipework shall also make allowance for one isolation valve downstream of the flow meter. The valve is specified elsewhere.

10.12 PUMP SUCTION BELL-MOUTHS

Pump suction pipework which draws from open sumps shall be provided with bell mouth inlets. The bell mouth shall have an integral flange and shall be bolted to a flange on the suction pipework.

The bell mouth shall be provided with an elliptical (i.e. not segmented) profile.

The bell mouth may be of glass reinforced plastic, EN Grade 1.4401 (316) stainless steel or of cast iron.

10.13 FABRICATION OF PIPEWORK

Fabrication shall comply with the clauses "Fabrication of Steels" and "Welding" in Aur 0001. Welding shall achieve full penetration without crevices and both internal and external weld surfaces shall have a neat profile. An internal root run shall be provided where required to achieve a neat profile.

The internal surface of pipework shall be accessible for inspection and this might require that bends, tees and bifurcations shall be short and shall not be welded to a straight pipe rather than being flanged.

10.14 FABRICATION OF DUPLEX STAINLESS STEEL PIPEWORK

Duplex stainless steel pipes shall be fabricated in a production facility dedicated to automated production of pipework using mechanised welding procedures; i.e. they shall not be fabricated bythe Contractor (or the Contractor's sub-contractor) from plate.

10.15 CORROSION PROTECTION OF PIPEWORK

Corrosion protection shall comply with Aur 0003.

10.16 SITE WORKS

In accordance with FIDIC General Condition 4.7, the Contractor shall make allowance for the misalignment of other pipework to which the Contractor's pipework is to be connected.

10.17 INSPECTION AND TESTING REQUIREMENTS

The Contractor shall make all arrangements and carry all costs for the Engineer to inspect thepipework after fabrication but before any corrosion protection.

The Contractor shall perform the following (in the presence of the Engineer unless otherwiseagreed):

a) Pre-manufacturing meetings and approval of quality control documentation.

b) 100 % dye penetrant testing of all welds.

c) 10 % of welds to be X-rayed (this percentage will reduce if welds are found to be in order during initial testing). On discovery of defective welds the Engineer may call for radiographic examination until it is shown that the necessary standard is being maintained.Repairs of welded joints will be permitted and the repair procedure and performance of repairs shall be in accordance with Section 10 of API Specification 5L.

d) Visual inspection of pipework. Where dispute arises regarding acceptance of welds, therequirements of SANS 10044 Part 3 shall be complied with.

e) Paint thickness measurements.

f) Pipelines which are not fully visible and/or below ground shall be pressure tested to

1,5 times maximum working pressure for at least 15 minutes without pressure loss. Thisshall be done before covering up the pipeline and shall be witnessed by the Engineer.

g) Provide inspection reports.

10.18 FLOW VELOCITY IN PIPEWORK

Where the pipe diameter is not specified, the design flow velocities for grit free water (water, effluent, centrate and supernatant) and for high solids water (wastewater and sludge) shall be as follows:

DESIGN FLOW VELOCITY [m/s]				
	flow = 0 - 2,5 ℓ/s	*flow = 2,5 - 15 ℓ/s*	*flow = 15 - 100 ℓ/s*	*flow = 100 - 500 ℓ/s*
grit free	< 0,75	< 1,25	< 1,5	< 2
high solids	0,8 – 1,5	0,8 – 1,5	1 – 1,75	1 - 2

11. PLASTIC PIPEWORK

Polyethylene or Polypropylene pipes shall comply with SANS 533 and SANS 1315 respectively and shall carry the SABS mark.

PVC pipework is not acceptable for applications involving vibration or shock, including hydraulic shock.

An operating life of 50 years shall be designed for and appropriate de-rating factors shall be applied to suit the application. The class of pipe selected shall be not less than 1,5 times the actual maximum operating pressure.

Plastic pipework installed externally shall be provided with protections against ultraviolet light.

Tappings, for example for gauges, shall be provided with welded, external doubler plates. The plates shall have a thickness at least equal to the wall thickness of the pipe.

12. CAST IRON PIPEWORK

Cast iron pipes and fittings shall comply with BS 2035 (Class D) and shall be pressure tested in accordance with Clause 12 of that Standard. The requirements of the Standard's Clause 6 regarding freedom from defects and casting appearance and Clauses 8, 9 and 10 regarding casting accuracy will be strictly applied. The requirements of the Standard with regard to protection and flanges shall be modified to comply with this Specification.

Cast iron pipework shall comply with the requirements of the clause “Castings".

13. ELECTRIC MOTORS

13.1 ELECTRIC MOTORS BELOW 30 KW

13.1.1 General

Cage induction motors below 30 kW shall be rated for operation on a 3-phase, 4-wire, 400/230volt, 50 Hz, AC supply.

Motors shall be standard squirrel cage motors with IC 0141 cooling, shall be suitable for a dampenvironment and shall comply with SANS 1804.

Bearings shall be of the grease lubricated roller and/or ball type. Re-greasable bearings shall be provided with grease nipples (with extension tubes where access is restricted) and sealed to suit external use but with relief from over-greasing. L-10 design life shall not be less than40 000 hours.

Terminal boxes shall be top mounted wherever possible and arranged for cable entry from eitherside. The two ends of each stator winding shall be "brought out" to the terminal box.

A stainless steel rating plate shall be secured to the frame. This shall include the lubrication details.

Motors may have nominal speeds above 1 500 rpm.Ingress protection shall be to at least IP 55.

13.1.2 Performance Requirements

Motors shall provide rated power output at an ambient temperature of up to 40 ºC and at an altitude of at least 1 500 masl.

The rated power of the motor shall be selected to be not less than 20 % in excess of the designed power requirement of the driven equipment. The Engineer might waive this requirement if the motor forms part of a factory packaged unit or another technical reason.

13.1.3 Operation and Control

Protection against both starting and running overload shall be designed and provided so that it is specific to the application.

13.1.4 Hazardous Locations

When required to suit a hazardous location in terms of SANS 10108 or in terms of this Specification, suitable motors complying with SANS 60034-5 or SANS 61241, as appropriate, shallbe supplied. The relevant SANS certificates, clearly indicating the location classification in whichthe machine may be operated, shall be submitted to the Engineer before delivery of the motors. Each motor shall be clearly and permanently marked with the applicable certificate number.

13.1.5 VFD Driven Motors

Unless of the submersible or immersible type, VFD driven motors shall be cooled by a separate, 50 Hz motor driven "piggy-back" fan (this requirement will be waived if the Contractor can provide documentation to confirm that the drive and motor design can operate in the application,with conventional shaft-mounted fan, without overheating).

Motors shall incorporate an insulated bearing or other protection against damage to the bearingsfrom induced currents.

13.1.6 Corrosion Protection

Motors shall be provided with the motor manufacturer's highest grade of corrosion protection coating available.

Fan cowls shall be of cast iron, stainless steel or plastic; i.e. shall not be of carbon steel.

13.1.7 Safety

Rotating parts shall be guarded as required by legislation.

13.2 ELECTRIC MOTORS OF 30 KW AND ABOVE

13.2.1 General Requirements

Cage and slipring induction motors of 30 kW and above shall comply with this clause.

400 Volt motors shall be tefc with an ingress protection of at least IP 55 and with rolling element bearings.

Motors with a rating above 1 000 kW shall be of CACA configuration with oil lubricated sleeve bearings.

Motors shall be suitable for both "continuous running duty", Duty Class S1, and "intermittent periodic duty", Duty Class S3. Windings shall be insulated with Class F material (100 ºC rise capability) with Class B temperature rise (80 ºC). The motors shall be suitable for 6 starts per hour,two of which shall be consecutive.

The type of motor (and starter if applicable) to be supplied is determined by the requirements of theapplication specified and by any starting limitations specified. In the absence of such specifications,a standard squirrel cage motor shall be provided.

Wound rotor motors shall have a separate enclosure for the slip-ring assembly to ensure that dustdoes not enter the motor. The rings shall preferably be of stainless steel. The enclosure shall have the same ingress protection as the main motor enclosure but shall have covers for direct access tothe assembly.

If a special motor is required to obtain special starting characteristics and/or variable speed, a fulltechnical specification of the motor must be supplied and such specification shall be for equipment to a standard at least equal to this specification and shall incorporate all aspects of electrical protection.

Motors shall be structurally suitable for DOL starting. This includes motors which are VFD driven.Motors above 30 kg shall be provided with lifting eyes or lugs.

An earth terminal shall be provided on the frame. Access shall be provided to the winding neutralpoint.

Protection against both starting and running overload shall be designed and provided so that it is specific to the application.

All monitored motor parameters; e.g. bearing temperature, winding temperature, current, etc.; shallbe indicated and shall be provided on the SCADA or HMI mimics, if applicable.

Motors shall be of the reduced noise level type unless otherwise specified.

Motors shall be adequately protected against corrosive environments and shall be provided with the motor manufacturer's highest grade of coating available.

Motors of size 75 kW and above shall be fitted with "pocket" heaters. The heater shall be mounted at the bottom of the motor frame and shall be replaceable without dismantling the motor. These shall be arranged to switch on when the motor stops operating and switch off when it starts operating.

A stainless steel rating plate shall be secured to the frame. This shall include the lubrication details.

Vibration levels shall meet the requirements of grade B in IEC 60034-14.

When motors are transported, care shall be taken to prevent damage to bearing elements. The shaft shall either be secured against relative movement and/or the motor base shall be mountedon suitable anti-vibration mounts during transport.

13.2.2 Performance Requirements

Motors shall be provided and shall perform in accordance with the requirements of the specified mechanical equipment.

Motors shall provide rated power output at an ambient temperature of up to 40 ºC and at an altitude of at least 1 500 masl.

The rated power of the motor shall be selected to be not less than 15 % in excess of the designedpower requirement of the driven equipment (the Engineer might override this requirement if the motor forms part of a factory packaged unit or another technical reason).

Motors shall reach full operating speed within 5 seconds unless driven by electronic soft start or variable speed drive.

13.2.3 400 Volt Motors

Motors shall be rated for operation on a 3-phase, 4-wire, 400/230 volt, 50 Hz, AC supply and shallcomply with SANS 1804.

Except as otherwise specified or as required by the design of the installation, motors shall be standard squirrel cage or slip-ring motors with IP55 enclosure and IC 0141 cooling and shall be suitable for a damp environment.

Motor frames shall be of the totally enclosed fan cooled type with cast iron stator frames and castiron end covers. The frame and end covers shall be properly machined and each cover shall locateon a spigotted register to ensure concentricity and parallelism.

Terminal boxes shall be top mounted wherever possible and arranged for cable entry from eitherside.

13.2.4 3,3 kV, 6,6 kV, 11 kV and 15 kV Motors

Motors shall be rated for operation on a 3-phase, 4-wire, 50 Hz, AC supply.

13.2.5 TEFC Motors

The fan cowl shall be of cast iron, plastic or stainless steel; i.e. carbon steel cowls are not acceptable.

An internal cooling circuit fan shall be provided for frame sizes 355 and larger.

If it is required that the motor shall produce low sound output, the fan cowl shall be provided withinternal damping.

13.2.6 CACA Motors

CACA motors shall have IP 55 ingress protection rating unless otherwise specified.The heat exchanger shall be provided with lifting eyes or lugs.

Fans shall have inlet silencers and shall have outlet silencers.Rotors shall be dynamically balanced.

The drive end bearing shall be earthed to prevent shaft currents.

Ports shall be provided for air gap measurement at the drive end and at the non-drive end.Vertical jacking shall be provided at each holding down point.

At least one internal cooling circuit fan shall be provided for frame sizes 355 and larger.

13.2.7 Hazardous Locations

When required to suit a hazardous location in terms of SANS 10108 or in terms of this Specification, suitable motors complying with SANS 60034-5 or SANS 61241, as appropriate, shallbe supplied. The relevant SANS certificates, clearly indicating the location classification in whichthe machine may be operated, shall be submitted to the Engineer before delivery of the motors. Each motor shall be clearly and permanently marked with the applicable certificate number.

13.2.8 Electronic Variable Speed Drive

Motors which will be driven by electronic variable speed drives shall be designed for the application and their design shall be submitted to the Engineer for approval. The design shall deal with harmonic currents and with protection against bearing damage.

Unless of the submersible or immersible type, VFD driven motors shall be cooled by a separate, 50 Hz motor driven "piggy-back" fan.

Motors shall incorporate an insulated bearing and shall incorporate an earthing brush at the drive end.

13.2.9 Bearings

Bearings shall comply with the clause “Bearings” in Aur 0001, i.e. this specification.

Each bearing shall be mounted in a cartridge housing which is securely attached to the end covers.

Grease lubricated rolling element bearings shall be re-greasable during motor operation. They shall be provided with grease nipples (with extension tubes where access is restricted) and shallbe suited for external use. Relief against over-greasing shall be provided.

Bearings on the non-drive end shall be insulated. Drive end bearings shall preferably be earthed.

Bearings for motors of 300 kW and above shall be provided with temperature measurement, indication and alarm.

13.2.10 Motor Speed

For motors with ratings between 30 kW and 132 kW (both inclusive), preference shall be givento nominal speeds of 1 500 rpm or lower.

Motors with ratings above 132 kW shall have a nominal speed of 1 500 rpm or below.This sub-clause does not apply to high speed motors with special bearings.

13.2.11 Instrumentation

Motors of 55 kW and up to (but not including) 150 kW shall be provided with thermistors embeddedin the windings of each phase. The thermistor tails shall be "brought out" to separate terminals mounted near the motor winding terminal block.

Motors rated at 150 kW and above, both fixed and variable speed, shall be provided with PT 100type RTDs. Two RTDs shall be provided per phase winding. All six shall be incorporated into the control system; three to provide monitoring and three to provide high temperature trip functions.

13.2.12 Safety

Rotating parts shall be guarded as required by legislation.

14. BASEFRAMES

14.1 GENERAL

Equipment and drivers shall not be mounted directly onto a concrete base without the use of either a baseframe or soleplate.

Driven equipment and their drivers shall be mounted on common cast iron or fabricated steel baseframes of rigid construction. Common baseframes shall be provided for direct coupled and for belt driven machines.

In applications where baseframes are not practical, machined soleplates, suitably fixed and grouted into the concrete plinths, shall be provided.

The Contractor shall provide the baseframe, anchor fasteners and chemical anchor for securing the fasteners.

14.2 DESIGN REQUIREMENTS

Baseframes shall prevent pooling of water and shall be grout filled or shall be provided with drain holes in all side members.

The baseframe shall incorporate machined mounting pads at the support and fixing positions of each item of plant and equipment to be mounted on the baseframe. On fabricated baseframes this machining shall be done after fabrication, stress relieving (if applicable) and hot-dip galvanizing are complete. The thickness of the mounting pads shall be not less than 1,25 times the diameter of the holding down bolts. The pads shall not be provided with threaded holes for machine screws but shall be drilled for inserting through bolts and adequate provision shall made for reaching the nut with a suitable spanner. In the period between machining and installation of the equipment, the machined surface shall be protected against corrosion by a removable coating. After installation, a non-hardening compound, Tectyl or equivalent, shall be applied to exposed machined surfaces and to the crevice formed at the foot of the equipment. The above design may be suitably modified if the Contractor uses a pourable resin based chocking system. Such chocks shall be at least 15 mm thick.

At least two diagonally opposed jacking screws shall be provided for belt tensioning in the case of belt driven units. Direct coupled motors above 10 kW shall be provided with jacking screws for horizontal alignment and direct coupled motors above 150 kW shall be provided with jacking screws for vertical alignment as well. Jacking screws shall be of EN Grade 1.4401 (316), or better. Drilled and tapped flat plate is not acceptable for jacking points. A jacking point shall consist of a suitable hot rolled steel section welded to the baseframe and with a captured machine nut to accept the jacking screw.

14.3 FABRICATION

Fabrication shall comply with the clause “Fabrication of Steels” and welding shall comply with the clause “Welding”.

Baseframes shall be manufactured of either:

- hot rolled steel sections.
- bent plate (with the overall length not more than 200 X plate thickness).

Practical requirements for providing accessibility for surface preparation and coating shall be taken into consideration. Inaccessible pockets shall be avoided. Hollow spaces which cannot be accessed by blast and spray equipment shall be avoided or shall be welded closed. All such hidden surfaces shall not be permitted.

Inspections of carbon steel fabrications will generally be done after fabrication is complete.

14.4 MATERIALS

Baseframes shall be fabricated from steels of the 300 W series.

14.5 CORROSION PROTECTION

Steel baseframes shall be hot-dip galvanized.

The requirements of the clause “Corrosion Protection” shall be followed if the item is to be hot-dip galvanised. Designs shall provide proper access for safe and proper entry of the zinc into open spaces so that subsequent drilling at the galvaniser’s yard is avoided.

14.6 FASTENERS

Anchor fasteners shall be of EN Grade 1.4401 (316), or better. Fasteners shall comply with theclause “Fasteners”.

A minimum of six anchors shall be provided for pumps with an inlet of DN 150 and smaller. Eight ormore anchors shall be provided for pumps with an inlet larger than DN 150.

Pumps with an inlet of DN 100 or smaller shall have anchor bolts of at least 12 mm. Pumps with aninlet larger than DN 100 shall have anchor bolts with a diameter no less than 12 + (Ø-100)/25.

14.7 INSTALLATION

Not more than three shims may be used at any point and these must be made of a corrosion resistant material.

Concrete surfaces under baseframes shall be scabbled before the baseframe is placed and shall be blow clean using compressed air immediately before grouting.

Baseframes shall be designed and grouted to eliminate collection points for water or dirt. Except where otherwise approved in writing by the Engineer, all baseframes on concrete plinths shall be fully grouted in. Grouting holes must be provided on baseframes having a continuous top plate. Tapped holes and fixing setscrew protrusions shall be suitably protected. The material used for grouting shall be a non-shrink, cementitious grout (ABE Duragrout 1000, or equivalent). ABE Epidermix 324, or equivalent, is acceptable if the Contractor’s design requires an epoxy grout to be used. The initial grouting shall be overseen by the grout supplier's technical representative.

Preliminary alignment of equipment mounted on baseframes shall be done at the factory to ensure that the baseframe has been correctly manufactured, but final alignment shall always be done on Site after installation and grouting has been completed. Alignment shall be accurate and to the approval of the Engineer and a final alignment check witnessed by the Engineer mustbe carried out by the Contractor prior to start up.

14.8 INSPECTIONS

The Contractor shall arrange for the Engineer to inspect the fabrication of the baseframe before it is hot-dip galvanised.

15. MACHINE GUARDS

Guards shall comply in all respects with the Occupational Health and Safety Act of 1993 as amended and the following points shall also be noted:

Guards are required to cover all moving or revolving components of machinery. Guards which do not adequately cover moving protrusions such as keys, lock nuts, lockwashers, setscrews, etc., or irregularities such as keyways, will under no circumstances be accepted.

Guards shall be neatly and rigidly constructed and fixed and shall not vibrate or cause noise during operation.

Where expanded metal or similar mesh is used, the mesh opening shall not permit a circular object 10 mm or larger to penetrate.

Mesh shall not be used for chain guards but on belt drives the side of the guard most conveniently sited for inspection shall be constructed of expanded metal or similar. Mesh should similarly be used in other situations where inspection or ventilation is required.

Guards shall completely enclose drives and shall entirely prevent a person from touching any moving protrusion.

Allowance must be made for adjustment on belt guards or where adjustment will be required.It shall be possible to remove the guard easily for maintenance purposes.

Guards shall preferably be fabricated of EN Grade 1.4401 (316) stainless steel (uncoated) but may also be hot-dip galvanized, hot metal zinc sprayed or hot metal aluminium sprayed carbon steel, coated to Specification in all these cases. Fasteners shall be M10 or larger and shall be of EN Grade 1.4401 (316) stainless steel.

16. SHAFT COUPLINGS

Shaft couplings shall be selected to reduce transmission of misalignment forces and of torsional oscillations between the driving and driven machine. Couplings shall, wherever practical, be of the rubber tyre or rubber compression type, keyed to the shafts.

Elastomeric elements shall be urethane based. Flexible metallic elements shall be of stainless steel. Couplings shall not require lubrication.

Spacer couplings shall be used in all cases where this will assist maintenance.

Coupling guards shall comply with the requirements of the OHS Act and shall be to the approvalof the Engineer.

After installation, the alignment of all couplings shall be checked by the Contractor in the presence of the Engineer or a person delegated by him. Alignment shall be accurate and to the approval of the Engineer.

17. BELT DRIVES

Belt drives shall be designed to suit the power rating of the motor using service factors appropriate to the driving and driven machinery. Drives shall be designed, manufactured and installed in accordance with BS 3790 and ISO 4184, utilizing taperlock pulleys with taperlocks keyed to the shaft.

Where alternative pulley diameters can be selected, preference must be given to the larger pulley diameters to minimize the belt loading on bearings.

The bearing arrangements of driving and driven machinery are designed to cope with the loads imposed by belt drives and shall incorporate lay shafts where necessary. Lay shafts shall be supported by bearings mounted in bearing housings which are adequately sealed and fitted withgrease nipples. Bearing units incorporating open, shielded bearings are not

acceptable. Contractors shall submit their design calculations and drawings for lay shaft arrangements for approval by the Engineer. Bearings shall be designed for an L-10 life exceeding 100 000 hours.

18. MOTOR DRIVEN GEARBOXES

18.1 GENERAL

Gearboxes shall be supplied with environmental protection to IP 55 or higher.

Gearboxes shall have an efficiency of not less than 96 % on two stage reduction and 95 % on three stage reduction.

The Contractor shall drain and replace oil in all gearboxes during the Defects Notification Period.

18.2 SERVICE FACTOR

18.2.1 Motor Driven Gearboxes

The service factor to be used for the design of gearboxes in uniform load duty shall be at least 1,25 for electric motor driven applications. A minimum service factor of 1,5 shall be used for moderate shock applications and a minimum service factor of 2 shall be used for heavy shock applications.

18.2.2 Engine driven gearboxes

The service factor to be used for engine driven gearboxes shall not be less than 2.

18.3 DESIGN REQUIREMENTS

Gears shall be case hardened, profile ground and lapped, helical and spiral bevel gears.

The gearbox housing shall be of rigid cast construction preferably split in the horizontal plane.

Unless close coupled, each gearbox shall be mounted on machined sole plates fitted with jacking screws to assist with alignment.

Bearings shall be designed for an L-10 life in excess of 100 000 hours.

Oil-bath gearboxes shall have suitable oil level indicators or dipsticks which indicate the allowable levels. Inaccessible oil drain points shall be provided with extensions so that the oil can be easily drained. The drain line shall be of EN Grade 1.4401 (316) stainless steel and shall be fitted with a ball valve and square head plug.

Grease lubrication points shall be easily accessible. Grease nipples shall be of stainless steel.A breather designed to prevent moisture from entering shall be fitted.

19. MANUAL GEARBOXES

An over-torque limiting device shall be incorporated.

Grease lubrication points shall be easily accessible. Grease nipples shall be of stainless steel.A breather designed to prevent moisture from entering shall be fitted.

20. BEARINGS

20.1 BEARING CHOICE

Bearings shall be chosen to suit the requirements of the equipment and the installation.

Units with high speed shafts, with power ratings above 1 000 kW or for high temperatureapplications shall be provided with plain bearings (oil film type).

The following guidelines shall be considered:

a) Greased lubricated bearings are acceptable for units with power ratings up to 100 kW.

b) Units with power ratings between 100 kW and 1 000 kW shall preferably be providedwith rolling element bearings.

20.2 OPERATIONAL REQUIREMENTS

Bearing designs shall ensure safe shut down without damage following electrical supply failure.

Bearing designs for variable speed drive applications shall be suitable for the full expectedspeed range.

Rotational bearings shall be designed to rotate in either direction unless the design preventsreverse rotation.

20.3 ROLLING ELEMENT BEARINGS

For shaft sizes above 50 mm, the L-10 bearing life shall be at least 100 000 hours. This may bereduced if the equipment is expected to operate for less than 3 000 hours in a normal year.

Grease lubricated rolling element bearings shall be provided with relief against over greasing.Oil lubricated rolling element bearings shall be provided with an oil ring.

20.4 PLAIN BEARINGS

Plain bearings (“slide bearings”, “oil-film bearings” or “sleeve bearings”) which are oil lubricated shall have lubrication by oil ring, by rotating dish or by pumped feed or by a combination of these. Lubrication shall be active during normal run down and during power failure and shall cause no damage to the bearing.

20.5 THERMAL ALARMS

Thermal alarms on bearing systems shall be set in accordance with the equipment manufacturer’s instructions.

Alarm settings done on Site shall be set after at least 24 hours of operation have occurred.

If high temperature protection is specified for a bearing, the Contractor shall note the equilibrium temperature reached after 30 minutes of normal operation and shall also note the ambient temperature. The high level trip temperature shall then be calculated as follows:

Ttrip = Tequilibrium + (40ºC -Tambient) + 10ºC. This assumes that the bearing is operatingcorrectly.

21. LUBRICATION

21.1 TYPE

Grease lubrication is generally acceptable where design parameters are not severe. Oil lubrication shall be provided where the design parameters are more severe. Some Aurecon equipment specifications give further requirements for lubrication.

21.2 GREASE LUBRICATION

Where a grease point is not easily accessible, a grease line shall be piped to an easily accessible position for manual greasing. Each grease point shall be provided with its own pipework.

A distributor shall be provided where motorised lubrication is provided to more than one destination. The distributor shall be a positive displacement device which ensures equal,successive lubrication to all destinations.

Pipework for grease distribution shall be of stainless steel or non-ferrous metal.

21.3 OIL LUBRICATION

Where oil lubrication is provided, the Contractor is responsible for the initial oil fill and the first oil change, including flushing, draining and filling, after an initial run in period not exceeding 3 months.

Oil level indicators shall be fitted for visual checking. Drain valves, including EN Grade 1.4401

(316) fittings where necessary to permit convenient draining, and plugged at the end, shall be provided for oil reservoirs exceeding 1,5 litre capacity. Drains shall be from the lowest point andsyphon type drains are unacceptable.

Lubrication systems shall be designed to exclude dirt and moisture.

Air vents on the oilreservoir shall incorporate filters. Drain facilities shall always be provided.

22. GAUGES

22.1 CONSTRUCTION

Gauges shall be of industrial construction. The case and bezel shall be of stainless steel unlessthis material is unsuitable for the application.

Pressure, vacuum or compound gauges shall comply with SANS 1062 and shall bear the Standards mark. Gauges shall be of Accuracy class 1.6 and Durability grade A unless otherwise specified.

The gauge reading shall indicate gauge pressure unless absolute pressure measurement has been called for.

Gauges shall have a scale diameter of not less than 100 mm.

Calibration shall be in mWC (metres Water Column) unless otherwise specified. The units of measurement shall be clearly marked on the dial.

The scale shall be chosen so that the expected pressure is not less than half full scale reading but the full scale reading for a gauge on the discharge leg of a centrifugal pump shall be higher than the pump shut off head.

Wherever applicable, gauges shall be clearly strip marked in green to indicate the normal operating range and in red to indicate the non-permissible range of values.

Gauges shall be suitable for continuous operation and shall be glycerine filled on all pump applications and where fluctuations in pressure may cause damage.

Scale markings shall be radial, plain, straight, black lines on a white background and shall be spaced so that one scale division represents approximately 1,5 % of the maximum scale valuein values of 1, 2 or 5 multiplied by any power of 10 to suit the maximum operating rating. On circular gauges the scale shall be concentric and the maximum and minimum scale values shall be near the bottom of the gauge, with the scale symmetrically disposed about the vertical centre line of the gauge. The tip of the pointer shall be of the knife edge type extending across the scale divisions and shall be as close as practical to the dial.

22.2 INSTALLATION

Gauges shall not be mounted directly on equipment subject to vibration.

Gauges for pipework larger than DN 250 shall be remotely mounted and isolating valves shallbe provided at each end of the connecting pipework.

Gauges shall be mounted vertically and in such a position that they can be easily read from floorlevel.

Flanged nozzles with a diameter of at least 50 mm shall be provided on the parent pipework formounting of gauges.

Pressure gauges shall be fitted with an isolating and an air bleed valve. Valves shall be stainless steel ball valves with stainless steel operating levers.

Gauges for sludges and other liquids which contain solids shall have their nozzles on the side of the parent pipe. The configuration shall allow easy cleaning of the passageways.

Gauges used on wastewater, sludge, chemical, solids conveying or other applications where blockage or corrosion of the gauge is possible shall be fitted with a diaphragm type chemical seal, both being liquid filled. The portion of the seal in contact with the process liquid shall be of a suitable non-corroding material.

When used on steam lines a siphon shall be fitted between the steam line and the gauge which shall be filled with water before putting the gauge into service.

23. ELECTRONIC INSTRUMENTATION – GENERAL REQUIREMENTS

Environmental protection of electronic instrumentation shall be as follows:

a) Instrumentation and associated displays and transmitters which are either located inside or located outside and above ground level shall have IP 55, or higher, rating.

b) Instrumentation and associated displays and transmitters which are located in underground chambers shall have IP 68 environmental protection. The instrument shall be mounted in an enclosure which shall provide physical protection and shall be self draining.

c) Instruments and associated displays and transmitters which are located outside buildings shall be mounted in enclosures. Enclosures shall be of polycarbonate construction with transparent front, Fibox EK or equivalent. The complete enclosure installation shall have an IP 55 rating or higher. The enclosure size shall be chosen to provide a clearance of at least 100 mm all around the instrument.

Instruments and their cabling shall be protected so that electromagnetic interference does notaffect their operation and signal transmission.

Instruments shall have permanently affixed nameplates.Calibration certificates shall be included in the Manual.

24. GUARD RAILS

24.1 GENERAL

Legislated requirements call for guard railing to be provided in positions where the verticalchange in level is 1 000 mm or greater.

Guard railing shall comply with SANS 10104 and shall be designed for access for maintenancepurposes.

24.2 OPERATIONAL REQUIREMENTS

Guard railing shall be designed to resist, without any damage and without excessive deflection, the loadings in Category E in Table 7 in Clause 9.4 of SANS 10160 2:2011, Edition 1.1, namely:

a) a force of 1 000 Newtons in any direction (concentrated over a length of 100 mm).

b) a distributed horizontal force of 1 000 Newtons per metre applied along the top rail.

24.3 DESIGN REQUIREMENTS

Guard railing shall be designed to resist the loadings set out in SANS 10160.

Hand and knee rails shall have an outside diameter of not less than 33 mm and a wall thickness of not less than 2,5 mm and a maximum span of 1 500 mm (greater spans will be acceptable if heavier tube dimensions are used).

Tubular stanchions shall have a wall thickness of at least 3,0 mm.

On platforms, walkways, landings or around dangerous areas the vertical height, measured fromthe top of the hand rail to the floor or surface, shall be at least 1 000 mm.

On stairways and fixed ladders the rails shall be parallel to the strings, and the vertical height,measured from the top of the hand rail to the nosing of the tread, shall be at least 900 mm.

No opening between rails shall allow the passage of a ball of diameter 600 mm.

Stanchions and rails shall be smoothly finished and free from sharp corners, edges and projections which may injure persons or damage clothing. Stanchion bases shall have the corners rounded or sheared off.

Welded guard rail installations are preferred. Installations which incorporate bolted sections shall be secure and tight under loading. "Pop" rivetted installations will not be acceptable. Joints shall be smoothly finished, without shoulders.

Railings shall be ended off with positively fixed closure bends. At corners, short radius bends with stanchions on both ends shall be employed or, alternatively, stanchions specifically designed for such a position shall be employed. No sharp ends will be permitted.

Stanchions shall generally be base-mounted to suit the arrangement requirements and shall be of solid or welded construction.

Stanchions which are hollow shall be self-draining.

Stanchion feet which are attached to metallic surfaces shall have minimum dimensions of150 mm X 60 mm X 8 mm. Two fasteners, of minimum size M16, shall be used to secure each foot. Neatly fitting packing, Denso tape or equivalent, shall be fitted under stanchion feet to prevent the formation of crevices.

Stanchion feet which are attached to non-metallic surfaces shall have minimum dimensions of 150 mm X 150 mm X 10 mm. In instances where the horizontal surface to which the foot is to be fastened is less than 150 mm wide, the foot shall be designed to be seated on at least two surfaces. Four fasteners, of minimum size M16, shall be used to anchor the foot. Non-shrink, cementitious grout shall be applied under the foot just prior to final tightening of nuts.

Where kickplates are required by legislation, these shall extend to 150 mm above the walkway level.

24.4 ADDITIONAL DESIGN REQUIREMENTS FOR GUARD RAILING IN PUBLIC PLACES

The requirements for guard railing at equipment installations shall also apply for guard railing forpublic places. The following specific requirements shall also be complied with:

a) The structural design shall be done in accordance with the requirements ofSANS 10104.

b) No opening in guard railing installed in public places shall allow the passage of a ball of100 mm diameter.

24.5 CARBON STEEL GUARD RAILS

Fabrication and welding shall comply with the clauses "Fabrication of Steels" and "Welding".

The guard rails shall be hot-dip galvanised in accordance with the clause "Corrosion Protection".Designs shall provide proper access for safe and proper entry of the zinc into open spaces so that subsequent drilling at the galvaniser's yard is avoided.

If the guard rails are welded or cut after hot-dip galvanising, they shall be returned to the galvaniser for re-galvanising.

24.6 STAINLESS STEEL AND 3CR12 GUARD RAILS

Fabrication and welding shall comply with the clauses "Fabrication of Steels" and "Welding".

24.7 FASTENERS

All anchor fasteners, including nuts and washers shall be of EN Grade 1.4401 (316) stainless steel. Fastener diameter shall not be less than M12.

25. GRID FLOORING

The depth of bearer bars in metal grid flooring shall not be less than 30 mm with a bearer bar pitch of not greater than 40 mm.

The bearer bars shall be across the shorter span.

Panels shall be set level and fixed to angle frames to prevent rocking.

Cut-outs in grid flooring for pipes, valve spindles, etc. are to be fully banded. The edges of removable grid access covers must also be fully banded. Corrosion protection shall only be done after welding of banding has been completed.

Unless another material such as stainless steel is specified, grid flooring and frames shall be of carbon steel, hot-dip galvanized after fabrication. If hot-dip galvanising is not suitable, a glass flake resin, such as Power Blast's Vitaglass or equivalent which is applied by dipping the flooringin catalysed resin, is acceptable. Painted coatings are not acceptable as corrosion protection.

Where grid flooring rests on painted surfaces, strips of rubber insertion material shall be securedunder the grid to protect the paint.

The fixing clip set (saddle clamp and locking plate) shall be of hot-dip galvanised steel or stainless steel. Fasteners shall be of EN Grade 1.4401 (316), or better.

GRP grid flooring is not acceptable.

26. FASTENERS

26.1 STANDARDS

Bolts and nuts shall be hexagon head type complying with SANS 1700 with threads of thecoarse pitch series.

26.2 MATERIALS

M12 fasteners and smaller shall be of EN Grade 1.4401 (316) or better.

Fasteners in corrosive areas shall be of EN Grade 1.4401 (316) or better. Corrosive areas shall be taken to include any moist or wet area such as in and above settling tanks, in or in the vicinityof open channels, where a continuous spray can be expected and all areas in the vicinity of a wastewater treatment works or wastewater sump.

Fasteners larger than M12 which are in non-corrosive areas shall, except when specified otherwise, be hot-dip galvanized.

Plated fasteners are not acceptable.

26.3 HIGH TENSILE BOLTS

Where high tensile bolts are required by the design, they shall be hot-dip galvanized and painted. The bolt holes and crevices shall be filled and sealed prior to painting.

26.4 ANCHOR FASTENERS

Anchor fasteners shall be of EN Grade 1.4401 (316), or better.

Anchor fasteners for water retaining structures and for brickwork shall be of the chemical anchorfastening type. Other anchors may be of the expanding type or chemical anchor type.

Where hook bolts are used, these shall be supplied and grouted by the Contractor into pockets which will be provided in the concrete structure in accordance with the information to besupplied by the Contractor. The grouting products shall be used strictly in accordance with the manufacturer's instructions.

Where machinery is anchored by studs or bolts which extend through the supporting structure and is therefore fastened down with the use of nuts from both sides, the studs or bolts, together with associated washers and brackets, shall also be of EN Grade 1.4401 (316), or better.

Submerged anchors shall be secured with chemical anchor designed for submersion.

26.5 MATERIAL COMPATIBILITY

Fastener material shall always be of equal or better corrosion resistance than the items being fastened, e.g. EN Grade 1.4401 (316) bolts must be used to fasten together EN Grade 1.4401 stainless steel flanges and fabrications.

26.6 WASHERS

Flat washers shall be provided under nuts and setscrew heads.

Flat washers shall be provided under bolt heads on painted surfaces.

Flat washers shall be provided under bolt heads where the bolt is positioned in a slot.

Spring washers shall be used on fasteners subject to vibration (other approved lockingarrangements will also be acceptable on proprietary equipment).

Anchor bolts for machinery shall each be provided with a flat washer and a spring washer (otherlocking arrangements are not acceptable).

Washers shall be of the same material as the fasteners.

Flat washers exhibiting visual deformation shall be replaced by thicker washers.

26.7 ANTI-SEIZE COMPOUND

Before assembly, stainless steel threads shall be treated with a nickel-based, anti-seize/corrosion protection compound such as Chesterton 725 : Nickel Anti-SeizeCompound, or equivalent. Copper based compounds are not acceptable.

A small amount of the compound shall be applied along the full length of the exposed thread before fastening. Excessive compound visible on the thread after the nut has been applied shallbe cleaned off.

26.8 THREAD PROJECTION

Bolt threads shall project no less than 1 thread and no more than 8 threads from the head of the nuts when fixed. Longer projections will only be allowed if the Contractor can show that bolts of a more suitable length are not manufactured.

26.9 CORROSION PROTECTION

After installation, the exposed surfaces of fasteners not of stainless steel shall be coated as for the items being fastened.

If the use of Allen head or similar fasteners has been approved by the Engineer, the recessed heads shall be filled with a suitable non-hardening sealing compound.

27. MACHINE VIBRATION

The mechanical vibration of machines measured at all important points such as bearings shallbe lower than that specified as "good" for that class of machine in BS 7854 (ISO 10816).

Reciprocating machines shall be designed and installed so that the machine vibrations are isolated from the floor structure. Vibration isolation mountings which will eliminate not less than 90 % of the vibrations transmitted by the equipment shall be provided between the baseframe and the concrete plinth. When mounted on the vibration isolators, distortion of the baseframe shall be negligible in comparison with the permissible and acceptable misalignment of the equipment mounted thereon.

Shafts shall be designed so that the critical speed is outside the operating speed range.

28. NOISE CONTROL

28.1 GENERAL

Noise emitted by equipment shall be kept to a minimum and shall not exceed the noise levels specified in these documents.

28.2 NOISE LEVELS

The sound power of any equipment shall not exceed 89 dB(A) (referred to 10^{-12} Watts) unless specifically approved by the Engineer. This is approximately equivalent to a sound pressure level of 81 dB(A) at a radius of one metre from the acoustical centre assuming uniform hemispherical propagation in a free field on a hard floor. In certain instances, a lower noise level may be called for.

Where the Contractor is unable to restrict the noise level of the machines to the maximum specified by the appropriate selection of suitable equipment; e.g. by selecting slow speed or silent type machines, quiet type cooling fans, suitable silencers, etc.; the Contractor shall inform the Engineer so that appropriate steps can be taken to counteract the effects of noise.

28.3 ACOUSTIC TREATMENT

Standard acoustic enclosures shall be provided where called for.

Acoustic treatment of high noise sources shall be provided where this can be done without greatly interfering with operation or maintenance.

If acoustic lagging of pipework or ducting is specified, this shall consist of pre-formed rockwool encapsulated in stainless steel sheet metal. Alternatively, a 100 mm thick layer of rockwool having a density of 60 kg/m^3, suitably fixed in place and reinforced to prevent collapse, and covered with 25 mm thick asbestos free plaster having a density of 1 000 kg/m^3 (I.P. Insultex AF720, or equivalent). The outer surface shall be finished off with scrim cloth before being painted.

It is not normally necessary to lag flow meters and cast iron valves on acoustically lagged pipelines.

Components which can move, such as those associated with expansion bellows or mechanical couplings, shall be enclosed by an effective acoustic enclosure designed to prevent sound transmission but able to cope with movement without damage.

28.4 MEASUREMENT

Noise levels will be verified by taking impulse weighted Leq readings in dBA over ten minutes at the specified positions. Readings so achieved shall not exceed the specified level by more than 2 dBA. Should the noise exceed the specified level or should the level be in dispute, the Contractor will be responsible for obtaining certified sound pressure levels across the full octave band mid-frequency range in order to establish the precise A weighted level.

29. THERMAL LAGGING

Thermal insulation shall only be carried out after successful pressure testing of the equipment.

The efficiency of the insulation system shall exceed 90 % and the insulation cold face temperature shall not exceed 40 ºC.

Pipe insulation shall consist of pre formed insulation material having a thermal conductivity of approximately 0,040 W/m ºK at 60 ºC. The insulation material shall not have any corrosive effect on the pipework and, in particular, it must be noted that fibreglass may not be used on stainless steel.

Inside buildings, or in other protected areas, pipe insulation shall be supplied with a canvas covering having a 50 mm lap at one end and along the longitudinal seam. The laps shall be sealed using a suitable lagging adhesive. On bends the insulation material shall be neatly mitred and covered with canvas. At all flanges the insulation shall be closed off. Flanges, couplings, tees and valves shall be insulated using a removable canvas blanket or jacket fastened in place with brass hooks and eyes.

All insulation shall be coated with a suitable sealer and then painted in accordance with the colour code. The manufacturer shall advise regarding the paint types and system to be used.

Outside buildings or in other exposed areas pipe insulation shall be fixed in position using three bands per section or a suitable adhesive and then clad with aluminium. All longitudinal and circumferential joints shall incorporate a 50 mm lap with each edge grooved. The longitudinal joints shall be positioned in the "twenty past" position with the lap and groove downwards. All ends next to couplings or flanges shall be closed off and sealed before fitting muff typeinsulation and cladding over the couplings and flanges. All bends, tees and other fittings shall also be insulated and clad but valves need not be insulated. All joints shall be primed and sealed using a silicone or other appropriate sealer and the contractor shall generally ensure thatthe lagging is weatherproof with particular attention being paid to all joints and pipework support or anchor points.

With large exposed items such as vessels mounted outside, a suitable system incorporating a20 mm thick, smooth layer of weatherproof, reinforced plaster covered with a scrim cloth and overcoated with at least two coats of fibre reinforced resin sealer shall be acceptable.

30. SPARES

Spares which are specified as part of the Works shall be packed individually in wooden boxes with the lids unattached. Each box shall be labelled with the Contract number, manufacturer, contents, relevant part/model numbers and the supplier’s address. The boxes shall be brought to Site and the lids shall be secured to the boxes immediately after the Engineer has approved the spares and the packaging.

31. SIGNAGE

31.1 GENERAL

All signs as specified below shall be installed prior to commissioning.

31.2 OPERATING INSTRUCTIONS

Operating instructions shall be framed and shall be attached to the wall in the control room usingbrass screws. The frame shall be of wood or aluminium with a glass front and hardboard backing. They shall include the following:

a) Start up, Shut down and Operating instructions shall be comprehensive and shall indicate actions to be taken in the case of all alarm conditions. These shall be written from the pointof view of the plant operator.

b) A layout drawing of the equipment installation.

c) A process flow diagram.

d) A P&ID.

31.3 SAFETY

Safety signs shall be suitably framed or encapsulated. Symbolic signs shall comply with SANS 1186. The wording of the signs shall be approved by the Engineer prior to final printing. They shall be provided by the Contractor in appropriate places on the walls of the plant roomand shall include the following:

a) All statutory and special safety warning instructions.

b) Course of action during/after electrical shock.

c) Any operating restrictions for equipment.

d) Operating instructions in cases of plant trip and electrical supply failure.

e) Spares list.

32. DESIGN

32.1 SUBMISSION OF CONTRACTOR'S DOCUMENTS

FIDIC General Condition 5 states that the Contractor is responsible for the design of the Works.

FIDIC General Condition 5.2 describes the Contractor's responsibility in submitting the Contractor's Documents to the Engineer for review.

The Contractor's Documents to be submitted are listed in the tender document.

32.2 HAZARDOUS LOCATIONS

Equipment which is to be installed in areas zoned 0,1 or 2 for gasses and/or zoned 20, 21 or 22 for dusts in terms of SANS 10108, shall be designed to comply with the requirements of that Standard.

32.3 OHS ACT AND SAFETY

In addition to the safety requirements to be complied with during the construction of the Works on Site, the Contractor is responsible for ensuring that:

a) all equipment supplied ; and,

b) the complete installation

comply with the Occupational health and Safety Act, Act 85 of 1993, and the regulationspromulgated thereunder.

Installations which do not comply with the OHS Act shall be corrected by the Contractor at no cost to the Employer.

Equipment which is potentially dangerous shall be designed in accordance with a relevant SouthAfrican or international Standard.

Hazards must be avoided or guarded to the satisfaction of the Engineer. Nip points shall be guarded. Sharp corners shall be rounded off. Items such as operating handles, supports and protrusions shall be kept clear of access ways or marked accordingly.

The Contractor shall cover all unsafe gaps and openings left in structures after installation.

Each motor driven device shall be provided with an emergency stop station in an appropriate position.

Trip wires shall be provided along the accessible side/s of moving conveyor belts, chains, etc., irrespective of operating speed and in addition to any guards provided. These shall stop the driving motor when pulled.

32.4 DESIGN PRINCIPLES

Mechanical engineering design shall ensure safety, robust construction, reliability, durability, prevention of avoidable corrosion, neatness as well as ease of maintenance and operation.

Design shall, as applicable, be based on:

a) the full range of duties which can be reasonably anticipated;

b) the maximum pressure or vacuum which can be produced by pumps, blowers and compressors under all conditions including blocked or closed inlet and outlet circuits;

c) conservative service and safety factors based on approved standards or laid down in the printed specifications of reputable and approved manufacturers;

d) twenty four hour per day operation (unless specified otherwise).

e) a minimum life of 100 000 hours for large items of equipment before repair or major part replacement;

f) prevention of serious damage from normal operational problems such as blockages, blinding, jamming, seizure, malfunction and, as far as is practical, maloperation (assuming that these occurrences cannot be avoided by good design).

g) the power and torque transmitted by the driver system under full load and stalled conditions;

h) machines with non-overloading characteristics shall be selected wherever possible; eg: motors shall be sized so that they cannot be overloaded by the driven machine.

32.5 FAIL SAFE OPERATION AND PROTECTIONS

Where damage can occur from normal operational or other foreseeable problems, plant, equipment and systems must be designed to be fail safe; i.e. must have built in redundant elements, or be fail-to-safe; i.e. must return to a safe condition where no further damage can be done in the event of a failure, malfunction, maloperation, overload and, as far as practical, misuse. All reasonable and economically justifiable protections to prevent or limit damage to plant and equipment, particularly in high risk situations, must be incorporated.

Protections shall:

a) be directed at the source of the problem, limit forces to safe levels and act quickly enough to prevent damage (electrical thermal type overloads are inadequate);

b) stop or prevent from starting all equipment at risk;

c) activate an alarm with a labelled indicator on the control panel whenever a protection operates;

d) operate reliably after long inactive periods exposed to corrosive and dirty conditions.

Contractors shall highlight equipment limitations which can be exceeded during operation and cannot be guarded against.

32.6 MOVING PARTS

The following general requirements apply not only to machines but to all equipment with moving parts such as headstocks, extension spindles, swivelling davits, heavy duty hinges, pivots and the like:

a) All rotating or swivelling shafts, pins and the like, shall be adequately supported, guided and restrained by lubricated or self-lubricating bearings, collars and/or bushes.

b) Swivelling joints on linkages and the like shall be of the "universal" or fork and rod type with bearings or bushes fitted to the eyes or forks.

c) Abrasion resistant materials and slow speed operation shall be used for abrasive applications. Raw sewage and sludge shall be regarded as abrasive.

d) All applications associated with wastewater shall be regarded as corrosive and materials of construction shall be selected to suit.

e) Susceptibility to fatigue failure shall be minimised by proper design and manufacturing procedures. Sharp changes in section and welding shall be avoided in components subject to fluctuating stress.

f) The locking of nuts and pins in position shall be done to the approval of the Engineer.

g) Wearing parts shall be designed for ease of removal and replacement.

32.7 ARRANGEMENT AND MOUNTING

The arrangement and general design shall take the following requirements into consideration:

a) Lifting eyes, lugs, hooks, etc., shall be provided on heavy or large items to facilitate handling.

b) Castings or fabrications shall have machined pads for seating and be mounted on either soleplates or baseplates as appropriate.

c) Where accurate alignment is required, positioning pins and/or jacking screws shall be provided.

d) The needs of operation and maintenance including neatness, access, working space, safety, cleaning, adjustment, handling, assembly, alignment, disassembly, removal, etc.

e) With plant and equipment to be mounted on or against concrete or brick structures built by others, provision shall be made for adjustment in the mechanical design. Any special accuracy requirements must be specified on the Contractor's Documents.

32.8 PREVENTION OF CORROSION

The Contractor shall review all designs from a corrosion protection point of view. Any details which might have a negative effect on the corrosion protection and the future application of coatings are to be brought to the Engineer's attention for a ruling prior to commencement of work.

All items shall be designed to minimise corrosion in the environment in which they will be exposed. Particular emphasis shall be placed on accessibility for surface preparation and the application of coatings. The detailed requirements for corrosion protection are dealt withelsewhere in this document.

Mastics, sealants, insertion rubber or suitable gasket material shall be used to seal unavoidable crevices such as bolted connections; e.g. under guardrail feet.

The design of articles shall ensure that surfaces of corrodible materials, such as carbon steel, shall be accessible for initial coating and for maintenance. The use of back-to-back angles, partially open box sections or inaccessible stiffeners shall be avoided. Fabrication openings shall be of sufficient size to enable fettling, blast cleaning, painting, pickling and

passivation and particular attention shall be paid to the fabrication and inspection requirements for internal weld surfaces in pipework.

33. PERFORMANCE ACCEPTANCE TESTING

The complete system shall be tested for compliance with the specified requirements for theoperation and control system over a period of at least three consecutive days.

The works shall operate in accordance with the clause “Operation and Control” and theContractor shall demonstrate this to the Engineer.

The Works shall be tested as specified in the FIDIC General Conditions. Testing shall precedethe start of the Trial Operation Period.

34. COMMISSIONING

34.1 GENERAL

The Contractor shall advise the Engineer when instructions may be given to the Building Contractor to execute any necessary screeding and finishing around the Works. Contractors shall allow a reasonable period in their installation programme for this work to be done and no compensation for delay in the commencement of testing and commissioning shall accrue to the Contractor during such period.

34.2 PREPARATION

Installation work shall be complete and approved by the Engineer prior to commissioning.

Before starting up any section of the Works, the Contractor shall make all necessary checks to ensure that the installation has been correctly carried out, that all ducts, pipework, tanks, etc., are clean, that all equipment is correctly aligned, lubricated and connected up, and is in all respects ready to start with safety. The Contractor shall provide initial fill requirements, such as lubricating oil.

34.3 STARTING UP AND TESTING

The Contractor shall arrange for the Engineer to be present at initial start up and also for any electrical and control instrumentation sub-contractors to be present.

The Contractor shall start up and test each section of the Works. These tests shall be carried out to certify that the Works is operating in accordance with the requirements specified and mustbe witnessed by the Engineer. All necessary modifications and rectifications shall be carried outduring this period.

Setpoints for equipment and process parameters which are required for the operation of control systems shall be confirmed and recorded.

34.4 SCADA SYSTEM

During commissioning of a new installation which incorporates SCADA as part of the control system, each control system alarm and interlock shall be tested and the resulting alarm messages shall be modified by the Contractor to be acceptable to the Engineer.

A schedule of alarm messages and their full explanations shall be inserted in the Manual.

34.5 COMMISSIONING

When all tests have been completed to the satisfaction of the Engineer, the Works shall be commissioned. Unless the Engineer states otherwise, the complete plant, including all control functions and control systems shall be commissioned as a unit and the process performance requirements shall be achieved during normal operation.

Once the Works has been commissioned to the satisfaction of the Engineer, the Trial Operation Period period shall start and shall consist of a continuous period of operation free from trouble. Unless otherwise stated, this period shall be four weeks. During the Trial Operation Period, the Contractor shall carry out all necessary servicing and any adjustments required. The plant staff will assist the Contractor in operating the Works during this period. The Contractor shall train the operational staff in the starting, operating and stopping of the Works, and shall train the maintenance staff on the routine maintenance requirements.

34.6 COMMISSIONING REPORT

A comprehensive commissioning test report, including the SCADA system commissioning procedure and schedule of alarm messages, shall be submitted by the Contractor prior to issue of the Taking-Over Certificate and shall be inserted in the Manual.

34.7 INSPECTION

At the end of the Trial Operation Period, an inspection shall be done by the Contractor and the Engineer for the purpose of taking over the Works in terms of Clause 10 of the General Conditions of Contract.

34.8 DEFECTS LIABILITY

Refer to Clause 11 of the General Conditions of Contract for the Contractor's responsibility during the 365 day Defects Notification Period.

34.9 TRIAL OPERATION PERIOD

The 28 day Trial Operation Period for the Works shall be 28 days unless otherwise specified in the Appendix to Tender.

35. TRAINING

35.1 GENERAL

During the Trial Operation Period, the Employer's site staff will assist the Contractor in operatingthe plant and the Contractor shall train these staff in the starting, operating and stopping of the plant and shall train the Employer's maintenance staff on the maintenance requirements and procedures.

The Contractor shall also provide each trainee with printed copies of the Operating and Training Manual which forms part of the Installation, Operation and Maintenance Manual.

35.2 OPERATIONAL AND MAINTENANCE TUITION

The Contractor shall provide the following tuition to 4 operational staff members and4 maintenance staff members (as applicable to the Contract):

aa) Start up, shut down and operating instruction for all operational modes for the Works shall be provided. This shall be comprehensive and shall include actions to be taken in the case of all alarm conditions and basic fault finding.

A layout drawing of the installation, a process flow diagram, and a P&ID shall be provided for each Operator. The instructions described in (a) above shall also be provided in printed form for each Operator.

If the specified control system is SCADA based, the tuition shall include instruction on the SCADA system.

35.3 ELECTRICAL ENGINEERING STAFF TUITION

The Contractor shall provide the following tuition (as applicable to the Contract): bb) Control system software instruction.

Detailed overview of 11 kV protection and settings.Tuition on setting of 11 kV protection.

Motor protection relay and settings.

Overview of PLC programming for the purposes of making changes and re loadingprograms if PLCs are replaced.

Overview of SCADA system.

35.4 CERTIFICATES

Each trainee shall be provided with certification for each training session. Certificates shall indicate the Contractor's name and shall be signed by the trainer.

PE: ELECTRICAL SPECIFICATION

CONTENTS

SECTION 1

STD SPEC: GENERAL DESIGN

CONTENTS

1.1 SCOPE

This standard specification covers general design criteria and standards applicable to all sections of work. Should the requirements of this standard specification be in conflict with any other standard specification or the detail specification, the other standard specification or detail specification shall govern and the Tenderer/Contractor shall seek information of such precedence from the Engineer.

1.2 DESIGN

1.2.1 The works shall be designed to facilitate easy accessibility, equipment replacement, maintenance, handling, inspection cleaning and repairs and to ensure satisfactory operation in which safety of plant, personnel and public and continuity of service is the first consideration.

1.2.2 All plant, equipment and apparatus shall operate satisfactory under the ambient and other conditions prevailing at the site.

1.2.3 All apparatus shall be designed to prevent the risk of accidental short circuits due to animals, birds, ants and vermin.

1.2.4 All moving, rubbing or wearing surfaces shall be machined or ground where they bear upon each other.

1.2.5 The plant and equipment shall be designed and constructed to keep maintenance costs and the number of persons employed for maintenance to a minimum.

1.2.6 All the equipment shall be to the approval of the Engineer and shall, unless otherwise specified, be suitably designed for operation on normal electrical supply systems, with voltage fluctuations of plus and minus 10% and under such sudden variations of load and voltage as may be met with under working conditions.

1.2.7 The design of equipment shall include as a major consideration the absolute safety of the general public, operating and maintenance personnel.

1.2.8 All dimensions, units and design parameters shall be in accordance with the international metric (SI) system.

1.3 STANDARDS

1.3.1 All electrical equipment shall be of approved manufacture and its construction, design and testing shall be in accordance with the requirements of the most recent South African, British Standards or IEC publications including all amendments issued thereto up to the date of tender. The installation and equipment shall also comply with the relevant clauses of the Occupational Health and Safety Act, 1993

(Act No 85 of 1993), and the regulations promulgated in terms of the Act, and with the Code of Practice for The Wiring of Premises, SANS 0142-1.

1.3.2 Notwithstanding reference in this specification to South African or British Standards and IEC or ISO recommendations the supplier may submit for approval material and designs conforming to other technically equivalent national standards, provided that the supplier supplies the Engineer with a translation of the standards into Afrikaans or English and satisfactory proof of actual compliance therewith.

1.4 QUALITY OF MATERIAL

All material shall be new and of a design and class suitable for working under the conditions specified, and shall withstand the variations of temperature and atmospheric conditions arising under working conditions without distortion, deterioration, or the setting up of undue stresses in any part such as to affect the efficiency and reliability of the plant and also without affecting the strength and suitability of the various parts for the duty which they have to perform.

1.5 INTERCHANGEABILITY

Corresponding parts throughout the works shall be made to such close tolerances that all similar components and spares shall be fully interchangeable without any further alterations or adjustments being necessary.

1.6 BOLTS AND NUTS

1.6.1 The threads of all bolts, nuts and studs shall be in accordance with SABS 135.

1.6.2 No brass bolt or stud shall have a diameter of less than 6 mm.

1.6.3 All nuts and studs shall be locked in position by lock washers and where necessary, lock nuts.

1.6.4 Each bolt shall protrude by at least one but not more than five threads through the nut with all washers in position.

1.6.5 All bolts, nuts and washers used outdoors shall be of approved materials and treated to prevent corrosion of the threads.

1.6.6 The Contractor shall provide special tools if any bolt, nut, screw or other fastener is used in a position, which is not accessible using conventional tools. This also applies where the size or shape of the fastener is not conventional.

1.7 FIRE PRECAUTIONS

All apparatus, connections and cabling shall be designed and arranged to minimise the risk of fire and any damage, which might be caused in the event of fire.

1.8 GALVANISING

1.8.1 Where galvanising is specified, or is a requirement of the design, such galvanising shall be performed by the hot-dip process to SANS 121:2000.

1.8.2 For all parts, other than wires, the equivalent zinc coating thickness shall not be less than 455 g of zinc per square metre of surface area.

1.8.3 The galvanising must be clean, smooth, of uniform thickness, unblemished and free from defects.

1.8.4 The preparation for galvanising and the galvanising itself shall not adversely affect the mechanical properties of the coated material.

1.8.5 All drilling, welding, cutting, sawing, punching, filing and bending shall be complete and the metal shall be cleaned of any machining blemishes, mill scale, rust and lubricants, before galvanising.

1.8.6 Galvanised areas must be kept free of lubricants. Surfaces which are in contact with oil shall not be galvanised or cadmium plated.

1.8.7 Electrolytic deposition of zinc is not acceptable.

1.8.8 Where it is not practicable to coat the surface of metal by the hot-dip galvanising process, such equipment may be zinc-sprayed instead. The surface being zinc-sprayed shall be suitably prepared in accordance with the requirements of the process adopted and the rate of deposition of zinc shall not be less than 760 g per square metre of surface area. After zinc spraying the surface shall be painted with a suitable paint to render it completely impervious.

1.9 WELDING

1.9.1 All welding shall comply with the appropriate international standards such as BS 1856 (General specification) and BS 709 (methods of testing).

1.9.2 The welding shall be executed in accordance with modern accepted practice for welding and shall be sound, full strength and free from undercut and slag inclusions. Crater effects at the ends of weld runs shall be eliminated.

1.9.3 Intermittent welding and incomplete penetration butt-welding will not be accepted.

1.9.4 All fabricated items shall be stress relieved after welding.

1.9.5 The supplier shall well in advance of the commencement of fabrication, submit for approval details of proposed welding procedures.

1.10 ELECTROMAGNETIC INTERFERENCE

1.10.1 All equipment installed under this contract shall comply with the requirements of IEC 61000 Parts 1 to 6 ELECTROMAGNETIC COMPATIBILITY (EMC).

1.10.2 Any equipment found producing Electromagnetic interference subsequent to commissioning, shall be suppressed or replaced to the satisfaction of the Engineer without any cost to the Employer.

1.11 LABELS AND NOTICES

1.11.1 Identification labels must be attached to all equipment, motors, control gear and all panels and the equipment contained therein.

1.11.2 All labels and plates shall be of an approved non-corrosive material and shall be fixed with stainless steel or nickel-plated screws of ISO metric thread form.

1.11.3 Labels shall have a matt or satin finish to minimise reflection.

1.11.4 Labels shall have black lettering on a white background. Danger plates shall have white lettering on a red background.

1.11.5 Cables shall be labelled at both ends, at through joints and at regular intervals.

1.11.6 Cables shall be labelled on both sides of the place where the cable passes through a permanent obstruction.

1.11.7 For outdoor applications labels shall be of aluminium, with letters filled in black, lightly sanded with fine grit paper and clear lacquered.

1.11.8 All lettering shall be in uppercase letters except where standard abbreviations of units are used, e.g. kWh, kVA, etc.

1.11.9 The wording of labels and character height shall be to the approval of the Engineer.

1.11.10 All labels shall be in English. In addition to the English text, all Warning/Danger labels shall also be in Afrikaans and Zulu.

1.12 CLEANING AND PAINTING

1.12.1 The cleaning and painting of all exposed surfaces of all plant and accessories, unless otherwise specified or approved, shall be carried out as follows:

a) Surface preparation

All metal work shall be thoroughly cleaned by blast cleaning or pickling so as to be free of all mill scale, dirt, rust, welding slag and spatter, grease and all other contaminants and so as to present a dry, bright metallic finish.

b) Priming

The metal work shall be primed with an approved primer which, for equipment intended for outdoor use, shall be red lead based and for indoor mounted equipment shall be phosphate based.

c) Finishing

The primed surfaces shall be finished with a minimum of two coats of approved alkyd based enamel of which each coat shall be of a different shade.

1.12.2 Epoxy powder coating will be considered as alternative, for indoor applications, subject to the approval of the application procedure by the Engineer.

1.12.3 Top and bottom plates of chassis compartments assemblies and chassis runners may be protected against corrosion in an alternative approved manner (e.g. by passivated cadmium plating) due to the likelihood of damage to paint work on removal and replacement.

1.12.4 All painting shall be spray applied using dry oil-free air.

1.12.5 The final paint thickness shall be not less than 0,1 mm as determined by a magnetic film thickness gauge.

1.13 WATER AND DEBRIS ACCUMULATION

All outdoor equipment must be designed so that water and debris will not readily accumulate to cause deterioration of equipment or an electrical discharge hazard. Where this cannot be avoided such places shall be easily accessible for cleaning.

1.14 INSPECTION AND TESTS

1.14.1 All equipment will be inspected and tested, both in the factory during manufacturing and on site during installation. The tests required are prescribed in the standard and detail specification. The Engineer will do all inspections accompanied by the Contractor and the Contractor shall perform all tests with the Engineer as witness.

1.14.2 The Engineer will require seven (7) days notification to avail himself for any tests or inspection. The Contractor shall arrange for the maximum number of tests and inspections to be done on the same day.

1.14.3 The Contractor shall provide all testing facilities and instruments and all equipment and labour required for a test or inspection. All instruments shall be adequately scaled for the application. All testing facilities and instruments remain the property of the Contractor.

1.14.4 All instruments used shall have a valid test certificate issued by an accepted testing authority. The Engineer reserves the right to call for a calibration test on any instruments used during the test.

1.14.5 The Contractor shall record all results of the tests done on a test certificate, of which the Engineer must receive two (2) copies.

1.14.6 The Contractor shall ensure that the equipment is ready for testing or inspection and that the equipment conforms to the specifications before the Engineer is requested to witness tests or inspections. Should it be found that the equipment or contract works is not ready for testing/inspection, or does not conform to the specification, the Engineer reserves the right to charge the Contractor for any re-tests or subsequent costs.

SECTION 2

STD SPEC: TESTING AND COMMISSIONING

CONTENTS

2.1 SCOPE

This section covers the factory and on site testing and commissioning requirements for all equipment supplied and installed under this contract. The procedures described are the minimum required and additional tests/requirements are specified in the relevant standard and detail specifications.

2.2 TESTING SEQUENCE

The testing to be performed on site is divided into two sections as follows:

a) Before official commissioning commences the Contractor shall test his equipment as described below to ensure that the plant has been installed correctly.
b) After the Contractor has been satisfied that his equipment is in running order, the commissioning of the plant will commence as described below.

2.3 SITE TESTING OF EQUIPMENT PRIOR TO COMMISSIONING

a) The Contractor shall timeously inform the Engineer when he intends to perform his first tests and start-up of equipment in order to allow a representative of the Engineer to witness the tests.
b) Before starting up any section of the mechanical plant or filling tanks and sumps with liquid, the Contractor shall clean out the tanks, pipes, fittings, equipment or structures, and, if necessary, make arrangements with other Contractors to remove their building rubble from the structures, check that all safety devices and alarms have been set and activated, all nuts have been tightened correctly, that all the equipment is complete and ready for start-up, that the plant has been installed correctly, and that three copies of the operating manuals have been handed over to the Engineer.
c) Each section of the equipment shall be started up by the Contractor, who shall ensure that all oil fillings, lubrication, vibration monitoring, etc, have been correctly completed. In addition, he shall be responsible for the first re-filling of all the lubricating oils as well as for adjusting the plant to operate according to specification. Before any equipment is started or energised, the Contractor shall ensure that it is safe for personnel and equipment on site to do so. Allowance for these costs shall be made in his tendered rates and sums.
d) The Contractor shall conduct his own tests on the equipment and, only when he is satisfied that these tests meet the requirements of the specifications, shall he notify the Engineer that he is ready to conduct the official tests on completion. The Contractor shall not conduct an official test without the Engineer being present or his approval to do so. All equipment tested shall conform to the requirements specified.

2.4 COMMISSIONING

a) The Contractor shall be responsible for commissioning all sections of the works and shall perform all of the tasks set out below:
   (a) Prior notice of and proper arrangements for the commissioning shall be made with the Employer, Engineer, supply authority, and all electrical Contractors and suppliers of equipment, which will be affected by the commissioning operation.

(b) If plant and equipment, which has been supplied by others has to be commissioned, the supplier's specific permission thereto, together with any specific requirements relating to commissioning shall be obtained prior to commissioning.

(c) All sections of the works shall be carefully inspected by a responsible representative of the Contractor to ensure that all construction and installation work has been properly completed.

b) Commissioning and testing on site shall be carried out by experienced personnel under the Contractor's supervision.

c) All pre-commissioning tests and checks shall be agreed with the Engineer prior to the commencement therewith.

d) When all the tests required before commissioning, or tests before tests on completion, have been completed and accepted by the Engineer, the commissioning may proceed. The commissioning period shall be undertaken over a trouble-free period of at least thirty consecutive calendar days. During this period the Contractor shall instruct the operating staff in the correct procedures of operating the plant under all circumstances of operation, including emergency conditions, the correct servicing of every part, the type of oil or grease to be used, and similar instructions. This shall be done by demonstration and confirmation in writing and operating manuals shall be referred to for this purpose.

e) At least four weeks before commissioning commences the Engineer will be requested to provide the Contractor with commissioning sheets for all the equipment installed by the Contractor. These forms shall be completed by the Contractor during the commissioning period and all items listed shall be entered. Final hand-over certificates will not be issued for equipment with incomplete commissioning reports. Information that is not available or applicable, or reasons for not performing certain tests shall be agreed with the Engineer.

f) The thirty-day commissioning period will commence with a day-one test and terminate with a day-thirty test in compliance with the commissioning report. Commissioning of the plant (which includes the thirty days between the day-one and day-thirty tests) shall include operating under conditions which shall adequately prove that all the specifications are met. All safety devices, stand-by plant, automatic controls and protection devices shall be adequately tested for reliability and correct functioning. The Contractor may be called upon to repeat testing during the maintenance period if the performance of any equipment supplied under this contract is suspected to be substandard by the Engineer. Such tests shall be for the Contractor's account and shall comply with the requirements specified. Copies of updated commissioning reports shall be provided to the Engineer within two days after a test has been performed.

g) After the Contractor has provided training to the Employer and provided all other contractual requirements have been met, the latter will sign the commissioning report.

h) Once a commissioning report is complete, the Engineer and the Contractor will sign and date the report, whereupon the Engineer will notify the Employer that maintenance for that particular piece of equipment from then on is the Employers responsibility in compliance with the general conditions of contract.

i) Programs for the day-one tests, day-thirty tests and instruction/training sessions with the client shall be prepared by the Contractor and provided to the Engineer no less than two weeks before the commissioning period commences. Weekly updates to these schedules shall be provided by the Contractor for the duration of the commissioning period.

j) Note that if any equipment should fail during the 30-day commissioning period, the equipment shall be repaired or replaced by the Contractor, and testing and commissioning will commence from scratch.

k) During the thirty-day commissioning period, the Contractor shall be responsible for providing all labour and materials (including testing equipment) and shall carry out all the servicing and any adjustment of the

plant required for ensuring that it operates as specified. Valid calibration certificates shall be available for all testing equipment on site during the commissioning period.

l) The Contractor shall conduct all the tests required to satisfy the Engineer that the plant is capable of performing in accordance with the specification, and shall make allowance therefore in his tendered rates and prices. Any defects detected during the commissioning period shall be made good by and at the expense of the Contractor, including all additional costs incurred by the Employer and his representatives and the Engineer. These tests shall be conducted to certify that the plant, as installed, is operating in accordance with the specified requirements. Note that all equipment will be tested as part of a system, where appropriate, and will not be passed if all protection devices, interlocking with other equipment, etc, are not fully functional.

2.5 MEASUREMENT AND PAYMENT

All costs for equipment, labour and other expenses for the on-site testing and commissioning of equipment shall be included in the tendered rates for testing and commissioning as set out in the measurement and payment clauses of each piece of equipment and in the schedule of quantities. Any additional tests specified in the standard and detail specifications shall also be included in the tendered rates.

SECTION 8

STD SPEC: MEDIUM VOLTAGE AND LOW VOLTAGE CABLE INSTALLATION

CONTENTS

8.1 SCOPE

This section covers the supply and installation of medium voltage and low voltage cables.

8.2 MATERIALS

8.2.1 Medium voltage cable joints and terminations

The medium voltage cable joints and terminations shall be as specified in the detail specification.

8.2.2 Low voltage cable joints and terminations

Low voltage joints shall be of the epoxy-resin type.
For indoor use the cable glands shall be of the adjustable type, equal or similar to the Pratley gland and shall be suitable for use with PVC PVC SWA PVC cables complying with the latest edition of SANS 1507. All glands shall be installed with non-deteriorating neoprene shrouds.
For outdoor use the cable glands shall be as for indoor use with the addition of a nipple gasket and inner seal kit, rendering the gland suitable for type "e" equipment (increased safety equipment).
In high corrosive areas, such as chlorination, chemical dosing and inlet works areas, the cable gland shall offer a minimum degree of protection according to SANS 1222 of IP 66, shall be suitable for type "e" equipment, shall be corrosion proof and shall have a positive seal internal to the cable gland that seals over the cable outer sheath. For these applications no shrouds are required.
For all gland installations on armoured cable, the outer sheath of the cable shall be cut back in accordance with the gland manufacturers' recommendations, so that a minimum of armouring is exposed between the gland and the outer sheath after gland installation. The shroud shall seal on the outer sheath of the cable.
Bi-metallic aluminium-copper lugs, equal or similar to SIMEL type ACX, shall be used according to the manufacturer's specifications, where solid aluminium conductors are terminated onto copper busbars.

8.2.3 Earth continuity conductors

Earth continuity conductors shall comprise of stranded copper conductors of cross-section indicated in the detailed specification.
A single earth conductor may be used where two or more cables run together, providing the earth conductor cross-sectional area is based on the largest size cable in the run.

8.2.4 Cable route markers

Cable route markers shall be constructed of reinforced concrete and shall be of dimensions as indicated on drawing nr STD/R/31 included in this document.

8.2.5 Cable warning tape

The plastic cable warning tape shall consist of a strip of polyethylene of thickness 0,04mm and of nominal width 230 mm, completely impregnated with a pigment such that the colour of the tape is yellow, colour No B49 of SANS 1091, and

having printed at intervals not exceeding 1 metre along its length, a black-triangle and an electric flash symbol and the words "Danger, Gevaar, Ingozi".
The plastic warning tape shall be installed on all cable routes (LV and MV) at 200 mm above the top cable layer. Where a cable route exceeds 600 mm in with multiple warning tapes shall be run in such a way that the space between adjacent warning tapes does not exceed 183 mm.

8.2.6 Concrete protective slabs

Concrete protective slabs shall have the following dimensions:

Length	1 000 mm
Width	350 mm
Thickness	50 mm

The slabs shall be constructed of 20 MPa concrete and each slab shall be reinforced with one longitudinal and three transverse mild steel rod of minimum diameter 8 mm. The slabs shall be manufactured in such a way that the slabs interlock with each other thus avoiding shifting of the slabs after installation.

8.2.7 Cable sleeves

Cable sleeves shall be as specified in SECTION 9: STD SPEC: SUPPLY AND INSTALLATION OF CABLE SLEEVES of the standard specifications.

8.3 EXCAVATIONS

8.3.1 General

The Contractor shall preserve the site as far as possible. Only the minimum of trees, shrubs, rocks, etc shall be removed and cleared for the cable route.
Where surplus material has to be disposed of the Contractor shall dump the material in the area provided by him.
The Contractor shall at his own cost load and transport to the above mentioned site all surplus material, unsuitable material for backfilling etc.

8.3.2 Trench routes

The cable trench shall be excavated along the routes indicated on the relevant drawings.
The trench shall be absolutely straight and shall comply with all requirements. The Engineer shall determine the length of the trench to be excavated, which shall not exceed 400 m, before the cable is installed and the trench backfilled.
If any obstacle or interference should be encountered which may require alterations to the trench or routes, such alterations shall receive prior written approval of the engineer.

8.3.3 Cable trench

The trench shall be excavated to a depth indicated on the drawings for the different cables. Where depths are not indicated on the drawings, the following shall apply:
For MV cables 1,0 m and for all LV cables the trench shall be deep enough so that the top layer of LV cables is buried a minimum of 500 mm below final ground levels.
The Contractor shall excavate by hand where he cannot excavate by means of machines due to limited access and the proximity of other services.
The bottom of the trench shall be level and shall follow the contours of the final ground level. Where the excavation is in excess of the required depth, the excavation shall be backfilled and compacted with suitable material to the required depth.
The Contractor shall trim the trenches and clean up the bottom of the trenches after he has completed the required excavation. Bedding and cables shall not be laid until the trench has been approved by the engineer. Where bedding has already been laid the Engineer may instruct the Contractor to demonstrate that the minimum thickness of bedding has been provided for before authorising cable laying to proceed.
The Contractor shall remove all sharp projections, which could damage the cable where the trench is excavated through rocky formations, and shall remove all loose rocks, material, etc from the bottom of the trench.

8.3.4 Excavation of jointing chambers

Jointing pits shall be excavated to a depth of 1,2 m and shall be rectangular in shape and large enough for the cable jointers to work comfortably and in an efficient manner. Where more than one joint is to be made in the same position

the joint pit shall be large and long enough to allow staggered joints to be made. The minimum size of a joint pit shall be as follows:

- one joint : 2,5 m long x 1,25 m wide
- two joints : 3,0 m long x 1,50 m wide

8.3.5 Excavated material

No excavated material shall be left closer than 300 mm from the side of the excavation. The excavated material which is considered by the Engineer to be suitable for bedding material for the cable shall be placed separately on one side of the trench so that it is available when required. The excavated material shall take up as small an area as possible with the safety of the workmen and Works taken into consideration.

8.3.6 Inspection and measurement of excavations

Once the excavations for cable trenches and joint pits have been completed, the Contractor shall give the Engineer 24 hours notice to inspect the trench and to be present when the measurements are made. No inspections shall be undertaken on Saturdays, Sundays and public holidays.
Full detail of the cable trench dimensions and classification of the type of excavation shall be recorded and signed by the Contractors representative and the engineers representative as the final quantities for such excavations.
Inspections and recordings shall be completed before the installation of any bedding or backfilling. The Contractor shall be responsible to keep all records as proof of progress and as basis for claims for payment.

8.3.7 Maintenance of excavations

The Contractor shall maintain the excavation in a good condition, free of water, mud, loose ground, rocks, stones, gravel and other strange material until the cables are installed and the excavation is backfilled and compacted.

8.4 INSTALLATION OF CABLES

8.4.1 Sand bed for cables

A sand bed layer of soft soil shall be installed and levelled at the bottom of each trench after the trench has been approved by the engineer, and prior to cable laying.
The minimum thickness of the sand bed layer is 50 mm.
If the material that has been excavated is not suitable for the sand bed layer then suitable soil shall be imported for this purpose. The cost thereof shall be included in the unit price for the excavation unless otherwise specified.
An adequate quantity of soil similar to the sand bed material shall be available next to the excavation for the sand bed cover before an inspection of the cables is called for. The sand bed cover for MV cables shall be a minimum of 150 mm thick and for LV cables shall be 100 mm thick and shall be placed directly after the cable(s) has been inspected.
If the soil for the sand bed and sand cover has to be sifted, a sieve with holes not larger than 6mm shall be used.

8.4.2 Cables shall be laid without delay

The cable shall, after the completion of the trench, be laid with the minimum of delay so that the trench can be backfilled. The Contractor shall, however, not backfill the trench until each length of cable has been inspected and approved by the engineer.
Only one cable shall be laid at a time and the Contractor shall take precautions that the cables which are already installed are not damaged.

8.4.3 Laying of cables

The method to be used for laying cables shall be approved by the Engineer prior to the commencement of the laying of the cables.
Cable rollers shall be used when cables are drawn into trenches. The cable rollers shall be placed so that the cable does not touch the bottom or the sides of the trench. The rollers shall be of an approved construction without any sharp metal parts, which could damage the cables.
If the Contractor intends using a winch to draw the cable into the trench, a cable stocking shall be used or the draw wires shall be soldered to the cable so that the tension is exerted on all the cores, lead sheath and/or steel wire armouring at the same time.
The maximum tension on a cable during laying operations shall not exceed the value specified by the manufacturer.

Should the Engineer not be satisfied with the manner or method employed to lay the cable he shall have the authority to instruct the Contractor to lay the cable by hand or in accordance with approved standards.
The medium-voltage cables shall be laid in such a manner that the beginning of a drum shall be laid from the end of the previous drum to ensure that the lay of the cores remain the same.
Medium-voltage cables shall overlap by at least 1 m, but not more than 1,5 m at joints.
Sufficient lengths of cable shall be left at the beginning and end of the cable routes to allow for the termination of the cables. Where necessary the Engineer shall decide on what length of cable is to be left. The Contractor shall take the necessary precautions to protect the cable ends until they are terminated. The cable ends shall be sealed by means of lead or heatshrink sealing caps to ensure that the cable is waterproof.
Where cables are drawn through sleeves, care shall be taken that they are not kinked or excessively bent. No bend in a cable shall have a radius less than the minimum bending radius specified by the cable manufacturer.
The Contractor shall keep accurate records of each length of cable laid. The following information shall be recorded:

- Cable drum number
- Size of cable
- Laid from where to where
- Length of cable
- Date laid.

The Contractor shall be liable for the repair of the cable due to the faulty manufacture of the cable, should this information not be recorded directly after the cable has been laid.
Every cable shall be marked by means of an aluminium label on which the size of cable and its source or destination and cable number is punched. The label shall be installed around the inner PVC sheath immediately above the cable gland.

8.4.4 Verification of cables

The Contractor shall be solely responsible for inspecting all cables before backfilling to ensure that the correct type and number of cables have been installed.
The engineer’s representative shall inspect all cable trenches before backfilling to ensure that the laying of cables complies with the specification.
During this inspection the Contractor's and engineer's representative shall record the lengths for all cables and all such records shall be signed by both representatives as the final quantities. The Contractor shall be responsible to keep the records as proof of progress and as basis for claims for payment.

8.4.5 Road crossings

The cable sleeves shall be installed 1,5 m below ground level to avoid damage when the roads are constructed.
Unless otherwise specified, two additional sleeves shall be installed for future use at each road crossing.
Sleeves used for crossings shall be straight and undamaged. Bends shall not be allowed in road crossings.
After the installation of the sleeves, the sleeves shall be meticulously backfilled so that no air pockets are left. The trench shall thereafter be backfilled in layers of 150 mm and compacted with mechanical vibrators to 95% modified AASHTO density.
The Contractor shall lay and join the cable sleeves and compact the trench to the satisfaction of the engineer. After installation, the sleeves shall be cleaned and a galvanised steel draw wire installed in the sleeve prior to the sleeve ends being sealed by means of plastic plugs.

8.4.6 Crossing of other services

Where a cable crosses over other services, the cable shall not be installed at a depth less than 800mm below ground level and if this is not possible the cable shall be installed underneath the other service and shall be protected in the prescribed manner by means of concrete slabs. The depth of the cable shall be maintained for one metre on either side of the crossing.
If it is not possible to cross over or underneath a service in the prescribed manner, the matter shall be referred to the Engineer for a decision.

The following minimum clearances shall be maintained between electrical cables and other services:

	Vertical	**Horizontal**
GPO Cables	0,3 m	0,3 m
Water pipes	0,3 m	0,3 m
Sewer pipes	0,3 m	0,8 m
Storm water pipes	0,3 m	0,6 m
Other electrical cables	0,15 m	0,15 m (Other than LV cables in same route)
LV cables on same route	0,100 m	One cable diameter of larger cable

8.4.7 Backfilling of trenches

When the cable has been laid, inspected and approved and the sand bed cover as specified in the clause on "Sandbed for cables" has been installed, the trench shall be backfilled with soil containing not more than 40% rock or shale which shall be able to pass through a 100 mm sieve and which is approved by the engineer.
Where more than 40%, but less than 70% rock occurs, the Contractor shall replace the rock with imported soil. However, should more than 70% rock occur then all the backfilling material shall be imported.

- The Contractor may import further stone-free material to the site or sieve the excavated material for sand bedding and cover but payment shall only be compensated for the actual quantity of imported material required as determined by the engineer. The quantity of imported material required shall be calculated from the nominal trench width.
- The excavated material shall be backfilled in layers of 150 mm and shall be well compacted and consolidated to 90% MOD AASHTO. Where necessary the Engineer may require that a mechanical vibrator be used for compacting the trench.
- The Contractor shall maintain the completed sections of the cable trench in a proper safe condition for the duration of the contract. The Contractor shall refill and compact the trench where subsidence occurs.
- After completion of the work the route of the cable shall be neatly finished off and cleared. All stones bigger than 25 mm as well as all loose organic material and rubble shall be removed.

8.4.8 Installation of concrete slabs and cable markers

Where cables cross other services such as water pipes, sewage pipes and other cables or where the chance exists that the cable may be damaged as a result of excavation by others, the cable shall be protected by means of reinforced concrete slabs. The slabs shall protect the cable for a distance of 500 mm on either side of the crossing.
Cable route markers shall be installed to indicate the cable route and positions of cable joints and cable sleeves. The markers shall be buried in the ground directly over the cable, joint, sleeve, or where the cable crosses a known service, with the top protruding 50mm above the finished ground level. Route markers shall be placed at every change in direction and at 100m intervals on straight runs.

8.5 JOINTING AND TERMINATION OF MEDIUM-VOLTAGE CABLES

The Contractor shall provide the Engineer with documentary proof that he has qualified, experienced and competent cable jointers in his employ to execute the work to the satisfaction of the engineer.
The Contractor's jointer(s) shall thereafter demonstrate to the Engineer or his representative that he/they are completely conversant with the standard jointing methods by doing a test joint for each type of cable to be installed on the contract.
The test joint may at the discretion of the Engineer be a joint, which is to be made in the execution of the contract. The jointer(s) shall be permitted to proceed with the jointing should the Engineer be satisfied with the test joint and the test joint withstands a medium-voltage test. Notwithstanding the aforementioned, the Engineer may at his discretion require that any one of the joints completed be opened and inspected to determine whether the joints comply with the requirements before the Contractor shall be allowed to proceed with the jointing.
The requirements in these clauses shall also apply to all new cable jointers employed during the duration of the contract to do cable jointing on the contract.
No jointer shall be permitted to do more than two joints per day.
The Engineer shall be informed in advance of when jointing is to take place to enable him to inspect the joint.
The jointer shall, before he commences with the jointing, ensure that:

- He has sufficient and suitable material to properly and efficiently complete the joint.
- The joint chamber is dry.

- All stones, loose ground, sticks, leaves etc is removed from the joint chamber.
- The walls and sides of the joint chamber is firm and free of loose ground, stones, gravel etc which could fall into the chamber.
- The necessary barriers are made to keep water out of the joint chamber.
- The necessary cover is provided over the joint chamber to keep unexpected rain out of the chamber and that enough light and ventilation is provided under the cover.
- He has the necessary material to seal off the joint or termination when he has to discontinue jointing or terminating the cable due to unexpected storms or flooding of the chamber which makes it impossible to continue jointing or terminating the cable, irrespective of how far the work has commenced.
- He has the necessary ground sheets to line the floor of the joint chamber.
- The cable and other materials are dry, undamaged and in all respects suitable for jointing or terminating.
- His equipment and tools are at all times dry, clean and absolutely free of ground

No jointing or terminating shall commence in rainy weather without the prior approval of the engineer. When the jointer commences with a joint he shall complete the joint before he leaves the site.
The Contractor is responsible to ensure that the requirements are carried out by his jointer.
No cable jointer shall be allowed to terminate more than two ends per day.
The standard phase arrangement shall be observed when connecting up cables in the end boxes. The Contractor shall ensure that the prescribed phase arrangement is at all times maintained on the external terminals of the end boxes.

8.6 JOINTING AND TERMINATION OF LOW-VOLTAGE CABLES

No joints shall be allowed in the low-voltage cables without the prior approval of the Engineer.

8.7 TESTS BEFORE ACCEPTANCE

After the completion of the electrical installation, the Contractor shall test the installation in accordance with the requirements of the specification.
The Engineer shall have the right to call for or to carry out any additional tests, which may be necessary to prove that the requirements of the specification have been met. The Contractor shall assist with the conducting of these tests without delay.
All tests shall be conducted in the presence of the Engineer and the costs thereof shall be included in the installation rates of the cables, joints and terminations.

8.7.1 General

The tests hereinafter described comprises only the site tests and tests before acceptance or handing over of the installation. Where cables and other material are supplied by the Contractor the factory and manufacturing tests shall be as specified in the specification.
After the installing and completing of the installation, before the service is taken over, the following tests shall be undertaken. These tests shall form an integral part of the erection, construction or installation of the various items and the costs thereof shall be included in the unit rates for the erection, construction or installation of the various items.

8.7.2 Tests on medium-voltage cables

The Contractor shall undertake the following tests in the presence of the Engineer before the Engineer shall agree to accept any part of the installation. The Contractor shall, furthermore undertake any other tests the Engineer may prescribe to satisfy himself that the work is of an acceptable standard.

a) Voltage tests

Each section of the cable installation between miniature substations shall be subjected to a preliminary voltage or insulation resistance test to prove the insulation resistance.

b) Continuity test

The resistance between each core and the lead sheath of the cable shall be measured for each section while the core and sheath is short circuited at the far end to ascertain if all connections have been correctly made.
All test instruments shall be of a high quality and shall, if required, be calibrated by the SABS or such body approved by the Engineer at the cost of the Contractor.

c) DC medium-voltage tests

Each cable circuit, including joints and terminations, shall be tested by means of a direct current voltage of 18 kV between the different cores and between the cores and the lead sheath or copper tape screen for a period of 15 minutes. The voltage shall be gradually raise to 18 kV and kept there for 15 minutes.
The Contractor shall undertake all repairs and replacements at his own costs in the event of the installation failing the above-mentioned tests.

8.7.3 Tests on low-voltage cables

a) Phase and continuity tests

The resistance of each circuit shall be determined by imposing a DC voltage not greater than 100 V between each phase and earth while the phase is short circuited at the end of the cable route.

b) Voltage tests

The insulation resistance shall be determined by imposing a 2000 volt DC supply between each individual phase and earth at the miniature substations. The insulation resistance shall not be less than 50 megohm.

8.8 INFORMATION REGARDING THE COMPLETED NETWORK

The Contractor shall submit the "as built" drawings on which complete information of the installation, as installed, is indicated after the completion of the installation and before the installation is handed over to the Employer.

8.9 CLEARING OF SITE

The Contractor shall remove everything that he brought onto the site or handled on the site in the execution of the contract as well as all excess excavated material and rubble so as to leave the site in a neat and clean condition to the satisfaction of the Engineer after the completion of the contract and after the engineer's approval has been obtained.

8.10 MEASUREMENT AND PAYMENT

	Item	Unit
8.10.1	Excavate in all materials for trenches, backfill, compact and dispose of surplus material	m^3

This rate shall apply to all the excavations.
The unit of measurement shall be the cubic metre of material excavated in trenches, classified according to the depth and width specified listed. The width classification shall be in accordance with the authorised dimensions and the depth classification in accordance with the total depth of the trench and not with the depth range in which the material is situated before excavation. The depth of excavation shall be measured to the underside of the bedding.
The tendered rate shall include full compensation for clearing and grubbing the trench areas and the temporary removal of improvements from the line of the trench, for excavating the trench, preparing the bottom of the trench, separating material unsuitable for backfill, keeping the excavations safe, dealing with any surface or subsurface water, measuring, classification and keeping of all records and for separating topsoil and selected backfill material where necessary.
The rate shall furthermore cover the costs of installing the sand bed and sand cover, backfilling, compacting and disposing of the surplus material.

	Item	Unit
8.10.2	Extra over item 7.10.1 for excavating in hard material	m^2

The unit of measurement shall be the cubic metre of material excavated and classified as hard, in accordance with the classification set out hereunder.
The tendered rate shall be paid over and above the rate tendered for excavation in respect of items 7.10.1 in full compensation for the additional cost of excavating in hard material instead of soft.
The tendered rate shall include full compensation for any overbreak as well as the additional backfilling required, reinstating the trench bottom, and for any other incidentals resulting from overbreak.
The materials excavated shall be classified as follows for payment purposes:

a) Hard material:

Material which cannot be excavated efficiently except with the use of pneumatic tools, blasting or wedging and splitting, and shall include boulders exceeding 0,15 m3 in volume.

b) Soft material:

All material not classified as hard material.
Notwithstanding the above classification, all material excavated from previously constructed fills, embankments, pavement layers and from above existing services shall be classified as soft material.
The decision of the Engineer as to the classification of the material shall be final and binding and any objection as to the classification shall be made before the excavation has been backfilled.

	Item	Unit
8.10.3	Extra over item 7.10.1 for excavating by hand in all materials	m^3

The unit of measurement shall be the cubic metre of trench material excavated by means of hand tools as instructed or authorised in writing by the Engineer where the use of conventional excavating equipment is either impractical or likely to cause damage to services, trees or property or where the electrical Contractor has to excavate by hand where he cannot excavate by machine.
The volumes of the trench excavation will be computed from the length and the depth to the bottom of the specified bedding layer and the minimum base widths specified in the drawings. The rate shall cover the cost of complying with the safety and protection requirements specified except where particular items are scheduled to cover particular costs for the excavation.
The tendered rate shall be paid extra over the rates tendered for item 5.10.1.1in full compensation for the additional expense of excavating by means of hand labour instead of conventional trenching equipment.

	Item	Unit
8.10.4	Extra over item 7.10.1 for using backfill material obtained from	
	(a) borrow areas	m
	(b) sources provided by the Contractor	m

The unit of measurement shall be the cubic metre of imported backfill material.
The tendered rate for item 7.10.4 (a) paid extra over item 7.10.1 and shall be in full compensation for the additional cost of excavating and selecting of suitable material and the moving of the material to the backfilling site.
Item 8.10.4 (a) and item 8.10.4 (b) above will not be measured for payment unless importation has been ordered in writing. The volume will be computed from the trench width and the depth from ground level to the top of the sand bed cover as shown on the tender drawings. The rate for material from designated borrow pits shall cover the cost of excavation and selection of suitable material, the moving of the material to the backfilling site, and the disposal of the material that becomes surplus as a result of the importation, all within 0,5 km.
The tendered rate for item 3.10.4 (b) paid extra over item 5.10.1.1 shall cover the cost of the acquisition of the material and of the disposal of the surplus material resulting from the importation together with all the costs of transporting the material to the site regardless of distance.

	Item	Unit
8.10.5	Backfill inverted culvert cable trench	m^3

The tendered rate shall be the cubic meter of cable trench backfilled.
The tendered rate shall include full compensation for importing and separating material suitable for backfilling, providing the bedding material, keeping the cable trench safe, dealing with any surface of subsurface water, measuring classification and keeping of all records.
The rate shall furthermore cover the cost of installing the sand bed and sand cover, backfilling and installing covers of the trench route. The covers will be provided by others.

	Item	Unit
8.10.6	Lay MV cable	m

The unit of measurement shall be the linear length in meter of MV cable installed.
The tendered rate shall include full compensation for the handling, inspection, laying, cutting and testing the cable. Cables will be measured linearly over all lengths laid. No extra will be allowed for jointing, overlaps and termination.

Item	Unit
8.10.7 Jointing and termination of MV cable	No

The unit of measurement shall be the number of MV cable joints or terminations.
The tendered rate shall include full compensation for the cost of providing the kits, complete with compound, ferrules and cable lugs, the cost of cutting the cable, handling and fitting the kits and the cost of testing the joints and terminations.

Item	Unit
8.10.8 Lay LV cable	m

The unit of measurement shall be the linear length in meter of LV cable installed.
The tendered rate shall include full compensation for the handling, inspecting, laying, cutting and testing the cable. Cables shall be measured linearly over all lengths laid. Separate items shall be scheduled for each size and each type of cable laid.

Item	Unit
8.10.9 Install LV and MV cable on cable ladder	m

The unit of measurement shall be the length of LV and MV cable installed on cable ladder.
The tendered rate shall include full compensation for the handling, inspection, laying, cutting and testing the cable. Cables shall be measured linearly over all lengths laid. Separate items shall be scheduled for each size and each type of cable laid.

Item	Unit
8.10.10 Termination of LV cables	No

The unit of measurement shall be the number of LV cable terminations.
The tendered rate shall include full compensation for providing the cable glands and shrouds, the cost of handling, fitting and cutting the cable. Separate items shall be scheduled for each size and type of cable.

Item	Unit
8.10.11 Jointing of low voltage cable	No

The unit of measurement shall be the number of LV cables joints.
The tendered rate shall include full compensation for the cost of providing the kits, the cost of cutting the cable, handling and fitting the kits and the cost of testing the joints.

Item	Unit
8.10.12 Supply earth continuity conductor	m

The unit of measurement shall be the length in meter of earth continuity conductor supplied.
The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

Item	Unit
8.10.13 Lay earth continuity conductor	m

The unit of measurement shall be the length in meter of earth continuity conductor installed.
The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

Item	Unit

8.10.14

Terminate and connect earth continuity conductor — No

The unit of measurement shall be the number of earth continuity conductors terminated and connected.

The tendered rate shall include full compensation for supplying all the material required to terminate and connect the earth continuity conductors and the connecting thereof to the earth bars.

Item	Unit
8.10.15 Supply plastic warning tape	m

The unit of measurement shall be the length in meter of plastic warning tape supplied.
The tendered rate shall include full compensation for the supplying, handling and laying the plastic warning tape.

Item	Unit
8.10.16 Lay plastic warning tape	m

The unit of measurement shall be the length in meter of plastic warning tape installed.
The tendered rate shall include full compensation for the supplying, handling and laying the plastic warning tape.

Item	Unit
8.10.17 Cable record drawings	Sum

The unit of measurement shall be the sum.
The tendered rate shall cover the cost of preparing and furnishing the drawings as specified in sub-clause "Information regarding the completed network".

Item	Unit
8.10.18 Supply and construct plinths for the distribution or junction kiosks	No

The unit of measurement shall be the number of plinths supplied and constructed.
The tendered rate shall include full compensation for the supply and delivery of all material required for the plinth, the excavation of the foundation for the plinth and the construction of the plinth.

Item	Unit
8.10.19 Install distribution or junction kiosks	No

The unit of measurement shall be the number of distribution or junction kiosks installed.
The tendered rate shall include full compensation for the installing and fastening of the distribution or junction kiosk on the plinth and the casting of a 50 mm floor at the bottom of the plinth.

Item	Unit
8.10.20 Substation building accessories	Sum

The unit of measurement shall be the sum.
The tendered rate shall include full compensation for the supply and installing of the substation building accessories specified in the detailed specification.

Item	Unit
8.10.21 Removal of existing medium voltage cable from existing switchgear	No

The unit of measurement shall be the number of existing MV cable removed from existing switchgear.
The tendered rate shall include full compensation for the disconnection and removal of existing medium voltage cables from existing switchgear.

Item		Unit
8.10.22	Supply cable markers	No

The unit of measurement shall be the number of cable markers supplied.
The tendered rate shall include full compensation for the provision of the cable markers and the cost of handling and installing them.

Item		Unit
8.10.23	Erect cable markers	No

The unit of measurement shall be the number of cable markers installed.
The tendered rate shall include full compensation for the provision of the cable markers and the cost of handling and installing them.

Item		Unit
8.10.24	Supply cable slabs	No

The unit of measurement shall be the number of cable slabs supplied.
The tendered rate shall include full compensation for the supplying, handling and installing of the concrete protective slabs where specified.

Item		Unit
8.10.25	Install cable slabs	No

The unit of measurement shall be the number of cable slabs installed.
The tendered rate shall include full compensation for the supplying, handling and installing of the concrete protective slabs where specified.

Item		Unit
8.10.26	Expose, cut and relocate existing cable	Sum

The unit of measurement shall be the sum to expose, cut and relocate existing cable.
The tendered sum shall include full compensation to expose the length of cable as specified in the detail specification by hand, taking all the necessary precautions not to damage the cable, cutting the cable and relocating the cable into the existing substation.

Item		Unit
8.10.27	Install LV cable in protective sleeve pipes	m

The unit of measurement shall be the length in meter of LV cable installed in sleeve pipes.
The tendered rate shall include full compensation for the installation of LV cable in protective sleeve pipes.

SECTION 9

STD SPEC: SUPPLY AND INSTALLATION OF CABLE SLEEVE PIPES

CONTENTS

9.1 GENERAL

The pipes shall be reinforced concrete, asbestos cement, polyethylene, or alternative pipe complying with this specification.
The pipes shall be 4,25 metres in length with a minimum wall thickness of 5 mm and mass not exceeding 45 kg per pipe length.

9.2 BORE AND JOINTING

The nominal inside diameter of the pipes shall be between 96 and 115 mm with a tolerance of 5 mm from the specified nominal diameter. The bore shall be accurate, smooth and without surface cracks and the inside edges shall be edged or rounded.
The edging or rounding shall be such that no ridge is formed when two pipes are joined and with the edges of the jointed pipes up to 5 mm apart.
A suitable slip collar or other simple device to maintain the 5 mm spacing after the installation of the sleeves, shall be provided.
The joints shall be flexible enough and have enough play to allow for a 5° adjustment in adjacent pipe lengths during installation or in the case of subsequent subsidence of the ground.
The joints need not be watertight but shall stop sand and other materials entering the sleeves.

9.3 STANDARD TESTS

All pipes shall withstand a shock test conforming to the requirements of BS 3505.
All pipes shall furthermore pass the break resistance test specified hereafter and the contractor shall submit a test certificate of a test carried out on a sample.
The electricity department reserves the right to request that the tests be repeated in the presence of their representative.
The testload shall gradually be applied near the centre and perpendicular to the pipe by means of two wooden blocks, each with a V-shaped edge lined with a 6 mm layer of felt.
The bottom block shall be 600 mm long and the block on top of the pipe shall be 300 mm long and positioned in the centre of the bottom block.
The sleeve pipe shall withstand a load of 8 kN per one minute without cracking while the vertical sag shall not exceed 25 mm.

9.4 PIPE POSITIONS

The positions of the pipes will be indicated on the drawings. The pipes must be installed strictly in accordance with the drawings to facilitate future location of the pipes.

9.5 SPACING

The distance between pipes shall be not less than 50 mm where more than one pipe is installed.
Pipes shall be installed in two staggered layers with a minimum distance of not less than 50 mm between pipes where more than six pipes are specified for a crossing.

9.6 PIPE LENGTHS

The pipes shall be extended 1,5 m on either side of the tarmac or other road surface.

9.7 DEPTHS

The pipes shall be installed at a depth of not less than 1 m below the top of the kerb. Where other services are to be crossed within one meter from the pipe end and the specified clearance between services cannot be maintained, the pipes shall be installed at a depth to allow crossing underneath the other service maintaining the minimum specified clearance and without the bending of the cables.
The minimum clearance between electric cables and other services shall be as follows:

Post Office cables	:	0,30 m
Water pipes	:	1.00 m
Other pipes	:	0,30 m
Sewage pipes	:	0,30 m
Storm water pipes	:	0,30 m
Other electric cables	:	0,15 m

9.8 METHOD OF LAYING

The papers shall be bedded on to a 50 mm layer of sifted sand. A 50 mm sand cover shall be backfilled over the pipes and thoroughly compacted.
The pipes shall be laid straight without kinks.
Joints shall be carried out with suitable couplings to prevent movement between pipe ends.
After installation all foreign matter in the pipe shall be cleared with a mandrill.
A 2,5 mm diameter galvanized steel wire extending 1 m on either side of the pipe crossing shall be installed in every pipe.
The pipes shall be sealed with PVC plugs to prevent the entry of sand before backfilling.
The necessary precautions during further construction activities shall be made to prevent damage to the pipes.
Where pipes are installed during the road construction, the pipe positions shall be marked with the letter "E" cut or casted into the concrete of the kerb.

9.9 INSPECTION

The contractor shall arrange with the Engineer to inspect the cable sleeves after the sleeves have been installed and before the trench is backfilled.

9.10 MEASUREMENT AND PAYMENT

	Item	Unit
9.10.1	Supply and install cable sleeves	m

The unit of measurement shall be the linear length in metre of cable sleeves supplied and installed.
The tendered rate shall include full compensation for the supply, delivery, handling and installing the cable sleeves including all the required couplings, steel draw wires and plugs.

SECTION 10

STD SPEC: LOW VOLTAGE PVC INSULATED POWER CABLES

CONTENTS

10.1 SCOPE

This specification covers the supply of 600 / 1000 V PVC insulated power and control cables. All cables shall be rated 600 / 1000 V.

10.2 STANDARD

Cables shall be manufactured strictly in accordance with the requirements of the latest edition of SANS 1507.

10.3 CONDUCTORS

Conductors shall consist of untinned annealed copper wires in accordance with the latest edition of SANS 1411 : Part I.

10.4 INSULATION

The insulating material shall comprise of PVC in accordance with the latest edition of SANS 1411 : Part II.

10.5 BEDDING

The bedding shall consist of a continuous PVC extruded sheath.

10.6 ARMOURING

The armouring shall consist of one layer of round galvanised steel wire complying with the requirements of the latest edition of SANS 1411: Part VI.

10.7 SERVING

An impermeable PVC outer sheath complying with the latest edition of SANS 1411 : Part II shall be provided.

10.8 MARKING

As per the requirements of the latest edition of SANS 1507. The number of cores and cross-sectional area shall be included in the marking.

10.9 TESTS

All routine tests as prescribed by the latest edition of SANS 1507 shall be carried out and test certificates shall be submitted in duplicate for each cable drum delivered to site.

10.10 CABLE DRUMS

The cable drums shall be capable of taking a round spindle and be lagged with strong, closely fitted battens, at the inner and outer circumference so as to prevent damage to the cables. The spindle bearing plates shall be steel. The dimensions of the drum shall not exceed 1 100 mm width, 2 000 mm diameter and the spindle bearing plate shall not be less than 9 mm thick. Each drum shall be clearly marked on both sides in accordance with the latest edition of SANS 1507.

The ends of the PVC sheathed cable shall be sealed to avoid penetration of moisture. Each cable drum shall be numbered.
The end protruding from the drum shall be protected against mechanical damage.

10.11 MEASUREMENT AND PAYMENT

	Item	Unit
10.11.1	Supply and delivery of low-voltage cable	m

The unit of measurement shall be the length of low-voltage cable supplied.
The tendered rate shall include full compensation for the manufacture, supply and delivery of the specified cable to the site.
Separate items shall be scheduled under this payment item for each size and type of cable required.

SECTION 11

STD SPEC: DB AND METERBOARDS

CONTENTS

11.1 STANDARDS

The latest edition of the following specifications and Codes of Practice shall be read in conjunction with the section:

SABS 152	:	Low voltage air-break switches, air-break disconnectors, air-break switch-disconnectors and fuse combination units
SANS 156	:	Moulded-case circuit-breakers
SABS 171	:	Surge arrestors for low voltage distribution systems
SABS 172	:	Cartridge type fuse-links for low voltage electric fuses
SABS 173	:	Fuse-link holders for cartridge type fuse-links
SANS 767	:	Earth leakage protection unit
SABS 783	:	Baking enamels
SABS 1092	:	Contactors
SABS 1180	:	Type for small installations
BS 88	:	Specification of supplementary requirements for fuses of compact dimensions for use in 240 / 415 V industrial and commercial electric installations
BS 387	:	Specification for miniature and moulded case circuit breakers
BS 5419	:	Specification for air-break switches, air-break disconnectors, air-break switch disconnectors and fuse combination units for voltages up to and including 1000 volt a.c. or 1200 volt d.c.
IEC 157	:	Low voltage switchgear and control gear
IEC 408	:	Low voltage air-break switches, air-break disconnectors, air-break switch disconnectors and fuse combination units
VDE 0660	:	Regulations for low voltage power fuses (NH fuses) with rated voltages up to 1000 volt a.c. and 3000 volt d.c.

11.2 GENERAL

11.2.1 The design and construction of the Distribution Board shall comply with IEC 439-1.

11.2.2 All distribution boards shall be of adequate size to accommodate specified equipment and a minimum of 30% spare capacity shall be allowed for future equipment unless specifically stated in the detail specification.

11.3 CONSTRUCTION

11.3.1 Recessed and semi-recessed distribution boards

Distribution boards shall consist of the following parts:
The bonding tray shall be constructed from 1,60 mm corrosion resistant mild sheet steel. Bracing gussets with cam-shaped slots shall be welded on the four corners. Knock-outs shall be provided in the upper and lower sides of the distribution boards. Expanded metal shall be spot-welded to the back of all bonding trays for 102,5mm thick walls.
The architrave frame shall be constructed from 1,20mm sheet steel with square edges. The architrave frame shall form 25mm border around bonding tray and shall be fixed to the tray in such a manner as to allow for adjustment for the inequalities in wall the finish.
A minimum of 75mm shall be allowed between the inside of the architrave frame and the equipment.

Distribution board numbers consisting of white engraved lettering on a black background shall be fixed to the top of the architrave frame.
Doors shall be constructed from 1,20mm sheet steel, reinforced to ensure rigidity. Doors shall be mounted flush in architrave frames. Door catches shall be constructed of chromium-plated brass and shall be mounted flush in the door. Built-in locks shall be provided when specified in the distribution board schedule.
The chassis shall be fixed to the architrave frame. The chassis shall be reinforced, with the necessary provision for fixing of the switchgear. A distance of 75mm shall be allowed between rows of equipment.
Panels shall be rigidly constructed from 1,6mm sheet steel with machine-cut openings for flush mounted equipment. Panels shall be fixed to the architrave frame on studs with chromium plated hexagon dome headed nuts, or captive fasteners such as "DZUS" or "CAMLOC" such that a clearance of 40 mm is maintained between panels and doors. Chromium-plated handles shall be supplied to facilitate removal of panels.
Busbars shall be of tinned HDHC solid copper with adequate cross-section and shall only be supplied if called for in the Schedules (part 5). Busbars are to be mounted on suitable isolators and shall be drilled and tapped.
Each distribution board shall be supplied with copper neutral and earth bars. Adequate terminals shall be provided.
Each busbar must be supplied with one larger terminal for the feeder cable.
Wiring shall be by means of PVC insulated conductors with sizes to suit the relevant switchgear.
The ends of wires shall be provided with suitable lugs, firmly crimped or soldered for connection to busbars.
Wiring shall, where possible, be carried out in front of the chassis and shall be neatly bound in horizontal and vertical rows by means of approved plastic cable ties. Wiring shall be kept free of any current carrying parts.
Ends of wires which are connected to the clamps of miniature circuit breakers, shall be turned together firmly before insertion into terminals.
Finish: Welding joints and steelwork shall be ground smooth and free from blemishes.
Metal components of the framework, panels and chassis, shall be painted in accordance with the procedure detailed below. Baked enamel or electrostatically applied powder coating may be used.

11.3.2 Surface preparation

Prior to painting, all metal parts shall be thoroughly cleaned of rust, mill scale, grease and foreign matter to a continuous metallic finish. Sand or shot blasting, or acid pickling and washing may be employed for this purpose.

11.3.3 Baked enamel finish

Immediately after cleaning all surfaces shall be covered by a rust inhibiting, tough, unbroken metal phosphate film and then thoroughly dried to SABS 064. Within forty eight (48) hours after phosphating, a passivating layer consisting of a high quality zinc chromate primer shall be applied, followed by two (2) coats of high quality baked enamel to SABS 783 type 1. The minimum paint thickness after baking shall be 0,6mm. The paint shall have a shock resistance of 25 kg-cm on 0,9mm soft steel plate and a scratch resistance of 2 kg.

11.3.4 Powder coated finish

Immediately after cleaning the metal parts shall be pre-heated and then covered by a micro structured paint powder applied electrostatically. The paint shall be baked on and shall harden within 10 minutes at a temperature of 190^{O}C. The minimum paint thickness after baking shall be 0,05 m and the paint cover shall have a shock resistance of 25 kg-cm on 0,9 mm soft steel plate and a scratch resistance of 2 kg.

11.3.5 Surface mounted distribution boards

Surface mounted distribution boards shall comply with SABS 1180 and shall be similar to the specification for flush mounted boards, except that the architrave frames and bonding trays are not required. In this case a box shall be supplied manufactured from 1,60 mm corrosion resistant sheet steel with knock-outs at the top and bottom for conduit entry. The board shall have a 25 mm wide frame around the flush mounted door, if required.

11.4 ELECTRICAL EQUIPMENT

a) Isolator

Moulded case isolators shall be of the ON-LOAD type similar and equal to "ABB".
Heavy duty metalclad isolators must be similar and equal to "MEM" or "SIEMENS". Toggles shall be interlocked with the covers. All isolators shall comply with SABS 152.

To distinguish the switches from circuit breakers the operating handles of isolators shall have a distinctive colour and where called for in the "detail specification" the switch shall be clearly and indelibly labelled "ISOLATOR".

b) Moulded case air circuit-breakers (MCB)

This section covers single or multi-pole moulded case circuit-breakers for use in power distribution systems, suitable for panel mounting, for ratings up to 2000A, 600V, 50 Hz a.c.
The overload protection and time lag settings for large frame multi-pole MCB's shall be either adjustable or non-adjustable as specified in the "detail specification".
All miniature or small frame circuit-breakers shall be of the free-handle type for panel mounting with time lag and non-adjustable overload protection. The silver alloy contacts, quick acting mechanism, heavy brass terminals and magnetic trip unit shall be housed in black fenolic moulded case. Circuit breakers shall be continuously rated at 1,5 x trip current with a fault capacity as specified in the "detail specification" but of not less than 5000A.
All MCB's shall comply with SANS 156 and shall be similar and equal to "ABB" or "Schneider" manufacture.

c) Metal clad air circuit-breakers, withdrawable type

This section covers withdrawable air circuit-breakers for use in power distribution system up to 1 kV, 50 Hz.
The circuit-breakers shall be metal clad and shall comply with BS 3871 and IEC 157.
The circuit-breakers shall be withdrawable and shall be a self-contained unit of the dead front type, with the necessary mechanical interlocks to prevent:

- Access to "LIVE" terminals when the circuit-breaker is withdrawn.

The withdrawal or insertion of the unit, when the circuit-breaker is in the closed position.
Closing of the circuit-breaker following an automatic trip condition without re-setting the mechanism.
Adjustable thermal overload releases shall be provided to suit the required current range. In addition instantaneous magnetic short circuit trips which are adjustable shall be fitted. This delay adjustment shall be bypassed with an instantaneous making current release when the circuit-breaker is closed to prevent the delay timer from operating when the circuit-breaker is closed on a fault.

- The air circuit-breakers shall be of the quick-make and quick-break type with a stored-energy spring assisted operating mechanism provided with:
    - a trip free mechanical hand operated closing mechanism;
    - a manually operated mechanical trip mechanism suitably protected to prevent inadvertent tripping;
    - A positively driven mechanical device to provide (ON/OFF/TRIP indication). This indication shall be clearly visible with the circuit-breaker in position.

Provision shall exist for the addition, if required, of a supply-side undervoltage release.
Air circuit-breakers shall have electrically separate auxiliary contacts as specified. Where none is specified two N/O and two N/C auxiliary contacts shall be provided.
Shunt trips and electrical stored energy circuit-breakers shall be interlocked to prevent repeated operation of the trips or winding mechanisms when the circuit-breaker is in the tripped or closed position.
All non-current carrying metal parts of air circuit-breakers shall be solidly interconnected and connected to an earth contact on the truck which shall engage with a mating contact or copper plate on the cradle which is connected to the earth busbar of the switchboard. The arrangement shall be such that the air circuit-breaker frame is earthed in the test position and before the circuit-breaker contacts engage the live fixed contacts.
The fixed cradle shall be of high mechanical strength.
The air circuit-breaker shall have RACKED-OUT, TEST and ENGAGED positions which shall be clearly marked.
The air circuit-breaker shall bear a clearly legible rating plate indicating the current rating, breaking capacity and voltage rating.
Extension type operating handles shall be fixed to the air circuit-breaker on completion of the installation.
A description and illustration of the circuit-breaker as well as trip curves, operating manuals and rupturing test certificates shall be provided.
Circuit-breakers shall be derated if necessary to compensate for the following environmental factors:

- Maximum ambient air temperature in excess of 40^{O}C or the daily average ambient air temperature in excess of 30 ^{O}C. This is especially important with regard to the type of enclosure in which the circuit-breaker is to be installed.
- Height above sea level.
- Operational duty cycle and estimated loading.

Metal clad air circuit-breakers, withdrawable type, shall be similar and equal to “ABB” or "Schneider" manufacture.

d) Fuse switches

Fuse switches shall be of heavy and rigid construction suitable for flush mounting behind a panel. Contacts shall be brass with adequate cross section and positive contact pressure. The fuses must be carried on a rigid frame and shall be fixed by means of bolts and nuts. The switch mechanism shall be of the quick-acting spring-assisted type. Fuse switches shall be similar and equal to “ENGLISH ELECTRIC FRONTIER", Stanley Electrical "QUADBREAK" or ATW "STRÖMBERG".
The fuse switch shall have a hand operated lever with clearly marked "ON" and "OFF" positions. The nominal rating, voltage and allowable fuse ratings shall be clearly and indelibly marked on the cover. Interlocks shall be provided to prevent the cover from being opened when the circuit is closed.
Light duty fuse switches (up to 200A) and heavy duty fuse switches (up to 1200A) shall comply with BS 5419.

e) Fuses

All fuses shall be of the standard cartridge type, non-aging with a high rupturing capacity (HRC) and shall be similar and equal to English Electric type "T".
All fuses used for distribution systems shall conform to the following standards:
Fuses : BS 88, parts 1 and 2 and SABS 172.
Holders : SABS 173 as revised.
Fuses of the types described above and conforming to the relevant DIN (49510, 49511, 49522, 49360, 49367) and VDE (0635, 0660) standards are also acceptable.

f) Types

The following fuses and fuse holder types are acceptable for use in distribution and power systems:
A cartridge type fuse-link, fitting into a fuse carrier, together with a fuse base with fixed terminals. The fuse can be removed by taking out the fuse carrier and then removing the fuse from the carrier.
Rewirable fuses are not acceptable and shall not be used.
Fuses shall be equipped with moulded plastic covers or rigid isolating barriers shall be installed between the fuses. Sufficient spacing to prevent accidental contact when inserting or withdrawing fuses shall be maintained. The covers or barriers shall be manufactured for the specific fuses to be used.
Fuses and holders shall not contain any parts than can wear unduly or distort.

g) Ratings

Fuse ratings shall be accurate to within ±5% of the published value for unused fuses and shall not vary significantly after long periods of service.

Fuses shall be derated for ambient temperatures above 25^{o}C in accordance with the Supplier's recommendation. If no such recommendation exists, a derating factor of 1%/$^{\circ}$C above 25°C shall be applied.
Fuses shall be derated for elevations of more than 1000m above sea level in accordance with the Supplier's recommendation. If no such recommendation exists, a derating factor of 1%/300 m above 1000 m above sea level shall be applied.

h) Lightning arresters

Lightning arresters shall be similar and equal to "METRO" and shall comply with SABS 171. Lightning arresters are to be installed close to the earth electrode and connected to it by means of copper tape following the shortest possible route.

i) Time-switches

Time-switches shall be of the synchronous type with 24 hour cycle and spring reserve with a transfer period of at least 24 hours. A suitable 24 hour day and night astronomic dial shall be supplied with one "ON" and one "OFF" lever and with a minimum period between settings of 15 minutes. Contacts shall be of silver alloy with continuous rating of 20A. Time-switches shall be mounted in dust-proof enclosures with lockable covers. Time-switches shall be similar and equal to "SANGAMO WESTON" model S354 Form 1.

j) Earth leakage relays

This section covers single and three-phase earth leakage relays with a sensitivity of 30mA, with associated circuit-breaker.
The earth leakage relay shall conform to SANS 767 as amended and shall be similar and equal to "ABB" manufacture.
On load switches used integrally with earth leakage units shall comply with BS 5419.

k) Contactors

Contactors shall comply with the requirements of SABS 1092 and shall satisfactorily withstand the thermal and dynamic effects arising from the magnitude and duration of through fault currents dictated by the characteristics of the associated protective devices.
Contactors shall be triple-pole electromechanically operated air-break type, held in or latched pattern as specified.
Contactors shall be classified as utilization category AC3 uninterrupted duty for motor starting and as utilization category AC1 intermittent duty, Class 1, 60% for heater duty.
Contactors shall be fitted with the required auxiliary contacts as indicated on the circuit diagrams. These shall be rated at not less than 10 A and shall be positively driven in both directions.

11.5 LABELLING

Care shall be taken to ensure that all equipment is fully labeled and accurate descriptions appear in one or both of the official languages.

- Labels shall consist of either -
  - Engraved sandwich board ("Traffolyte", "Darvic" or equal).
  - Reverse engraved acrylic material ("Perspex") with filled letters and reverse sprayed.
  - Labels shall be rectangular in form with proportions appropriate to the wording, and shall have true, parallel, lightly bevelled edges and shall be neatly and squarely fixed.

Engraving shall be of uniform height, character and line width.
The type of material or process shall be such as to finish with black letters against a white background, except in the case of cautionary labels where the letters shall appear white on a red background.
For outdoor applications (where specified) labels shall be brass or aluminium (with letters filled in black), lightly sanded with fine grit paper and clear lacquered.
All lettering shall be in upper-case letters except where standard abbreviations of units are used, eg. kWh, kVA, etc.
The material used shall be selected having regard to the size and fixing methods of the label and the label shall not warp in service.
Labels shall be fixed by the use of either -

a) Self-tapping screws

Metal-thread screws and nuts.
These shall be nickel plated in either case and adequate clearance shall be allowed around lettering to accommodate these. Adhesive fixing alone will not be accepted. Extruded aluminium section is preferred, provided the label is firmly held.
All terminal strips shall be labelled in conformity with the associated circuit and connecting diagrams.
Labels shall contain the following minimum information:

b) The equipment name in both Afrikaans and English.

The equipment plant reference number (tag no).
Main switchboards shall have a main designation label prominently displayed on the outside of the switchboard. The lettering shall be 10mm high. Distribution boards shall be identified by means of a label fixed to the architrave frame or doors. The lettering shall be 10 mm high.
Flush equipment within doors or front panels shall be identified with labels fixed to the doors or front panels. The labels for equipment installed behind panels shall be fixed to the chassis close to the equipment. Where the positioning of equipment is such that descriptive labels cannot be accommodated or where the equipment is identified by means of labels containing circuit numbers, the abbreviations and/or circuit numbers shall be identified on a legend card. Where blanked off slots are provided for future equipment, these spaces shall be labelled in accordance with the circuit numbers and/or the code used for existing circuits on the switchboard and shall not bear the inscription "SPARE". The

codes for spare circuits shall be identified as "SPARE" on the legend card. The legend card shall be of A5 size acrylic plastic panels and shall be installed on the inside of the switchboard door or in any other prominent position.
All information contained on the legend card shall be typed in black. Hand written descriptions shall not be accepted.
All labels identifying equipment shall have 5mm high lettering.

11.6 DRAWINGS

Three copies of the following drawings shall be submitted for approval prior to the manufacturing of the distribution boards:

- Dimensions outline drawings of the distribution boards; and
- Typical layout of the equipment in the distribution boards.

11.7 INSTALLATION

The distribution boards shall be installed in the positions indicated on the drawings and at the heights specified in the detail specification.

11.8 MEASUREMENT AND PAYMENT

	Item	Unit
11.8.1	Supply and deliver distribution boards	No

The unit of measurement shall be the number of distribution boards supplied and installed. The tendered rate shall include full compensation for the supply and delivery of the distribution board as specified in the detail specification complete with all the electrical equipment specified.

	Item	Unit
11.8.2	Install, test and commission the distribution boards	No

The unit of measurement shall be the number of distribution boards installed, tested and commissioned. The tendered rate shall include full compensation for the installing, testing and commissioning of the distribution boards complete with all the specified electrical equipment in the distribution board. The tendered rate shall furthermore include for the wiring of the distribution board.

	Item	Unit
11.8.3	Supply and deliver isolators	No

The unit of measurement shall be the number of isolators supplied and delivered.
The tendered rate shall include full compensation for the supply and delivery of the isolators where the isolators are specified separately.

	Item	Unit
11.8.4	Install isolators	No

The unit of measurement shall be the number of isolators installed.
The tendered rate shall include full compensation for the installing of the isolators where the isolators are specified separately.

	Item	Unit
11.8.5	Supply and deliver circuit breakers	No

The unit of measurement shall be the number of circuit breakers supplied and delivered.
The tendered rate shall include full compensation for the supply and delivery of the circuit breakers where the circuit breakers are specified separately.

	Item	Unit
11.8.6		

Install circuit breakers — No

The unit of measurement shall be the number of circuit breakers installed.
The tendered rate shall include full compensation for the installing of the circuit breakers where the circuit breakers are specified separately.

Item		Unit
11.8.7	Supply and deliver fuse switches	No

The unit of measurement shall be the number of fuse switches supplied and delivered.
The tendered rate shall include full compensation for the supply and delivery of the fuse switches where the fuse switches are specified separately.

Item		Unit
11.8.8	Install fuse switches	No

The unit of measurement shall be the number of fuse switches installed.
The tendered rate shall include full compensation for the installing of the fuse switches where the fuse switches are specified separately.

Item		Unit
11.8.9	Supply and deliver earth leakage units	No

The unit of measurement shall be the number of earth leakage units supplied and delivered.
The tendered rate shall include full compensation for the supply and delivery of the circuit breaker earth leakage units where the earth leakage units are specified separately. (30mA)

Item		Unit
11.8.10	Install earth leakage units	No

The unit of measurement shall be the number of earth leakage units installed.
The tendered rate shall include full compensation for the installing of the circuit breaker earth leakage units where the earth leakage units are specified separately. (30 mA)

Item		Unit
11.8.11	Supply and deliver contactors	No

The unit of measurement shall be the number of contactors supplied and delivered.
The tendered rate shall include full compensation for the supply and delivery of the contactors where the contactors are specified separately.

Item		Unit
11.8.12	Install contactors	No

The unit of measurement shall be the number of contactors installed.
The tendered rate shall include full compensation for the installing of the contactors where the contactors are specified separately.

SECTION 12

STD SPEC: WIREWAYS, FLOOR DUCTING AND BUSBAR TRUNKING

CONTENTS

12.1 SCOPE

This section covers the supply and installation of conduit, trunking- and power skirting- wireways and accessories, floor ducting and busbar trunking.

12.2 STANDARDS

The latest edition of the following particular specifications and Codes of Practice shall be read in conjunction with this section:

SANS 0142-1	:	The wiring of premises
SANS 121:2000	:	Hot dip galvanized coatings on fabricated iron and steel articles
SANS 1195	:	Busbars
SANS 950	:	Unplasticized polyvinyl chloride rigid conduit and fittings for use in electrical installations
SANS 606142-2-1	:	Specification for conduits for electrical installations
SANS 1085	:	Wall outlet boxes for the enclosure of electrical accessories
BS 159	:	Busbars and busbar connections
BS 731	:	Flexible steel conduits for cable protection and flexible steel tubing to enclose flexible drives
BS 1433	:	Specification for copper for electrical purposes - Rod and bar
IEC 439	:	Low voltage switchgear and controlgear assemblies

12.3 CONDUIT

12.3.1 General

This specification covers the supply and installation of conduits and allows for the following types of conduit installations:

- Screwed metallic conduit - black enamelled and galvanised
- Plain-end metallic conduit - black enamelled and galvanised
- Non-metallic PVC conduit
- Flexible metallic and non-metallic conduit.

12.3.2 Materials

a) Screwed metallic conduit and accessories

Screwed metallic conduits shall comply with SANS 606142-2-1 and shall bear the SABS mark. Screwed metallic conduits shall comprise of a heavy gauge, welded or solid drawn, black enamelled or hot-dipped galvanised, screwed steel tube. Galvanised conduits shall be hot-dipped on both the inside and outside thereof, in accordance with SANS 121:2000:1999.

All conduit ends shall be reamed and threaded on both sides and shall be delivered to site with a steel coupling fitted at one end and a plastic screw on cap on the opposite end.

All screwed metallic conduit accessories shall be of malleable cast iron or pressed steel with brass bushes and all accessories shall be in accordance with SANS 606142-2-1 Part II. No alloy or pressure cast metal accessories or zinc base alloy fittings will be accepted.

All accessories whether galvanised or black enamelled shall be supplied with brass screws.

Locknuts are to be of the narrow, hexagonal type. Ring type lock nuts shall not be accepted except when used in round grouping boxes.

Bushnuts and male or female conduit bushes shall be manufactured from solid brass. Brassed alloy bushnuts and bushes shall not be accepted.

b) Plain-end metallic conduit and accessories

As an alternative to threaded metallic conduit, plain-end or unthreaded metallic conduit and accessories may be used.
Plain-end conduit shall be manufactured from mild steel having a minimum wall thickness of 0,9 mm and shall comply with SANS 606142-2-1.
Bending and setting of plain-end conduit shall be undertaken using the correct bending apparatus as recommended by the manufacturer of the conduit.
Galvanised conduits shall be hot-dipped on both the internal and external surfaces, in accordance with SANS 121:2000:1999.
All plain-end metallic conduit accessories shall be of malleable cast iron or pressed steel and shall comply to SANS 606142-2-1.

c) PVC conduit and accessories

PVC conduit shall comply with SANS 950 and shall bear the SABS mark.
PVC conduit shall be constructed from rigid PVC and shall be supplied in standard 4 metre lengths. PVC conduit shall be white in colour and shall be non-inflammable. The minimum softening temperature shall be at 75°C.
All PVC conduit accessories shall be fully in accordance with SANS 950 and shall bear the SABS mark.

d) Flexible conduit

Flexible steel conduit and adaptors shall comply with BS 731, part 1 where applicable. Flexible steel conduit shall be of a galvanised steel construction which is not required to be waterproof, but shall be verminproof and suitable for protection of cables against mechanical damage.
In moist or damp areas flexible steel conduit shall be of the plastic sheathed galvanised steel type.
Flexible polypropylene tubing shall only be fastened to PVC conduit installations.

e) Earth clamps

Earth clamps shall comprise of copper strips having a minimum thickness of 1 mm and shall not be less than 12 mm wide. Earth clamps shall be provided complete with a 25 mm x 4 mm brass bolt, washer and nut and shall be constructed so that the clip can be firmly attached to the conduit without the need for any additional packing.

f) Flush mounted steel wall boxes

Flush mounted steel wall boxes shall be manufactured from heavy gauge sheet steel and shall be galvanised. All wall boxes shall comply with SANS 1085.
The boxes shall be provided with the necessary mounting lugs to suite the units for which the box is intended. Mounting highs shall be drilled and tapped at 82,5mm centres suitable for fastening either flush mounted switch and socket outlet units. All fastening screws shall be provided with the box.
Single gang wall boxes shall be approximately 500mm wide by 100mm long by 50mm deep, with one knock-out at each end and at the back, and with two knock-outs on each side thereof.
Double gang wall boxes shall be approximately 100mm wide by 100 mm long by 50mm deep, with two knock-outs on each end and with at least two knock-outs on the back, and on each side.
All knock-outs are to be suitable for making-off 20 mm diameter conduits.

g) Flush mounted PVC wall boxes

Flush mounted PVC wall boxes shall be manufactured from rigid PVC and shall be white in colour. All PVC wall boxes shall comply with SANS 950.
The boxes shall be provided with the necessary mounting lugs to suite the units for which the box is intended. Mounting lugs shall be drilled at 82,5mm centres and shall be provided with no 6 u.n.c. screw threads.
The boxes shall be of approximately the same physical dimensions as those specified in clause (f) above for steel wall boxes and shall have 20mm knock-outs.
Facilities shall be provided for the fixing of earth terminals to the box.

h) Round group-type steel boxes

The boxes shall be manufactured in accordance with SANS 606142-2-1 where applicable.
The boxes shall be of the long spout pattern and shall be constructed from either store enamelled jet black or galvanised steel, or from malleable cast iron. The two cover fixing holes shall be diagonally opposite each other, and shall be drilled and tapped at 50 mm centres.
The internal dimensions shall be approximately 60mm in diameter by 60mm deep for use in concrete work. Shallower boxes shall be used in open roof spaces.
Threaded spouts shall be suitable for 20 mm diameter conduit.
Round box covers shall be constructed from pressed enamelled or galvanised steel and shall be seared by using brass screws.

i) Round group-type PVC boxes.

The boxes shall be similar in shape to those specified in clause (viii) above and shall have spouts which are to be reinforced with webs.
The cover screw pillars shall be provided with tapped brass inserts and provision shall be made for a brass earthing terminal adjacent to one or both of the pillars.
PVC round box covers shall be of PVC and shall be secured by means of 2 cadmium plated or brass screws at 50mm centres.
The boxes shall be fully in accordance with SANS 950.

j) Draw wires

All draw wires for unused conduits shall comprise of galvanised steel wire having a minimum diameter of 2mm.

12.3.3 Installation

a) Screwed metallic conduit

In general screwed steel conduit shall be used in the wiring of buildings.
The installation shall conform to par 5.4 of SANS 0142-1.
All joints in conduit tubing shall be red leaded to prevent rust.
Galvanised conduit and accessories shall be used in the following circumstances and normally be electro-galvanised or cadmium plated:

(i) In damp areas.

(ii) In areas exposed to the weather.

(iii) For all installations within 50 km of the coast. (These conduits and accessories shall be hot-dip galvanised to SANS 121:2000:1999).

(iv) In plenum chambers containing humidifying equipment.

(v) For surface mounted conduit installations in kitchens and boiler rooms.

(vi) In screed resting directly on soil.

(vii) For connection points to future installations.

(viii) For underground conduit containing earthing conductors.

(ix) In buildings where animals are housed such as cattle, sheep, dogs, etc.

Screwed conduits shall be terminated by means of a brass female bush and two lock nuts in pressed steel switchboards and distribution boxes, cable ducts, power skirting, etc. The conduit end shall only project far enough through the hole to accommodate the bush and locknut.
A female bush and two lock nuts shall be used to terminate conduits at draw boxes and outlet boxes without spouts should there be sufficient room in the box. Where there is insufficient room, a coupling, brass male bush and locknut may be used with sufficient allowance for the reduction of the internal diameter by the male bush.
Mechanical and electrical continuity shall be maintained throughout the conduit installation. The resistance of a completed joint shall not exceed 0,2Ω.
Under no circumstances shall conduit be relied upon for earth continuity

b) Plain-end metallic conduit

Where specified plain-end conduit shall be installed. The following shall apply:
Bending and setting of plain-end conduit shall be done with special benders and apparatus manufactured for this purpose. Damaged conduit resulting from the use of incorrect bending apparatus shall be completely removed and rectified at the electrical contractor's expense.

c) PVC conduit

Where specified for a particular service, PVC conduit shall be installed.
All PVC conduit shall be installed in accordance with Appendix C, SANS 950.
Insulated heat-resistant boxes shall be used for outlets of totally enclosed luminaires and other fittings where excessive temperatures are likely to occur.
Luminaires and other fittings shall not be supported by PVC conduit of conduit boxes. These fittings shall be secured to the surrounding structure in an acceptable way.

d) Flexible conduit

In installations where the equipment has to be moved frequently to enable adjustment during normal operation, for the connection of motors or any other vibrating equipment, for the connection of thermostats and sensors on equipment, for stove connection and where otherwise required, flexible conduit shall be used for the final connection to the equipment.
Flexible conduit shall be connected to the remainder of the installation by means of a draw box. The flexible conduit may be connected directly to the end of a conduit if an existing draw box is available within 2m of the junction and if the flexible conduit can easily be rewired.
Flexible conduit shall consist of metal reinforced plastic conduit or PVC covered metal conduit with an internal diameter of at least 15mm, unless approved to the contrary. In false ceiling voids, flexible conduit of galvanised steel constructions may be used. Connectors for coupling to the flexible conduit shall be of the gland or screw-in type, manufactured from either brass or mild steel plated with zinc or cadmium.

e) Installation requirements

All accessories such as boxes for socket outlets, switches, lights, etc shall be accurately positioned. It is the responsibility of the electrical contractor to ensure that all accessories are installed level and square at the correct height from the floor, ceiling or roof level as specified. It shall be the responsibility of the electrical contractor to determine the correct final floor, ceiling and roof levels in conjunction with the principle contractor. Draw boxes shall not be installed in positions where they will be inaccessible after completion of the installation. Draw boxes shall be installed in inconspicuous positions to the approval of the engineer's representative and shall be indicated on the "as built" drawings.
Galvanised steel draw wires shall be installed in all unwired conduit, e.g. conduits for future extensions, telephone installations and other services.
The edge of flush mounted outlet boxes shall not be deeper than 10mm from the final surface. Spacer springs shall be used under screws where necessary.
Oversize cover plates shall be provided on all flush mounted round conduit boxes, where required. Surface mounted boxes shall be provided with standard size cover plate.

f) Installation in concrete

In order not to delay building operations, the electrical subcontractor shall ensure that all conduits and accessories which are to be cast in concrete are placed in position in good time. The electrical contractor or his representative shall be in attendance when the concrete is cast.
Draw boxes, expansion joints and round ceiling boxes shall be installed where required and shall be neatly finished to match the finished slab and wall surfaces. Ceiling draw boxes shall be of the deep type. In columns where flush mounted draw boxes are installed, the conduits shall be offset from the surface of the column immediately after leaving the draw box.
Elbows for conduits of 32mm dia and smaller and sharp bends will not be allowed in concrete slabs.
Draw boxes and/or inspection boxes shall, where possible, be grouped together under a common approved cover plate. The cover plate shall be secured by means of screws.
All conduits shall be installed as close as possible to the neutral axis of concrete beams, slabs and columns. The conduits shall be rigidly secured to the reinforcing to prevent movement towards the surface of the concrete.

All conduits, draw boxes etc, shall be securely fixed to the shuttering to prevent displacement when concrete is cast. Draw boxes and outlet boxes shall preferably be secured by means of a bolt and nut installed from the back of the box through the shuttering. Fixing lugs may also be used to screw the boxes to the shuttering where off-shutter finishes are required. Where fibre glass shuttering is used by the builder, the equipment shall be fixed to the steel only and no holes shall be drilled or made in shuttering. All draw boxes and outlet boxes shall be plugged with wet paper before they are secured to the shuttering.
As far as possible, conduits shall not be installed across expansion joints. Where this is unavoidable a conduit expansion joint shall be provided. The expansion joint shall consist of two draw boxes with an interlinking flexible conduit connection. The draw box shall be installed adjacent to the expansion joint of the structure and a conduit sleeve, one size larger than that specified for the circuit, shall be provided on the side of the draw box nearest to the joint. The one end of the sleeve shall terminate at the edge of the joint and the other shall be secured to the draw box. The circuit conduit passing through the sleeve shall be terminated 40 mm inside the draw box and in the case of metallic conduit, the conduit end shall be fitted with a brass bush. The gap between the sleeve and the conduit at the joint shall be sealed with "Pratley Tic-Tac" or equal sealing compound, to prevent the ingress of wet cement. In the case of metallic conduit, an earth clip shall be fitted to the conduit projection inside the draw box and the conduit bonded to the box by means of 2,5mm□ bare copper earth wire and a brass bolt and nut. The other end of the circuit conduit shall be secured to the draw box by means of lock nuts and a brass bush in the case of screwed metallic conduit or a standard bushed adaptor for other conduit types. In addition to an earth wire which may be specified for the circuit, a 2,5mm□ bare copper wire shall be provided between the first conduit box on either side of the joint in the case of metallic conduit. The conduit boxes shall be drilled and tapped and the earth wire shall be bonded to the boxes by means of lugs and brass screws. Suitable steel cover plates shall be screwed to draw boxes installed along the expansion joint. The cover plates shall be installed before the ceiling is painted. Where a number of conduits are installed in parallel they shall cross the expansion joint of the structure via a single draw box. A number of draw boxes adjacent to each other will not be allowed.
The installation of conduits in floor screed shall be kept to a minimum. Where conduits are installed in screed, the top of the conduit shall be at least 20mm below the surface of the screed. Where the screed is laid directly on the ground, galvanised conduits shall be used. A minimum distance of twice the outside diameter of the conduit shall be left free between adjoining conduits. Conduits shall be secured to the concrete slab at intervals not exceeding 2,0m. The electrical contractor shall ensure that conduits are not visible above the screed where the conduits leave the screed.
All draw boxes, conduits, etc, which are installed in concrete shall be cleaned with compressed air and provided with draw wires two days after removal of the shuttering. Errors that occurred during the installation of the conduits, or any lost draw boxes, or blocked conduits shall be immediately reported to the engineer by telephone and confirmed in writing in order that an alternative route can be planned and approved by the engineer before the additional concrete is cast.
Where it is necessary to cut or drill holes in the concrete structure, prior permission shall be obtained from the engineer in writing.

g) Installation in brickwork

Recessed conduits and accessories installed in brickwork shall be built-in. In order not to delay building operations the electrical contractor shall ensure that all conduits and accessories which are to be built-in are placed in position in good time.
Any conduits, draw boxes, outlet boxes etc, which have been damaged, lost or omitted shall immediately be reported to the engineer by telephone and confirmed in writing.

h) Surface installations and installations in roof spaces

All conduits shall be installed horizontally or vertically as determined by the route. The electrical contractor shall take all measures to ensure a neat installation.
Conduits shall be firmly secured by means of saddles and screws and in accordance with SANS 0142-1, par. 5.4.2(b).
Conduits shall be secured within 150 mm before and after each 90^{o} bend.
Only approved plugging materials such as fibre plugs or plastic plugs, etc, and round head brass screws shall be used when fixing saddles, switches, plugs etc, to walls. Wood plugs are not acceptable nor should plugs be installed in joints in brick walls.

i) Chasing and builder's work

Except where otherwise specified the builder or principle contractor shall be responsible for building in of conduits, outlet boxes, switchboard trays, bonding trays and other wall outlet boxes. The electrical contractor shall notify the builder of his requirements and the responsibility lies with the electrical contractor to ensure that all builder's work is clearly indicated or marked where necessary and provided in accordance with his requirements.
Electrical materials to be built in must be supplied, placed and fixed in position by the electrical contractor when required to do so by the builder or principle contractor. The electrical contractor shall also ensure that these materials are installed in the correct positions.
Unless specifically stated to the contrary in the detail specification all flush mounted conduits, accessories, switchboard trays, bonding trays etc, shall be built-in and no chasing shall be allowed.

j) Mounting height of distribution boards, switches and socket outlets

Except where stated otherwise, mounting heights shall be as follows:

Distribution boards	:	top frame 2000mm above finished floor level
Switches	:	underside 1400mm above finished floor level
Socket outlets	:	underside 300mm above finished floor level
Telephone outlets	:	underside 300mm above finished floor level

All distribution boards, switches and socket outlets shall be of the flush mounted type except where stated otherwise.

k) Position of outlets, equipment and conduit

Position of light outlets indicated on the plans are approximate. The exact positions of light outlets shall be determined with due regard to ceiling squares, brandering and patterns. Where any doubt arises as to the correct location of outlets, the engineer and/or architect shall be consulted.
The positions of other outlets, equipment and conduit are also approximate. The exact positions shall be determined on site in consultation with the engineer and/or architect.

12.4 UNDERFLOOR DUCTING

a) General

This section covers two or three compartment underfloor ducting in buildings.

b) Construction

The ducting and associated accessories shall be manufactured from 2 mm thick sheet steel. The sheet steel shall either be galvanised prior to the manufacturing of the ducting or shall be epoxy powder coated after manufacture.
The three compartment ducting shall be subdivided into three approximately equal compartments, of which the centre compartment shall be used for electrical power distribution with the outer two compartments for other services.
Outlets shall be provided on a modular basis in the ducting for the installation of pedestal or recessed outlets. The openings shall have removable flush cover plates and shall have tapped holes for the installation of the pedestal or recessed outlets.
The under-floor ducting shall be complete with flush cross-over, T-junction and right angle bend draw boxes. The junction boxes shall be complete with cross-over of services and removal cover plates secured by means of countersunk screws.

c) Pedestals

Pedestals suitable for two or three services as specified shall be manufactured from die-cast aluminium or pressed steel. The pedestals shall be epoxy coated of an approved colour after the manufacturing thereof.

d) Installations

The under-floor ducting with accessories shall be installed strictly in accordance with the manufacturer's instructions.
The ducting shall be fixed to the floor by approved means.
Upbends shall be supplied and installed where ever the ducting is terminated at distribution boards, telephone distribution boards or behind power skirting.
The power circuit wiring shall be installed in the centre compartment of the ducting. Sufficient slack shall be left in the form of a loop at each outlet in the ducting in the area to be served by the ducting. Galvanised draw wires shall be

installed in the other compartments to enable cables to be drawn in by others. The entire installation shall be effectively earthed and bonded together.

12.5 POWER SKIRTING

a) General

This section covers the supply and installing of two or three compartment power skirting.

b) Construction

The power skirting and covers shall be manufactured from 1 mm thick sheet steel or aluminium and shall be manufactured in modular lengths. The length of the skirting shall not exceed 2,5 metres and, unless otherwise specified in the detail specification, the covers shall be supplied in 1 metre lengths.
The covers shall either snap on or shall be fixed by means of toggle or swivel nuts.
Each modular cover shall be punched and prepared for the installation of a standard three pin socket outlet. The punched holes shall be blanked off with easily removable blanking plates, painted the same colour as the power skirting.
Suitable brackets shall be supplied for the fixing of the socket outlet to the channel.
All internal and external bends and off sets shall be factory made.
The power skirting and cover shall be epoxy powder coated of an approved colour after the manufacturing thereof.

c) Installation

Conduits for the circuit wiring to the power skirting shall be installed in the floorslabs and chased into the walls to terminate in flush conduit boxes behind the power skirting at the heights of the compartments for the telephone, power and other service compartments.
The wiring shall pass through large diameter holes, suitably bushed, cut in the rear of the power skirting.
Where power skirting is interrupted by doorways bridging conduits shall be installed for each of the service compartments.

12.6 TRUNKING

a) General

This section covers the supply and installation of trunking and accessories in buildings.

b) Materials

Rising and overhead busbar trunking shall be fully enclosed in a metal duct which shall form part of the busbar support. The metal enclosure shall form an integral part of the bus section and shall be of the same length as the conducting sections of the busbar. The covers of the busbar trunking shall be secured to the framework by at least four points per section. Busbar covers shall be so designed that they can be easily removed after installation of the trunking. Sections of the busbars which pass through walls and floors shall have separate covers.
Two fire barriers of non-flammable, non-conducting material in the busbar trunking shall form an integral part of each section of rising busbars.
The fire barriers shall be so placed as to prevent the spreading of fire from one floor to another but shall not restrict the ventilation of the busbar.
Overhead busbars shall be equipped with fire barriers where the busbars pass through walls or partitions.
Busbar trunking shall be of "TELEMECHANIQUE-CENALIS" manufacture.

c) Rating

Busbars shall be either manufactured from aluminium or solid drawn high conductivity copper with a rectangular cross-section, as specified in the "detail specification", part 2 of this document. Busbars shall be in accordance with SANS 11950, 1195 and BS 1433, 159 where applicable.
The rating shall be as specified in the detail specification with the maximum allowable temperature of the busbars (including joints) carrying full load current in an ambient temperature as specified not exceeding 80°C.
Busbars shall not be tapered and the neutral busbar in three-phase, four wire supplies shall have a cross-section equal to 100% of the cross-section of the phase busbars.
An earth busbar shall be installed along the entire length of the busbar trunking and shall be calculated according to IEC 439 with a minimum cross-section of 6,3 x 20 mm.

d) Construction

The busbars shall be supported at a minimum of two points in each section and shall be supported by a suitable resin bound synthetic material. The surface of these supports shall be treated to prevent surface tracking. The fixing of the busbars shall be designed to withstand the mechanical and thermal stresses during fault conditions at the specified fault level.
All non-current carrying metal parts of the trunking shall be bonded to the earth busbar.

Expansion joints shall be provided at intervals not exceeding 10 m to allow for a temperature variation of 0^{O} to 90^{O}C. These expansion joints shall have the same current rating as the rest of the busbar trunking.
All accessories shall be purpose-made and shall conform to the same specification as the busbars.
All ratings and the name and address of the manufacturer shall be indicated on a metal label fixed to each section of the busbar trunking.

e) Installation

Trunking shall be of the size and type as specified in the detail specification.
The electrical subcontractor shall ensure that the trunking is installed in accordance with the routes indicated on the relevant drawings.
However should the electrical subcontractor discover that the indicated route is not practically possible, or for some other reason the route clashes with other services, he shall immediately contact the engineer for clarification in this regard.

f) Ceiling space

Trunking for use as wireways shall be installed subject to the approval of the local supply authority. When installed in open ceiling spaces, trunking shall be mounted as close as is physically possible to immediately below the apex of the roof to allow maximum working space. The trunking shall be installed along the full length of the open ceiling space. Individual conduits shall be extended from the trunking to switch and socket outlet boxes, light points, distribution boards, etc.
The trunking shall be installed in one straight length and all joints shall be both electrically and mechanically continuous.
The trunking shall only be installed where there is a minimum clearance of 750 mm as measured between the top of the final trunking installation and the underside of the roof sheeting.
The trunking shall be securely fixed to every roof truss or member by means of round headed screws.
Both incoming and outgoing conduits shall be bonded to clean surfaces, both internally and externally, by means of two locknuts and a female brass bush. A solid brass bushnut installed from inside the trunking may also be used. Conduits which are extended from the trunking to outlets and power points shall be installed along roof members. Suitable timber or other supports shall be provided for free standing conduits extended from the trunking.

g) Suspending or fixing trunking against walls

The electrical subcontractor shall provide all the necessary hangers, supports, brackets and fixing hardware for the securing of the trunking installation.
Trunking up to and including 76 mm x 76 mm shall be supported at regular maximum spacings of 600 mm and larger channels at regular maximum spacings of 1 m. Trunking runs shall be carefully planned to prevent clashes with other services and to ensure that all covers can be easily removed after completion of the installation.
Purpose made clamps and hangers shall be provided as required. Where however it is not possible to support the trunking at the specified spacings, such trunking sections shall be supported in a sound manner and to the approval of the engineer.

(i) Cast in concrete

Where trunking is to be cast into concrete, the insert type of trunking shall be used. Spacer blocks shall be used where required to prevent the trunking from being deformed during the casting of the concrete.
The trunking shall be filled with polystyrene or other suitable fillers, prior to casting, to prevent the ingress of concrete.
The trunking shall furthermore be securely fixed in position to the shuttering.

(ii) Conduit connections

Conduit connections shall be bonded to clean surfaces, both internally and externally, by means of either two locknuts and a female brass bush or by means of a solid brass nut inserted from the inside of the trunking. Conduit connections may be made by means of a conduit box if the trunking is wide enough to allow a hole to be punched through the back

or side thereof. All holes through which conductors pass shall be fitted with bushes, grommets or shall be aligned with PVC strip grommet.

(iii) Joints and bends

Two adjoining lengths of trunking shall be aligned and shall be securely joined by means of fishplates fixed by means of mushroom bolts, washers and nuts. Alternatively connection pieces that are pop-rivetted to both adjoining sections may be used.
All adjoining lengths of trunking shall be rectangular and shall burr tightly. Special care shall be taken to ensure that the covers fit tightly across the joints.
Where the trunking passes through an expansion joint in the structure, suitable expansion joints shall be provided in the trunking by means of fishplates which are to be pop-rivetted or screwed to the trunking on one side of the expansion joint and floating flecky, without obstruction in the trunking on the opposite side of the expansion joint.
Bends and T-joints shall be constructed to ensure compliance with the minimum allowable bending radii as specified in SANS 0142-1, appendix D in the case of PVC insulated cables and conductors.
All burrs and sharp edges shall be removed from the cut edges of the trunking and the inside edges shall be lined with a suitable rubberised or plastic compound to prevent laceration of the conductor insulation during installation.

(iv) Circuits

The conductors for each individual circuit, including the earth continuity conductor for that circuit, shall be grouped together at regular spacings not exceeding 500 mm by means of PVC cable ties or straps.
Each circuit to be installed inside the trunking shall be individually laid to avoid unnecessary tangling of the grouped conductor.
The utilized cross sectional area of the trunking shall not normally exceed 50% of the total cross section of the specified trunking.

(v) Earthing

A separate earth continuity conductor of size as specified in the detail specification shall be installed from the main earth bar or terminal to the trunking where it shall be terminated to ensure a posture earthing of the trunking.
The earth conductor shall be equipped with a crimped or soldered lug and shall be bolted to the wall of the trunking by means of a 6 mm Ø brass bolt, washers and nut.

(vi) Cover plates

Cover plates shall be installed over the full length of the installed trunking.
Flush mounted trunking shall be provided with overlapping metal cover plates with plastic edge trim to cover irregularities in the wall recess.
Where required and when specified, in the detail specification, cover plates shall be attached to the trunking by means of screws at suitable intervals to prevent warping.

(vii) Verminproofing

After installation all trunking shall be suitably vermin proofed. Any holes present in the trunking shall be sealed by means of screwed metal plugs or else with metal strips which are tube-bolted or pop-riveted to the trunking.
No timber or other temporary form of plug shall be accepted. Coverplates shall be installed over the full length of the trunking.

12.7 MEASUREMENT AND PAYMENT

	Item	Unit
12.7.1	Supply and delivery of conduit	m

The unit of measurement shall be the linear metre of conduit supplied and delivered.
The tendered rate shall include for full compensation for the supply and delivery of the specified conduit and shall include full compensation for the supply of the couplings to join the conducts. Separate items shall be scheduled for the different types of conduit specified.

Item		Unit
12.7.2	Installing of conduit	m

The unit of measurement shall be the linear metre of conduit installed.
The tendered rate shall include for full compensation for the installing of the conduit including jointing and bending the conduit and fixing the conduit using saddles as specified. Separate items shall be scheduled for the different types of conduit and for installing the conduit in concrete, fixing the conduit in brick work, including the chasing thereof, fixing the conduit on the surface of structures or installing the conduit in ceiling voids.

Item		Unit
12.7.3	Terminate conduit	No

The unit of measurement shall be the number of terminations made.
The tendered rate shall include full compensation for terminating the conduit in draw boxes and outlet boxes and shall include for all locknuts and bushes.

Item		Unit
12.7.4	Supply and install draw boxes	No

The unit of measurement shall be the number of draw boxes supplied and installed.
The tendered rate shall include full compensation for supplying and installing the draw boxes including the cover plates. Separate items shall be scheduled for installing the boxes in concrete, in brickwork including chasing, and on the surface of structures.

Item		Unit
12.7.5	Supply and install conduit outlet boxes	No

The unit of measurement shall be the number of conduit outlet boxes supplied and installed.

The tendered rate shall include full compensation for supplying and installing conduit outlet boxes and shall include blank cover plates where no equipment is installed in the boxes. Separate items shall be scheduled for 1, 2, 3 and 4 way outlet boxes and for installing the boxes in concrete, in brick walls, including the chasing thereof, and surface on structures.

Item		Unit
12.7.6	Supply and deliver busbar trunking	m

The unit of measurement shall be the linear metre of busbar trunking supplied and delivered.
The tendered rate shall include for full compensation for the supply of the specified busbar trunking including all material needed for the installation of the busbar trunking.

Item		Unit
12.7.7	Supply and deliver busbar trunking end feed units	No

The unit of measurement shall be the number of trunking end feed units supplied and delivered.
The tendered rate shall include for the full compensation for the supply and delivery of the specified busbar end feed units including all material needed for the installation of the busbar end feed unit.

Item		Unit
12.7.8	Supply and deliver busbar trunking directional change units	No

The unit of measurement shall be the number of busbar trunking directional change units supplied and delivered.
The tendered rate shall include for full compensation for the supply and delivery of the specified busbar directional change units including all material needed for the installation of the busbar trunking directional change unit.

Item		Unit
12.7.9	Supply and deliver busbar trunking fire barriers	No

The unit of measurement shall be the number of busbar trunking fire barriers supplied and delivered.
The tendered rate shall include for the full compensation for the supply and delivery of the specified busbar trunking fire barriers including all material needed for the installation of the busbar trunking fire barriers.

Item		Unit
12.7.10	Supply and delivery of busbar trunking expansion units	No

The unit of measurement shall be the number of busbar trunking expansion units supplied and delivered.
The tendered rate shall include for the full compensation for the supply and delivery of the specified busbar trunking expansion units including all material needed for the installation of the busbar trunking expansion units.

Item		Unit
12.7.11	Install busbar trunking	m

The unit of measurement shall be the linear metre of busbar trunking installed.
The tendered rate shall include for full compensation for the installation of the specified busbar trunking including all material needed for the installation of the busbar trunking.

Item		Unit
12.7.12	Install busbar trunking end feed units	No

The unit of measurement shall be the number of busbar trunking end feed units installed.
The tendered rate shall include for the full compensation for the installation of the specified busbar end feed units including all material needed for the installation of the busbar end feed unit.

Item		Unit
12.7.13	Install busbar trunking directional change units	No

The unit of measurement shall be the number of busbar trunking directional change units installed.
The tendered rate shall include for full compensation for the installation of the specified busbar directional change units including all material needed for the installation of the busbar trunking directional change unit.

Item		Unit
12.7.14	Install busbar trunking fire barriers	No

The unit of measurement shall be the number of busbar trunking fire barriers installed.
The tendered rate shall include for the full compensation for the installation of the specified busbar trunking fire barriers including all material needed for the installation of the busbar trunking fire barriers.

Item		Unit
12.7.15	Install busbar trunking expansion units	No

The unit of measurement shall be the number of busbar trunking expansion units installed.
The tendered rate shall include for the full compensation for the installation of the specified busbar trunking expansion units including all material needed for the installation of the busbar trunking expansion units.

Item		Unit
12.7.16	Supply power skirting	m

The unit of measurement shall be the linear metre of power skirting supplied.
The tendered rate shall include full compensation for the specified power skirting including cover plates. Separate items shall be scheduled for one, two and three compartment power skirting.

Item		Unit
12.7.17	Install power skirting	m

The unit of measurement shall be the linear metre of power skirting installed.
The tendered rate shall include full compensation for installing the power skirting including all material required to install the power skirting.

	Item	Unit
12.7.18	Supply and install power skirting end caps, bends, conduit outlets & accessories	No

The unit of measurement shall be the number of power skirting end caps, bends and conduit outlets supplied and installed.
The tendered rate shall include full compensation for the supply and installing of the power skirting end caps, internal and external bends and outlets and shall include for the supply of all material required to complete the installing thereof.

	Item	Unit
12.7.19	Supply underfloor ducting	m

The unit of measurement shall be the linear metre of underfloor ducting supplied.
The tendered rate shall include full compensation for the supply of underfloor ducting. Separate items shall be scheduled for the two and three compartment ducting.

	Item	Unit
12.7.20	Supply underfloor ducting accessories	No

The unit of measurement shall be the number of accessories supplied.
The tendered rate shall include full compensation for the supply of the required accessories for the completion of the underfloor installation. Separate rates shall be scheduled for cross-over, T-junction and right angle bend draw boxes and upbends.

	Item	Unit
12.7.21	Supply pedestal units	No

The unit of measurement shall be the number of pedestals supplied.
The tendered rate shall include full compensation for the supply of the specified pedestal units.

	Item	Unit
12.7.22	Install underfloor ducting	m

The unit of measurement shall be the linear metre of ducting installed.
The tendered rate shall include full compensation for the installation of the underfloor ducting.

	Item	Unit
12.7.23	Install underfloor ducting accessories	No

The unit of measurement shall be the number of accessories installed.
The tendered rate shall include full compensation for the installation of the accessories. Separate items shall be scheduled for the cross-over, T-junction and right angle bend draw boxes and upbends.

	Item	Unit
12.7.24	Install pedestal units	No

The unit of measurement shall be the number of pedestal units installed.
The tendered rate shall include full compensation for the installation of the pedestal units. Separate rates shall be scheduled for the connecting up of socket outlets and other equipment.

	Item	Unit
12.7.25		

	Supply wiring channel	m

The unit of measurement shall be the linear metre of channel supplied.
The tendered rate shall include full compensation for the supply of the wiring channel of different materials and sizes as detailed in the schedule of quantities, complete with snap on cover plate.

	Item	Unit
12.7.26		
	Install wiring channel	m

The unit of measurement shall be linear metres.
The tendered rate shall include full compensation for the handling, cutting to size and fixing to the roof, wall, columns, trusses by means of appropriate fasteners of the wiring channel.

	Item	Unit
12.7.27		
	Supply and install wiring channel accessories	No

The unit of measurement shall be the number of bends, end caps, splices and fittings.
The tendered rate shall include full compensation for the supply, delivery and installation of accessories such as bends, elbow, end caps and splices, including appropriate fasteners.

SECTION 13

STD SPEC: WIRING AND TERMINALS

CONTENTS

13.1 SCOPE

This section covers the supply, installation and connections of wiring inside approved wireways for electrical installations in buildings or other structures under normal environmental conditions and with a system voltage not exceeding 600 V.

13.2 STANDARDS

The latest edition of the following specifications and Codes of Practice shall be read in conjunction with this section:

SANS 0142-1 : The wiring of premises
SANS 1411-1 : Materials of insulated electric cables and flexible cords
SANS 1507 : Electric cables with extruded solid dielectric insulation for fixed installation

13.3 GENERAL

The electrical subcontractor shall only commence with the wiring of the installation, or part thereof, after the complete conduit installation, or part thereof including the distribution board tray supplying the circuits in that part of the installation, is complete.
The electrical subcontractor shall however ensure that the wiring of the electrical installation in the building is completed prior to the main contractor. The electrical subcontractor shall be responsible for the co-ordination of his proposed program for the wiring of the building with the main contractor's proposed painting program.
Any debris or moisture inside of wireways shall be removed prior to the installation of conductors.

13.4 MATERIALS

13.4.1 Conductors

All wiring shall, unless expressly stated otherwise in the detail specification, comprise of PVC insulated, stranded copper conductors and bare stranded copper or green PVC insulated, stranded earth continuity conductors.
The conductors shall comprise of high conductivity annealed stranded copper conductors and shall be insulated with general purpose PVC, of the 600/1000 V grade.
All conductors used for the wiring of the electrical installation shall comply with SANS 1411-1.
Conductors shall be from new stocks and shall be delivered to site with unbroken seals.

13.4.2 PVC insulated unarmoured cables with a bare earth conductor

a) General

This section covers the following PVC insulated unarmoured cables with a bare earth conductor:

- PVC insulated flat multicore cable with a bare earth conductor
- PVC insulated round multicore cable with a bare earth conductor and with metal stiffening.

The cable shall comply with the requirements of SANS 1507.

b) Installation

The cables shall be installed in accordance with SANS 1507 and as specified in the detail specification.
The cables shall be terminated by means of PVC glands fitted with a neoprene seal. The neoprene seal shall have a round opening for the round multicore cable and a rectangular shaped opening for the flat multicore cable.

13.4.3 Wiring terminals

Terminal bodies and screws shall be constructed from non-corrosive metal, enclosed in fire resistant, moulded plastic insulating bodies. No part of the terminal body or fastening screws shall project beyond the insulating material which shall afford suitable protection against accidental contact by personnel and against short circuits or tracking.
The terminal block and its associated mounting rail shall be constructed in such a manner as to ensure a firm and positive fastening of the terminal block to the rail. Terminal blocks shall be held in position by means of standard end clamps. It shall furthermore be possible to extend the terminal block by adding additional terminal blocks within the terminal sequence without having to disconnect or dismantle the terminal strip.
It shall be possible to intermix terminals of various sizes, for different conductor sizes, whilst utilising the same mounting rail. Where smaller terminal blocks occur adjacent to larger terminal blocks, suitable shielding barriers shall be inserted to conceal the terminals that might otherwise be exposed.
The terminal bodies and clamping screws shall be so constructed as to ensure that conductors are not needed or severed when the clamping screws are tightened. Screws shall not come into direct contact with the conductors.
Each terminal block shall have provision for clip-in numbering or labelling strips to be installed, together with protective, clear caps over the sheets.

13.5 INSTALLATION

The electrical subcontractor shall ensure that the wiring of the electrical installation for the building or other structure is carried out in accordance with SANS 0142-1.

13.5.1 Wireways

All unarmored conductors shall be installed in conduits, trunking or power skirting and such conductors shall under no circumstances be exposed.

13.5.2 Circuits

The circuits for the complete electrical installation are indicated on the relevant drawings. The following are the maximum number of points normally connected to each type of circuit unless otherwise indicated on the drawings:

Light points per circuit	=	8
Socket outlets per circuit	=	4
Air conditioner points per circuit	=	2
Stoves, etc	=	1

Conductors supplying circuits which are fed from different switchboards shall not be installed in the same wireway. The wiring of one circuit only will be allowed in a 20 mm diameter conduit, with the exception of the wiring from switch boards to fabricated sheet metal boxes located close to switchboards, in which case more than one circuit will be allowed. For larger conduit sizes the requirements of SANS 0142-1, par. 5.4.1, shall be met.

13.5.3 Looping and joints

A loop-in wiring system where conductors are looped from outlet to outlet shall be employed. Joints in conductors shall be avoided as far as possible but where it becomes unavoidable, joints will be accepted in cable channels only and not in conduits. Joints shall be soldered or shall alternatively consist of approved ferruling properly covered with the correct size heat-shrink sleeves. The use of PVC insulation tape is not acceptable.

13.5.4 Grouping of conductors

In cases where the conductors of more than one circuit are installed in the same wireway, the conductors of each separate circuit, including the circuit earth continuity conductor, shall be grouped at intervals of at least one (1) metre using plastic cable ties. The conductors of different circuits shall however remain separate in order to ensure that any given circuit may be withdrawn from the wireway. Conductors entering distribution boards or control boards shall be grouped and bound by means of plastic cable bands. The use of PVC insulation tape for grouping conductors will not be accepted.

13.5.5 Pulling-through of conductors

The electrical subcontractor shall take utmost care whilst pulling conductors through conduit to ensure that the conductors are not kinked, twisted or strained in any manner. Care shall furthermore be taken to ensure that

conductors do not come into contact with materials or surfaces that may damage or otherwise adversely affect the insulation and durability of the conductor.

13.5.6 Conductor colours

The colours of conductor PVC insulation shall comply with SANS 0142-1, par. 5.2.1(d). The colours of conductors for sub-circuits shall as far as possible correspond with the colour of the supply phase.
The colours of conductors for the wiring of two-way and intermediate switches shall preferably differ from the colour of phase conductors.

13.5.7 Earth continuity conductors

Bare copper earth continuity conductors or green PVC insulated stranded copper earth continuity conductors, as specified in the detail specification, shall be used throughout the installation.
When earth continuity conductors are looped between earth terminals of equipment, the looped conductor ends shall be twisted together and then ferruled or soldered to ensure that a positive earth continuity is maintained when the conductors are removed from any earth terminal.
Where bare copper earth wires are specified for circuits installed in power skirting and floorducting, the electrical subcontractor shall provide a suitable length of PVC sleeving over the bare earth conductor where it passes behind or is connected to power outlets to ensure that such an earth conductor does not come into contact with any live parts.

13.5.8 Wiring inside vertical wireways

Conductors installed in vertical wireways shall be secured at intervals not exceeding 5 m to support the weight of the conductors. Approved clamps shall be supplied and installed in suitable draw-boxes for this purpose.

13.5.9 Conductor sizes

The conductor size for each circuit type is specified in the detail specification. In the event that a conductor size is not specified in the detail specification, the following minimum conductor sizes shall be used:

CIRCUIT	MINIMUM CONDUCTOR (SIZE)	
	Phase (mm^2)	Earth (mm^2)
Lighting	1,5	2,5
Socket outlet	2,5	2,5
Stove	6	6
Bell	1,5	1,5
Clock	1,5	1,5
Air conditioner	4	2,5

13.5.10 Single pole switches

Single pole switches shall be connected to the phase conductor and shall not be connected to the neutral conductor.

13.5.11 Three phase outlets

With the exception of three phase outlets, wirings to circuits connected to different phases shall not normally be present at lighting, switch or socket outlet boxes. Where this is unavoidable, barriers shall be provided between terminals or connections of the various phases and the box shall be suitably labelled internally to indicate the presence of three phase voltages.
A separate neutral conductor shall be installed together with each three phase circuit to outlets intended for equipment connection by means of isolators or sockets, irrespective of whether the particular equipment normally requires a neutral or not.

13.5.12 Connections

The insulation of conductors shall only be removed over the portion of the conductors that enter the terminals of switches, socket-outlets or other equipment. When more than one conductor enters a terminal, the strands shall be securely twisted together. Under no circumstances shall any of the strands be removed to enable easier insertion of the conductors into terminals.
No more than two conductors shall be permitted to be fastened to any one terminal.
The electrical subcontractor shall take care to ensure that the copper strands are not kicked during the removal of the insulation.
PVC insulated conductors shall not be used for the direct connection to equipment where the temperature exceeds 75°C, such as stoves, geysers, electric water heaters and high power incandescent lamps. Silicon coated or other approved conductors shall be used in such cases.

13.5.13 Terminals

Terminals shall be sized and current rated to match the conductors that are connected to them.

13.6 MEASUREMENT AND PAYMENT

	Item	Unit
13.6.1	Supply and deliver LV conductors	m

The unit of measurement shall be the linear length of conductor supplied and delivered.
The tendered rate shall include full compensation for the supply and delivery to site of the specified conductors. Conductors will be measured linearly along the full length installed in the wireway and sufficient provision will be made in the quantities for conductor slack at outlet boxes and distribution board trays. No extra will be allowed for jointing, overlapping and wastage at connections.
Separate items shall be scheduled for each conductor size.

	Item	Unit
13.6.2	Install LV conductors in conduit	m

The unit of measurement shall be the linear length of conductors installed in conduit.
The tendered rate shall include full compensation for the handling, inspection, pulling in conduit the specified number and sizes of conductors, cutting and testing of the conductors. Sufficient provision will be made for conductor slack at outlet boxes and distribution board trays to make the necessary connections to equipment.
Separate items shall be scheduled for each size of conductor.

	Item	Unit
13.6.3	Install LV conductors in trunking	m

The unit of measurement shall be the linear length of conductors installed in trunking.
The tendered rate shall include full compensation for the handling, inspection, installing in trunking the specified number and sizes of conductors, the grouping of these conductors into circuits using plastic cable ties, cutting and testing of the conductors.
Separate items shall be scheduled for each size of trunking and for each size of conductor.
This rate shall furthermore include for the supply of all cable ties, clamps and other materials necessary to ensure that the wiring conforms to the specification.

	Item	Unit
13.6.4	Install LV conductors in power skirting	m

The unit of measurement shall be the linear length of conductor installed in power skirting.
The tendered rate shall include full compensation for the handling, inspection, installing in power skirting the specified number and sizes of conductors, the grouping of these conductors into circuits using plastic cable ties, cutting and testing of the conductors. Sufficient provision will be made for conductor slack at power outlets.

Separate items shall be scheduled for each type of power skirting and for each size of conductor.
This rate shall furthermore include for the supply of all cable ties, PVC sleeving for earth conductors and other materials necessary to ensure that the wiring conforms to the specification.

	Item	Unit
13.6.5	Install LV conductors in floorducting	m

The unit of measurement shall be the linear length of conductors installed in floorducting.
The tendered rate shall include full compensation for the handling, inspection, installing in floorducting the specified number and sizes of conductors, the grouping of these conductors into circuits using plastic cable ties, cutting and testing of the conductors. Sufficient provision will be made for conductor slack at power outlets.
Separate items shall be scheduled for each type of floorducting and for each size of conductor.
This rate shall furthermore include for the supply of all cable ties, PVC sleeving for earth conductors and other materials necessary to ensure that the wiring conforms to specification.

	Item	Unit
13.6.6	Supply conductor terminals	No

The unit of measurement shall be the number of conductor terminals supplied.
The tendered rate shall include full compensation for the supply and delivery to site of the specified terminals complete with mounting rail and all hardware required to fasten the terminals and mounting rail. Separate items shall be scheduled for each size of terminal.

	Item	Unit
13.6.7	Install conductor terminals	No

The unit of measurement shall be the number of conductor terminals installed.
The tendered rate shall include full compensation for the handling, inspection and installation of the specified terminals and mounting rail. Separate items shall be scheduled for each size of terminal.

	Item	Unit
13.6.8	Supply PVC insulated multicore cables	m

The unit of measurement shall be the linear length of cable installed.
The tendered rate shall include full compensation for the supply and delivery of the cables. Separate items shall be scheduled for the different types and sizes of cables.

	Item	Unit
13.6.9	Install PVC insulated multi core cables	m

The unit of measurement shall be the linear length of cable installed.
The tendered rate shall include full compensation for the supply and delivery of the cables. Separate items shall be scheduled for the different types and sizes of cables.

	Item	Unit
13.6.10	Supply and install the terminations for PVC multicore cables	No

The unit of measurement shall be the number of terminations installed.
The tendered rate shall include full compensation for the supply and installing of the terminations as specified.

SECTION 14

STD SPEC: LIGHTING INSTALLATION

CONTENTS

14.1 SCOPE

This section covers the supply, installation and connecting of light fittings and switches for electrical installations in buildings or other structures.

14.2 STANDARDS

The latest edition of the following specifications and Codes of Practice shall be read in conjunction with this section:

SABS 163 : Wall and appliance switches
SANS 10142-1 : The wiring of premises
SABS 1084 : Cover plates for wall outlet boxes

14.3 GENERAL

The electrical subcontractor shall only commence with the installation of light fittings after the paintwork in the vicinity of the fitting is complete and dry. Care shall be taken to ensure that ceiling boards and paintwork is not damaged during the installation of light fittings.
The type of light fittings to be used are indicated and specified on both the relevant drawings as well as in the detail specification.

14.4 MATERIALS

14.4.1 Flush mounted switches

Flush mounted switches shall comply with SABS 163 and shall bear the SABS mark.
All flush mounted switches shall be suitable for mounting in 100 x 50 x 50 mm galvanised steel wall boxes unless otherwise specified in the detail specification.
The switch mechanism shall be of the tumbler operated micro-gap type with silent operation and shall be rated for 16 A at 250 V and 50 Hz.
Switches shall have protected terminals for safe wiring. Multi-lever switches shall be constructed so as to enable individual defective switches to be removed and replace without having to remove the remaining switches.
The mounting holes provided on the yoke strap shall be slotted to allow for easy alignment. A brass earthing terminal shall furthermore be provided on the yoke to ensure the positive earthing of the switch assembly.

14.4.2 Switches with pilot light indication

Flush mounted switches with pilot light indication shall comply with the relevant SABS specification and shall bear the SABS mark.
Switches with pilot light indication shall be suitable for mounting in 100 x 50 x 50 mm galvanised steel wall boxes.
The switch shall be rated at 16 A at 250 V and 50 Hz. A red neon indication lamp shall form an integral part of the switch level and shall light-up when the switch is in the on position.

14.4.3 Cover plates for switches

Cover plates for flush mounted switches shall have levelled edges which overlap the wall box in order to conceal all wall imperfections and shall conform to SABS 1084.
Cover plates shall be finished in ivory coloured baked enamel and shall bear the identical manufacturing batch number.

14.4.4 Surface mounted switches

Surface mounted switches shall comply with SABS 163 and shall bear the SABS mark.
Surface mounted switches shall consist of single or multiple switches, not exceeding four, and shall be mounted in a pressed steel box of heavy duty construction.
The switch mechanism shall be of the tumbler operated micro-gap type with silent operation and shall be rated for 16 A at 250 V and 50 Hz.
A brass earthing terminal shall furthermore be provided on the switch construction to ensure the positive earthing of the switch assembly and enclosure.
The covers of surface mounted switches shall have toggle protectors.

14.4.5 Watertight Switches

Watertight switches shall consist of 10A switches on porcelain bases in cast iron or aluminium alloy housing. Contacts must be of heavy duty brass construction and a quick acting spring mechanism shall be fitted. A rigid operating knob shall be clearly marked to indicated the "ON" and "OFF" positions. Conduit entry shall be provided through a tapped hole. The complete unit shall be watertight.

14.4.6 Photo electric daylight switches

The unit shall comprise a photo cell, thermal actuator and change-over switch. The cover of the unit shall be manufactured from a tough, durable material providing protection against tampering. The cover shall have good weathering properties. It shall be ultra violet resistant and shall not deteriorate when exposed to sunlight for prolonged periods.
The operation level shall be factory preset for "ON" at a light level of approximately 54 lux and "OFF" at approximately 108 lux. Voltage variations shall not materially affect the operational levels.
A time delay of not less than 15 s shall be provided to prevent the unit from functioning due to lightning or other short period changes in illumination.
The unit shall be effectively safeguarded against voltage surges by means of a suitable surge protector which shall preferably form an integral part of the unit.
The unit shall be of the wall mounting type and shall be supplied complete with a suitable bracket.
The changeover switch shall be capable of switching 10 A alternating current at 230 volts.

14.5 INSTALLATION

14.5.1 Positions of light fittings

The mounting positions of light fittings is indicated on the relevant drawings and shall be verified on site.

14.5.2 Mounting heights of light switches

Light switches shall be installed 1,4 metres above finished floor level unless specified to the contrary.

14.5.3 Mounting of light fittings

Incandescent surface mounted fittings shall be screwed to the ceiling by means of at least two 4 mm diameter electroplated self-tapping screws. On concrete, plastered and brick surfaces good quality plastic expansion plugs shall be used and on suspended and soft ceilings a solid timber backing strip of at least 40 x 40 mm timber shall be supplied and installed between supports and the screws fixed to these backing strips.
Surface mounted fluorescent fittings will be firmly mounted to ensure close contact with the ceiling over the entire length of the fitting. On concrete slabs the fittings shall be mounted by means of two screws into the ceiling conduit box as well as two round headed 4 mm x 30 mm electroplated self-tapping screws and plastic expansion plugs, one at either end. On suspended ceilings the fittings shall be similarly mounted but timber backing strips of at least 40 x 40 x 450 mm shall be placed in position on top of the ceiling board and the end screws secured to these strips to spread the load.

14.6 MEASUREMENT AND PAYMENT

Item	Unit

14.6.1

Supply and deliver light fittings No

The tendered rate shall include full compensation for the supply and delivery to site of the specified light fitting, complete with lamp/s, wiring, control gear where applicable, diffusers, etc.
Separate items shall be scheduled for each type of light fitting required.

Item Unit

14.6.2

Install light fittings No

The tendered rate shall include full compensation for the handling, inspection, fastening, connecting and testing of the light fitting.
Separate items shall be scheduled for each type of light fitting. This rate shall furthermore include full compensation for the cost of providing and installing all hardware, timber backing, plugs, screws connector terminals and other materials required to install the light fitting in accordance with the specification.

Item Unit

14.6.3

Supply and deliver switches No

The tendered rate shall include full compensation for the supply and delivery to site of the specified switch complete with coverplate and fastening screws.
Separate items shall be scheduled for each type of switch.

Item Unit

14.6.4

Install switches No

The tendered rate shall include full compensation for the handling, inspection, fastening, connecting, fitting of coverplate and testing of the switch.
Separate items shall be scheduled for each type of switch.
This rate shall furthermore include full compensation for the cost of providing and installing all hardware screws and wall plugs in the case of surface mounted switches, required to install the switch in accordance with the specification.

Item Unit

14.6.5

Supply and deliver photo-electric switch No

The tendered rate shall include full compensation for the supply and delivery to site of the specified photo-electric daylight switch complete with mounting bracket and around bulkhead light enclosure.

Item Unit

14.6.6

Install photo-electric switch No

The tendered rate shall include full compensation for the handling, inspection, fastening of the bulkhead enclosure and photo electric switch, connecting and testing of the switch.
This rate shall furthermore include full compensation for the cost of providing and installing all hardware, screws, wall plugs and other material required to install the photo electric light switch in accordance with the specification.

Item Unit

14.6.7

	Item	Unit
	Supply lighting track	m

The unit of measurement shall be the linear metre of track supplied.
The tendered rate shall include the supply and delivery to site of the track as specified in the detail specification.

	Item	Unit
14.6.8		
	Install lighting track	m

The unit of measurement shall be the linear metre of lighting track installed.
The tendered rate shall include full compensation for cutting to size and fixing to the ceiling or wall with appropriate fasteners of the lighting track and shall include the wiring connections of the supply circuit.

	Item	Unit
14.6.9		
	Supply and install lighting track accessories	No

The unit of measurement shall be the number of splices, bends, elbows, connector units and end caps.
The tendered rate shall include full compensation for the supply, connecting, installation and fixing of accessories as detailed in the schedule of quantities.

SECTION 15

STD SPEC: POWER OUTLETS

CONTENTS

15.1 SCOPE

This section covers the supply, installing and connecting of power outlets for the electrical installation in buildings.

15.2 STANDARDS

The latest edition of the following specifications and Codes of Practice shall be read in conjunction with this section:

SABS 152 : Low-voltage air-break switches, air-break disconnectors, air-break switch-disconnectors and fuse-combination units
SABS 163 : Wall and appliance switches
SABS 164 : Two-pole and earthing-pin plugs and socket outlets
SABS 1084 : Cover plates for wall outlet boxes

15.3 GENERAL

The electrical contractors shall only commence with the installation of power outlets in the conduit outlets allowed therefore of the plasterer and painter have completed their work in the vicinity of the outlet.

15.4 MATERIAL

15.4.1 Socket outlets with switches

All socket outlets with switches shall be of the standard 16A 3-pin pattern. Units for flush mounting shall be suitable for 100 x 100 x 50 mm deep flush wall box. Surface mounted patterns shall be housed in heavy pressed steel boxes. Shutters shall be provided.
All socket outlets with switches shall be continuously rated at 16A and shall be suitable for operation on a 250V, 50 Hz, a.c. system. Socket outlets with switches for flush mounting and surface mounted patterns shall be similar and equal to "CRABTREE". All socket outlets with switches shall fully comply with SABS 164 as amended and SABS 163 as amended. Cover plates shall be in accordance with SABS 1084 and shall have bevelled edges which overlap the box.

15.4.2 Isolators

Moulded case isolators shall be of the double pole ON-LOAD type similar and equal to "ABB".
Heavy duty metalclad isolators must be similar and equal to "MEM" or "SIEMENS". Toggles shall be interlocked with the covers. All isolators shall comply with SABS 152.
To distinguish the switches from circuit breakers the operating handles of isolators shall have a distinctive colour and where called for in the "detail specification" the switch shall be clearly and indelibly labelled "ISOLATOR".

15.5 INSTALLATION

15.5.1 General

Socket outlets and power outlets shall be installed in the positions as indicated on the drawings.

15.5.2 Socket outlets

Unless otherwise specified socket outlets shall be installed at the following heights above finished floor level, measured to the underside of the outlet:

- 300 mm above finished floor level for general applications; and
- 1 200 mm above finished floor level in kitchens.

15.5.3 Connections to geysers

Each geyser shall be connected to a separate circuit with a separate earth conductor.
The conduit from the distribution board shall terminate in a 100 x 100 x 50 mm outlet box within 1 metre of the geyser. A suitably rated double pole isolated shall be installed in the outlet box. A flexible conduit shall be installed between the isolator and the geyser.

15.5.4 Connections to heaters, fans and air conditioners

A suitably rated double pole isolator shall be supplied and installed within 1 metre of heaters, fans and air conditioners. Where the equipment is out of reach the isolator shall be installed 1,5 metres above floor level. Flexible cords of sufficient rating may be used for the final connection to the equipment.
Where control units are to be installed the units shall be installed 1,5 metres above floor level.

15.6 MEASUREMENT AND PAYMENT

	Item	Unit
15.6.1	Supply socket outlets	No

The unit of measurement shall be the number of socket outlets supplied.
The tendered rate shall include full compensation for the supply and delivery of single or double single phase, three pin socket outlets.

Separate items shall be scheduled for the following:

- socket outlets flush mounted
- socket outlets surface mounted
- socket outlets to be installed in power skirting
- socket outlets to be installed in pedestals for floor ducting
- socket outlets to be installed in recessed service outlets for floor ducting.

Separate items shall be scheduled for standard and dedicated switched socket outlets. All socket outlets shall be supplied complete with cover plates and boxes where required. The tendered rate shall therefore include for the supply of the coverplates and fixing screws where applicable.

	Item	Unit
15.6.2	Install socket outlets	No

The unit of measurement shall be the number of socket outlets installed.
The tendered rate shall include full compensation for the installing of the socket outlets. Separate items will be scheduled for the various type of socket outlets specified in item 11.5.1. The tendered rate shall furthermore include for the installing of the coverplates where applicable.

	Item	Unit
15.6.3	Supply plug tops for dedicated socket outlets	No

The unit of measurement shall be the number of plug tops supplied.
The tendered rate shall include full compensation for the supply of plug tops for each of the dedicated socket outlets supplied and installed under this contract.

	Item	Unit

15.6.4

Supply and deliver double pole isolator for geyser supply No

The unit of measurement shall be the number of double pole isolators supplied.
The tendered rate shall include full compensation for the supply and delivery of double pole isolators for the geyser supplies.

Item Unit

15.6.5

Install double pole isolator for geyser supply No

The unit of measurement shall be the number of double pole isolators installed.
The tendered rate shall include full compensation for the installing of double pole isolators for the geyser supplies.

Item Unit

15.6.6

Supply and install connections to heaters, stoves, fans and air conditioners units No

The unit of measurement shall be the number of connections made.
The tendered rate shall include full compensation for the installing of the connections to the heaters, stoves, fans and air conditioners and shall include for the supply and installing of the double pole isolator or control unit whichever is applicable.
Separate items shall be scheduled for each type of connections.

Item Unit

15.6.7

upply double pole isolators for powerskirting No

The unit of measurement shall be the number of double pole isolators supplied for the powerskirting.
The tendered rate shall include full compensation for the supply and delivery to site of the double pole isolators.

Item Unit

15.6.8

Install double pole isolators for powerskirting No

The unit of measurement shall be the number of double pole isolators installed.
The tendered rate shall include full compensation for the installation of the double pole isolators in the powerskirting and shall include the connections of the conductors to the isolators.

Item Unit

15.6.9

Supply Pratley boxes No

The unit of measurement shall be the number of Pratley boxes supplied.
The tendered rate shall include full compensation for the supply and delivery to site of the Pratley boxes.
Separate items shall be scheduled for each type of Pratley box.

Item Unit

15.6.10

Install Pratley boxes No

The unit of measurement shall be the number of Pratley boxes installed.
The tendered rate shall include full compensation for the installation of the Pratley boxes as specified.
Separate items shall be scheduled for each type of Pratley box.

SECTION 16

STD SPEC: TELEPHONE INSTALLATION

CONTENTS

16.1 SCOPE

This section covers the supply, installation and commission of various type of communication systems in buildings or other structures.

16.2 STANDARDS

The latest edition of the following specifications and Codes of Practice shall be read in conjunction with this section:
SABS 1098 : Softwood furniture timber

16.3 GENERAL

The electrical subcontractor shall only supply and install all materials required for the provision of telephone distribution wireways and outlets as indicated on the relevant drawings. The telephone cabling installation shall be undertaken by others.

16.4 MATERIALS

16.4.1 Telephone distribution board

The board shall comprise of a steel tray, architrave frame and hinged door/s.
The tray shall be constructed from corrosion resistant mild sheet steel having a minimum thickness of 1,6 mm. Bracing gussets with slots shall be provide on the four corners. Expanded metal shall be spot welded in position on the back of the tray.
Sufficient 25 mm diameter knock-outs shall be provided on the top and bottom sides of the tray.
The architrave frame shall be constructed from 1,2 mm thick sheet steel with square edges. The architrave frame shall form an overlapping 25 mm border around the tray and shall be fixed to the tray in such a manner as to follow for adjustment for the inequalities in the wall finish.
A 20 mm thick soft timber panel of fine grade pine to SABS 1098 without knots shall be installed inside the main telephone distribution board and shall cover the entire back of the distribution board. Clipboard or similar timber or other materials are not acceptable for use as back-boards.
The doors shall be constructed from 1,2 mm sheet steel, reinforced to ensure rigidity. The doors shall be flush mounted in architrave frames. Door catches shall be constructed of chromium plated brass and shall be installed flush with the door. Built-in locks shall be provided when specified in the detail specification.
The main telephone distribution board shall be of the dimensions and type as specified in the detail specification.
The main telephone distribution shall normally be intended for indoor use but however when specified to the contrary in the detail specification or on the drawings, a weatherproof, outdoor type board shall be provided. All outdoor boards shall be equipped with a drip overhang and shall be normally intended for surface mounting.
The boards shall be finished with a high quality undercoat and two final coats of off-white colour paint unless specified to the contrary in the detail specification.

16.4.2 Wireways and outlets for telecommunication cables

All materials for the wireways and outlets for the future installation of telecommunication cables by others, shall comply with the standard specification for "wireways, floorducting, power skirting, cable sleeves and manholes" (SECTION 12) which forms part of this document.

16.4.3 Wall and column mounted telephone outlet points

Outlet points shall, unless specified to the contrary in the detail specification, consist of a 100 x 100 x 50 galvanised steel conduit box flush mounted and complete with a blank cover plate to match the cover plates of switched socket outlets and light switches.

16.4.4 Conduit for connecting telephone outlet points

A minimum size 25 mm diameter conduit shall be used. All conduits shall be installed with 2 mm steel draw wire with at least 300 mm length of tail at either end. Conduit shall be installed on a looping basis with not more than six points per run.

16.5 INSTALLATION

The installation of wireways in buildings for telephone cables shall comply with the latest edition of "facilities for telecommunication services in buildings" as issued by the Department of Posts and telecommunications.

16.5.1 Underground cable sleeves and manholes

Refer to standard specification for "wireways, floorducting, power skirting, cable sleeves and manholes" (SECTION 12) which forms part of this document.
Sleeves and manholes shall be provided in the ground along the proposed route for all future underground telecommunication cables as indicated on the relevant drawing. The dimensions of manholes and sleeves are indicated in the detail specification. Sharp 90° bends in sleeves intended for telecommunication cables shall be avoided. All unequipped sleeves shall be equipped with a 3 mm diameter galvanised steel draw wire.

16.5.2 Main telephone distribution board

The main telephone distribution board shall be flush mounted in the wall in the position indicated on the relevant drawing. The mounting height for the board is specified in the detail specification.
All conduits and sleeves to telephone outlets or sub-distribution boards in the buildings or elsewhere on the site as well as the main incoming sleeves, shall terminate at the main telephone distribution board as shown on the relevant drawing.

16.5.3 Draw boxes

Where 150 mm x 150 mm x 50 mm or other draw boxes are specified in the detail specification, these boxes shall be flush mounted and provided with a suitable cover plate. A timber board shall not be provided in these boxes.

16.5.4 Wireways for telecommunication cables

The installation of wireways, for the future installation of telecommunication cables by others, shall comply fully with the standard specification for "wireways, floorducting, power skirting, cable sleeves and manholes" (SECTION 12) which forms part of this document.
All wireways other than floorducting and power skirting intended for future telecommunication cables shall be provided with a 2 mm diameter galvanised steel draw wire.

16.5.5 Separation of services

Wireways provided for telephone or other related services shall under no circumstances be used for any other purpose. Power cables, conductors and accessories shall be installed at a minimum distance of 300 mm away from the routes reserved for telecommunication cables.
Conduits and other channels shall be installed in such a way as to avoid telephone cables from crossing power cables.

16.5.6 Telephone outlets

Telephone outlets in walls shall comprise of 100 mm x 100 mm x 50 mm deep wall boxes which shall be flush mounted in the wall, in the position shown on the relevant drawing, with the underside 300 mm above the finished floor level. The wall box shall be fitted with an ivory coloured blank coverplate.
All outlet boxes shall align up neatly with adjacent socket outlet wall boxes.
Telephone outlets in floors fitted with floorducting shall be of the same type as the floor outlets for power socket outlets and shall normally be provided in the same outlet box.

Telephone outlets in power skirting shall be provided in the positions shown on the relevant drawing and the electrical subcontractor need only provide a separate short length cover plate at these positions. The cover plate for the fixing of the telephone outlet shall not exceed 250 mm in length and shall be secured in such a manner that adjacent coverplate sections may be removed without disturbing the telephone outlet.

16.6 MEASUREMENT AND PAYMENT

	Item	Unit
16.6.1	Supply telephone distribution board	No

The tendered rate shall provide full compensation for the supply and delivery to site of the specified telephone distribution board, complete in all respects to the site.
Separate items shall be scheduled for each type of distribution board.

	Item	Unit
16.6.2	Install telephone distribution board	No

The tendered rate shall provide full compensation for the handling, inspection and installation of the telephone distribution board in full accordance to the requirements of the specification.
Separate items shall be scheduled for each type of distribution board.

	Item	Unit
16.6.3	Supply telephone outlet point	No

The tendered rate shall include full compensation for the supply and delivery to site of the outlet box, cover plate and screws.

	Item	Unit
16.6.4	Installing telephone outlet point	No

The tendered rate shall include full compensation for the handling, chasing into the wall or positioning in the wall and fixing to the conduit ends of an outlet box.

	Item	Unit
16.6.5	Supply of conduit	m

The tendered rate shall include full compensation for the supply and delivery to site of conduit of material as specified in the detail specification and sizes as specified in the schedule of quantities.
The rate shall include for all joints and end connections and shall also include for the supply and delivery of 2 mm steel draw wire.

	Item	Unit
16.6.6	Install conduit	m

The tendered rate shall include full compensation for the handling and installation of conduit of sizes and types of installation as specified in the schedule of quantities.
The rate shall include for making joints, making connections at the ends and installing the draw wire.

SECTION 17

STD SPEC: EARTHING INSTALLATION

CONTENTS

17.1 SCOPE

This section covers the supply and installation of earthing installations for substations, miniature substations, switch rooms, outdoor equipment, buildings or other structures and standard low voltage earthing systems.
On completion of the installation the specialist subcontractor shall supply a set of accurately dimensioned "as built" drawings, and all test certificates.

	REQUIRED READING
Substations and associated equipment	1 (one) Ohm
Lightning protection of all building structures	10 (ten) Ohms

17.2 INSTALLATION

17.2.1 Earthing of substations

All substations shall be earthed in accordance with the requirements of the supply authority. If no earthing is specified and no specific requirements of the supply authority exist, the following method shall be adopted.
A main earth bar (minimum cross-sectional area 50 mm x 6 mm and of HDHC copper) must be provided and fixed to the high voltage room wall by means of shock proof insulators. Suitable space shall be provided between the earth bar and the wall.
All earth wires shall be secured to the earth bar by means of 10 mm diameter brass bolts. Lock nuts shall be provided for all terminals.
The following connections shall be made from this earth bar system:

- 70 mm² insulated stranded conductor to the transformer neutral.
- Copper tape to the transformer tank (where applicable).
- 70 mm² bare copper earth conductor to HT switchgear earth bar.
- 70 mm² copper earth conductor to switchgear frame and board.
- 2 x 70 mm² bare copper earth conductors to earth electrode/earth rods.
- 70 mm² bare copper earth conductors to the Municipal mainwater feed.

Where necessary, earth connections shall be protected against mechanical damage and corrosion.
Two earth rods shall be driven into the ground in the immediate vicinity of the substation at least 3 m apart with their tops not less than 600 mm below ground level. The rods shall be interconnected with a 70 mm² bare copper conductor buried at a depth of not less than 750 mm. A 70 mm² earth conductor shall be taken from each of the two earth rods to the main earthing bar in the high voltage room.

17.2.2 Earthing of miniature substations

The earthing of miniature substations is similar to the earthing requirements of substations described above except that a main earth bar is not required. The earthing bar in the LV compartment shall become the main earth bar. The MV switch, transformer earth terminal and neutral busbar shall be bonded to the earthing bar in the LV compartment as described for substations.

17.2.3 Earthing of switch rooms

The earthing of switch rooms shall conform to the earthing requirements of substations as described above.

17.2.4 Earthing of outdoor equipment

In cases where substations contain transformers or switchgear installed outdoors, the compulsory fence, if no other method is specified, shall be earthed as follows:

- A 70 mm^2 earth conductor shall be installed 400 mm below ground level and 500 mm from the fence on the outside of the substation along the entire perimeter of the fence. This earth conductor shall be earthed at each corner by means of a 1,8 m earth rod and the rod and earth conductor bonded to the fence. The earth conductor shall be bonded, at least at two points, to the main earthing system.
- A 70 mm² earth conductor shall also be buried at a depth of 400 mm around each transformer and switch and bonded to the main earthing system.

17.2.5 Earthing of buildings

All hot and cold water pipes and discharge pipes shall be interconnected by means of 12 x 1,6 mm solid or perforated copper tape and clamped with brass bolts and nuts. Copper tapes shall be fixed to walls by means of brass screws at intervals not exceeding 250 mm.
Iron roofs, gutters, down-pipes, etc., shall be interconnected in the same way. Connections shall be carried out with brass bolts and nuts (not self-tapping screws).
Iron roofs shall be connected at intervals not exceeding 15 m with a common earth conductor of bare copper wire. The common earth conductor shall run under the roof over the full length firmly fixed to the upper purlin.
This earth conductor shall also be connected to the main earth conductor of every distribution board.
When plastic conduit is used, a 2,5 mm² bare copper conductor shall be installed throughout for earth continuity.
This copper conductor shall be securely fixed to all metal appliances and equipment, including switch boxes, socket outlet boxes, draw boxes, switchboards, luminaires etc.

17.2.6 Earthing of LV Systems

A separate earth connection shall be installed from every sub-distribution board to the earth terminal on the main distribution board. These earth connections shall consist of bare copper conductors, drawn into conduit or piping, together with PVC conductors or cables.
Socket outlets shall be connected with 2,5 mm² earth conductor to the earth busbar in the relative distribution board.
The earth terminals of fluorescent light fittings shall be connected to the nearest earth terminals by means of 2,5 mm² stranded copper conductors.
The earth terminals on the main distribution board shall be earthed by means of a 70 mm² bare copper conductor connected to the cold water main.

17.2.7 Lightning Protection System

17.2.7.1 System description and performance

The system shall comprise of:

- Air conductors installed on the roof
- Down conductors
- Earthing electrodes installed around the building periphery and at column positions as shown on the drawings.
  Each earth electrode associated with a down-conductor shall have a resistance not exceeding **two hundred (200) ohms** or **n R_t**, whichever is the lesser, where:
  R_t - 30Ω for category A structures
  R_t - 50Ω for category B or C structures
  n - the number of down conductors connected to a common air terminal system

After the down conductors have been bonded to their separate earth electrodes, the earth resistance of the earth electrodes system thus connected in parallel by a common air terminal system must not exceed R_t.
The resistance of the completed system shall not exceed ten (10) ohms.

17.3 MEASUREMENT AND PAYMENT

Item	Unit

17.3.1

	Supply and install earthing and bonding for the installation	Sum

The tendered lump sum shall include full compensation for the provision of all material required for the earthing and bonding of the installation in accordance with SANS 0142-1.

	Item	Unit

17.3.2

	Supply and install earthing for substations	Lump Sum

The tendered lump sum shall include full compensation for the supply of all the material required to earth the substations and the installing of the substation earthing. Separate items shall be schedule for the different earthing installations.
The tendered sum shall furthermore include for the testing of the earthing installation and the submission of the test results to the engineer.

	Item	Unit

17.3.3

	Testing of the earth installation by a specialist contractor	Lump Sum

The tendered lump sum shall include full compensation for the testing of the earth installation by a specialist contractor when specified in the detail specification.

SECTION 19

STD SPEC: EARTHING AND PROTECTION OF ELECTRONIC EQUIPMENT

CONTENTS

19.1 SCOPE

This specification covers the requirements for the supply, delivery, installation, commissioning, testing, labour and incidentals to provide an earthing, lightning and surge protection installation for electronic systems.

19.2 STANDARDS

19.2.1 National and international standards

The latest edition, including all amendments up to date of tender of the following national and international specifications publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

(i) SABS 03 The protection of structures against lightning

(a) SANS 0142-1 The wiring of premises

(b) SANS 1222 Enclosures for electrical equipment (classified according to the degree of protection that the enclosure provides)

(c) SABS 1200DB Earthworks

(d) SABS 1200 LC Cable ducts

(e) SABS 0199 The design and installation of an earth electrode

(f) SABS 1063 Earth rods, couplers and clamps

(g) SABS 171 Surge arresters for low voltage distribution systems

(h) ELEK 165 A lightning protection guide for electronic installations.

19.2.2 Standard Specifications Included in this Contract Document

The following standard specifications bound in this document shall be read in conjunction with this specification.

SECTION 17: STD SPEC : EARTHING INSTALLATION

19.3 EARTHING OF THE INSTALLATION

19.3.1 The installation shall be earthed properly in accordance with the latest issue of SANS 0142-1: Regulations for the wiring of premises and with the bylaws of the local supply authority.

19.3.2 All electronic equipment stations shall be earthed by means of a local earth point. The local earth point shall have a resistance to earth of less than 1Ω.

At minimum the earth point shall consist of a "crowsfoot" earth spike configuration consisting of four earth spikes with a minimum distance between spikes of 2m (three spikes in a row with the fourth spike perpendicular to the connecting line opposite the centre spike).
These spikes shall be inter-connected below ground level by means of 70mm² bare copper earth wire (BCEW).
All connections to the earth spikes shall be accessible via standard cast iron valve/meter boxes with a minimum dimension 200 x 200mm.
Any incidental adjacent buried metallic components such as buried pipes, tanks and structural steel in reinforced concrete foundations shall, if possible, also be bonded to the earth point.

When conditions do not permit normal installation of the vertical earth rods, holes shall be drilled into which the earth rod shall be installed and filled afterwards with high conductivity (graphic) cement.
The contractor shall ensure that the correct measures are taken to protect the installation against the adverse effects of corrosion.

19.3.3 The design and construction of the equipment shall be such that all external parts, surfaces and shields shall be at ground potential at all times.

19.3.4 Every installation shall be equipped with an adequately sized earth bar suitable for the installation but which shall not be smaller than 150 mm by 10 mm by 6 mm which shall serve as the common tie between the static ground and power ground. All earth points shall be bonded directly to the earth bar.

19.3.5 A point on the electrically conductive chassis or equipment frame shall be connected to the earth bar. Mechanical points such as shields and hinges shall not be used to complete the grounding circuit. Adequately sized braiding shall be used for this purpose.

19.3.6 Careful attention shall be paid to the common bonding of all equipment, earth terminals and bars and the earthing thereof.

19.3.7 The earth conductor of circuits, equipment and equipment housings which can conduct current, shall be as follows:

(a) It shall be permanent and continuous.

(b) It shall have the capacity to conduct any fault currents, which could possibly flow along this route in a safe way.

(c) The impedance of this conductor shall be low enough to limit the voltage to earth as small as possible in order to enable the protection circuit element in the electronic circuit to function properly.

19.3.8 The equipment earth shall be adequately earthed to the local main earth point by means of 35mm^2 copper earth conductors.

19.3.9 Conduit earth is not acceptable for earthing purposes.

19.3.10 The contractor shall make use of suitable measuring apparatus and support equipment so that each earth connection can be monitored individually after the connection has been made to ensure that no earth loop currents flow.

19.3.11 Should earth loop currents be detected, a suitable surge arrester shall be connected in series in the earth loop current path.

19.4 EARTHING OF COMMUNICATION AND SIGNAL CABLES

19.4.1 For the purpose of this specification communication cables shall include all data and signal communication and transmission cables.

19.4.2 The contractor shall ensure that communication cables are properly earthed in order that:

(a) External (outside) cables, which may be prone to lightning, induced surges are properly protected.

(b) Noise on cables is limited to an absolute minimum to prevent communication faults on signal cables as well as to comply with the prescribed noise regulations.

19.4.3 The outer screen of all communication cables must, at the point of entry into any equipment housing, be properly earthed with the aid of cable lugs. The route that the screened wire follows to the earthing point shall be as short as possible.

19.4.4 Communication cables shall be of the double screened type.

19.4.5 No voltage greater than 5 volt AC rms between any terminal and earth will be acceptable.

19.4.6 Proper electrical isolation (greater than 8 megaohm, 300 volt) shall exist between the conductors and the earth conductor at all points.

19.5 EARTHING OF LIGHTNING AND SURGE PROTECTION MODULES

19.5.1 Where more than one module is used at any one location, these shall be grouped together in one physical location.

AN EARTH BAR OF MINIMUM CROSS SECTIONAL AREA 60MM^2 AND SUITABLE LENGTH SHALL BE PROVIDED AND INSTALLED AT ALL LOCATIONS WHERE LIGHTNING AND SURGE PROTECTION MODULES ARE INSTALLED. THE EARTH BAR SHALL BE INSTALLED IN CLOSE PROXIMITY TO THE PROTECTION MODULES. (THIS EARTH BAR MAY BE THE EQUIPMENT EARTH BAR).

19.5.2 Each protection module shall be individually connected to the earth bar using the shortest route possible.

19.5.3 The earth bar shall be connected to the local main earth bar by means of a bare copper earth conductor of minimum cross sectional area of 35mm2.

19.5.4 The ground terminal of each arrester shall be solidly strapped to the earth bar in the distribution board or cabinet by means of an appropriate copper strap.

19.6 PROTECTION OF THE INSTALLATION

All protection modules shall be DIN rail mounting.

19.6.1 Lightning protection

19.6.1.1 General requirements

The telemetry and communications equipment to be used will operate in areas with high lightning strike probability. The parameters used for the Transvaal Highveld, which is the most stringent of all the areas, shall be used to determine the degree of protection required, and Calculated Probabilities of lightning strikes shall be based on the values shown in Table 1 of SABS 03. The equipment shall withstand the induced current and voltage surges associated with lightning strikes encountered in this area, with minimum of damage. Damage is most likely to occur in the RF elements, the power supplies and the copper communication lines of the equipment.

19.6.1.2 Applicable lightning parameters

According to the CSIR, the following parameters are typical for the Transvaal Highveld, which can be assumed as the worst case:

PARAMETER	MINIMUM VALUE	MOST COMMON	MAXIMUM VALUE
Number of strokes per flash	1	5-6	25
Flash duration (ms)	10	200	2 000
Interval between strokes (ms)	3	40 - 60	200
Peak current per stroke (kA)	1	20 - 40	200
Time to peak current (micro sec)	0.5	1 – 2.5	30
Rate of rise (kA/micro sec)	1	20 - 30	200
Time to half value (micro sec)	10	30 - 50	200
Peak continuing current (A)	30	150	1 500
Continuing current duration (ms)	50	150	500
Charge in continuing current (C)	3	25	300
Charge per flash (C)	1	10 - 20	400

19.6.1.3 Lightning generated transient surge protection

Telemetry equipment that interfaces directly with any externally exposed equipment lines, including the AC power supply, shall require transient protection as an integral part of the equipment.
The installation shall furthermore also be properly protected against lightning in accordance with the CSIR Special Report "ELEK 165 - A lightning protection guide for electronic installations" published in 1978 by the National Electrical Engineering Research Institute.
The contractor shall be held responsible for any damage caused by lightning to electronic equipment forming part of this installation which is not protected against lightning in accordance with the aforementioned "ELEK 165".
Imported equipment which is not protected to meet the requirements of "ELEK 165" shall be equipped with external lightning protection equipment.
All mains lightning arresters shall comply with the requirements of SABS171 and shall bear the SABS mark.

19.6.1.4 Air terminations

A vertical steel or copper clad steel rod or tube lightning conductor, of minimum diameter 15mm) shall extend above the top of all masts so as to provide a 30 degree cone of protection (measured to the vertical). The rod shall be bonded to the mast by welding or brazing except where otherwise indicated in the detail specification.
A copper bonding conductor of 70mm² cross sectional area bare stranded copper shall be run from the top of the mast downwards. This conductor shall be bonded to the mast at several points, with the interval between adjacent bonds not exceeding 1,5 meters. All metallic elements in the vicinity of down conductors should be bonded to the conductor. The top bond to the down conductor shall be to the air terminal on top of the mast. The bonding shall be done by welding or brazing process in the case of non-galvanised sections and by the use of clamps in the case of galvanised sections. The bottom end of the down conductor shall be bonded to the earth point.

19.6.1.5 Antennae

At least one point on each antenna shall be directly connected to ground potential. Antennae shall be mounted to the masts with suitable clamps and no metal or plastic straps shall be used for this purpose.

19.6.1.6 Tests by South African Bureau of Standards

Where there is doubt about the ability of a system to withstand lightning surges, the Engineer shall have the right to call for a suitable test carried out by the South African Bureau of Standards. The contractor shall be held liable for the cost of such tests.

19.6.1.7 Surge protection

The contractor shall include for the installation of surge protection equipment on all system input/output circuits, power supply input (dc, mains) circuits, and for the necessary earth connections.
Surge protection shall consist of, but not be limited to the following requirements:

- On all analogue/digital input and output circuits - suitable signal surge protection units with appropriate voltage ratings as detailed in the paragraph on "Signal Lightning Protection Modules".
- On all mains power supply circuits - suitable power supply protection modules as detailed in the paragraph on "Power Supply Protection Modules".
- On all telephone lines - Telkom approved protection network, containing gas arresters, inductance's, transorb type arresters and 600Ω/600Ω isolating transformers. Loop and ringing current circuits shall be optically isolated.
- Surge arresters shall be installed on all phases at the input terminals to each equipment cabinet.
- Where external lines have to interface with sensitive electronic equipment, such as computers and associated peripheral equipment, suitable opto-isolators with an isolation level of at least 5kV shall be installed.
- All co-axial cables shall be provided with in-line surge suppressers.

It is not anticipated that the stated equipment will, used on their own, necessary provide the required level of protection and the Contractor shall implement additional measures deemed necessary to achieve the required protection level.
The Engineer may allow use of alternative types of surge arresters, provided that equivalent or superior protection levels will be achieved. SABS and/or CSIR test reports to substantiate claims shall be submitted to the Engineer prior to installation for the alternative equipment.
The connecting cable between electronic units shall have continuous screen (not bridged) which shall be earthed at both ends.

19.6.2 Power supply protection modules

The power supply protection module shall be used to protect the incoming power supply to the system and for mains supplied stations shall have the following characteristics:

a) The unit shall be rated to operate at a voltage up to 280V AC/DC.
b) The nominal discharge surge current (8/20 µs-wave) shall be greater or equal to 15kA.
c) The maximum discharge surge current shall be greater or equal to 40kA.
d) The unit shall react in less than 25ns.
e) The unit shall be equipped with a visual indication to indicate a fault within the unit or if it is disconnected from the supply.
f) A fault within the unit shall not effect the operation of the power supply.

A power supply protection module shall be made up out of two units with the above characteristics the one unit connected between live and neutral and the other between neutral and earth. The earth shall be connected to the lightning protection interface earth bar via the shortest possible route and shall have a conductor cross sectional area of not less than 25mm².

19.6.3 Signal lightning protection modules

(a) Signal lightning protection modules shall be of a pluggable design, with the decoupling elements arranged in the plug base element. The decoupling elements shall not be effected by the presence or absence of the protection plug and the removal of the protection plug shall not break the signal circuit.
(b) It shall be possible to remove and test the protection unit on site using a portable test set.
(c) Signal lightning protection modules shall be designed for 2 conductor floating ground circuits and shall offer individual signal line to ground as well as signal line to signal line protection.
(d) The protection plug shall have the following basic elements and shall function as follows:

- It shall be provided with a gas discharge tube that will absorb the largest part of the energy of an over-voltage impulse.
- It shall be provided with a solid state Zener diode combination, which will clamp the output voltage before the gas discharge tube, is activated.
- It shall be provided with diodes that will limit the capacitance between lines in order to limit the interference of high frequency signals.
- The protection unit shall be able to contain over voltages to a maximum of 30 volt AC peaks between any of the output terminals and earth or between the two output terminals.

Note
The over voltage referred to above, is defined as an over voltage with a rise time of 10 micro seconds, a peak voltage of 800 volt AC, a short circuit peak current of 100 Amp and a voltage down-time linear with a down-time of 50% of the peak value after 100 micro seconds. Such an over voltage is generally accepted in the telecommunications industry and represents the maximum energy and typical wave forms that are induced on twisted pair communications lines in the vicinity of lighting.

- Type tests of the offered protection units shall be submitted to the Engineer for approval.

19.6.3.1 Terminal strip interface between RTU and field equipment

Two separate terminal strips shall be provided, one for digital signals and one for analogue signals. The terminals shall be grouped per field device and secondarily by function (i.e. all inputs together and all outputs together per field device). All digital inputs shall be powered by the electronic device's power supply and all digital outputs shall be field powered. All digital signals shall be protected by means of pluggable signal circuit protection units. The surge protection units shall equal or exceed the characteristics as given in Table 1.
All analogue inputs will be field powered. All analogue inputs shall be protected by means of pluggable signal circuit protection units. The units shall equal or exceed the characteristics as shown in Table 2.

PARAMETER	NORMAL		HIGH TRANSMISSION FREQUENCY	
Nominal voltage V_n	$5V_{DC}$	12 - 110 $V_{AC/DC}$	5 V_{DC}	24 V_{DC}
Nominal current I_n	2A	2A	200 mA	200 mA
Nominal discharge current i_{sn} (8/20)	10kA	10kA	10 kA	10 kA
Output voltage threshold at 1 kV/µs	□ 3.2 Û $_{max}$ / □ 1.6 Û $_{max}$	□ 3.6 Û $_{max}$ / □ 1.8 Û $_{max}$	-/□ 8 V	-/□ 40 V
Response time t_a	-/ 1ns	-/□ 1ns	-/□ 500ns	-/□ 500ns
Impedance in series: inductive (L)	80 µH	80 µH	-	-
ohmic (R)	100 mΩ	100 mΩ	22 Ω	22 Ω
Cut-off frequency fg (3dB)	-	-	-/200 MHz	-/200 MHz

TABLE 1: CHARACTERISTICS OF SURGE PROTECTION UNITS FOR DIGITAL SIGNALS

PARAMETER	NORMAL TRANSMISSION FREQUENCY		HIGH TRANSMISSION FREQUENCY			
Nominal voltage V_n	$5V_{DC}$	12 - $220V_{AC/DC}$	5 V_{DC}	12 V_{DC}	24 V_{DC}	48 V_{DC}
Nominal current I_n	2A	2A	200 mA	200 mA	200 mA	200 mA
Nominal discharge current i_{sn} (8/20)	10kA	10kA	10 kA	10 kA	10 kA	10 kA
Output voltage threshold at 1 kV/µs	□ 1.6 Û $_{max}$ / □ 650V	□ 1.8 Û $_{max}$ / □650V	□8V / 650V	□22V / □650V	□40V / □650V	□86 V / □650V
Response time t_a	□ 1ns / □ 100Vns	□ ins / □ 100ns	□500ns /□100ns	□500ns /□100ns	□500ns /□100ns	□□□□□□ / □200ns
Impedance in series: inductive (L)	80 µH	80 µH	-	-	-	-
ohmic (R)	100 mΩ	100 mΩ	22 Ω	22 Ω	22 Ω	22 Ω
Cut-off frequency fg (3dB)	-	-	200 MHz /-	200 MHz /-	200 MHz /-	-/200 MHz

TABLE 2: CHARACTERISTICS OF SURGE PROTECTION UNITS FOR ANALOGUE SIGNALS

In addition to the above, all outgoing and incoming signal lines shall be protected by means of knife disconnect terminal blocks with gas-filled surge arresters between signal lines.
The pluggable signal protection unit may serve as the terminal block for connecting outgoing cables.
All digital output signals shall be interfaced by means of interposing relays with a single pole changeover contact. The contacts shall be rated for a minimum of 2 A, 230 V at a power factor of 0,8.
The terminal arrangement as detailed above shall have at least 25% spare space after all incoming cables (including spare cores) have been terminated.

19.7 TESTS TO BE CARRIED OUT

Where specified in the Detail Specification, earth resistivity tests shall be carried out prior to the installation of the earthing installation by a Specialist Contractor and the results shall be submitted to the Engineer.
After completion the Contractor shall arrange for an earth-resistance test to be carried out in the presence of the Engineer by a Specialist Contractor. Any further earthing that may be required will be determined by the test results.

19.8 MEASUREMENT AND PAYMENT

	Item	Unit
19.8.1	Earthing of electronic equipment station	No

The tendered rate shall be the number of electronic equipment station earthing installations.
The tendered rate shall include full compensation for the supply, delivery, installation and commissioning of a complete earthing of communication and signal cables for each electronic equipment station.

	Item	Unit
19.8.2	Provision for additional earthing as required	Prov sum

The provisional sum provided shall include for any additional earthing which may be specified by the Engineer after the acceptance of the contract.
The contractor shall submit a written quotation to the Engineer when requested to by the Engineer and shall not commence with the installation of any additional earthing without the written instruction of the Engineer.

	Item	Unit
19.8.3	Earth tests	No

The unit of measurement shall be the number of earth tests undertaken.
The tendered rate shall include full compensation for providing the equipment required to undertake the tests and the undertaking of the tests.

	Item	Unit
19.8.4	Supply and deliver of 1,8 m copper earth spikes	No

The unit of measurement shall be the number of earth spikes supplied and delivered.
The tendered rate shall include full compensation for the supply and delivery of copper earth spikes and cable clamps suitable for use in the earthing installation as specified.

	Item	Unit
19.8.5	Supply and lay earth continuity conductors	m

The unit of measurement shall be the meters of earth continuity conductors supplied and installed.
The tendered rate shall include full compensation for the supply and laying of the specified earth continuity conductors.

	Item	Unit
19.8.6	Terminating of earth continuity conductors	No

The unit of measurement shall be the number of terminations.
The tendered rate shall include full compensation for the supplying all the material required to terminate and connect the earth continuity conductors and the connecting thereof to the distribution kiosks, distribution boards, enclosures, antennae and masts.

	Item	Unit
19.8.7	Supply and Installation of Signal Power supply protection modules	Sum

No separate payment will be made for the supply delivery installation, testing and commissioning of the specified surge protection units. The cost for these units must be included in the tendered rates for the equipment in which they will be installed.

4.3 SERVICES AND FACILITIES

4.3.1 Site Facilities Available

Source of Water

The Contractor shall make his own arrangements with the Local Authority for the supply of water required by him for the execution of the Works, and his tender will be deemed to include for all costs in this connection.

Source of Power

The Contractor shall make his own arrangement with the Local Authority for the supply of power required by him for the execution of the Works, and his tender will be deemed to include for all costs in this connection.

Location of Yards and Offices

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

Security

The Contractor will be responsible for the security of his site establishment and the Works.

Plant and Equipment

The plant and equipment used on the site shall not be inferior to that described in the Schedule of Plant and Equipment.

4.3.2 Site Facilities Required

Telephones

The Contractor shall make his own arrangements for the supply of telephones and his tender shall be deemed to include for all costs in this regard.

Sanitary Facilities

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

All latrines shall conform to the requirements of the Local Authority. All sanitary fees and charges due under the Local Authority or State Health Regulations or bylaws shall be paid by the Contractor. Throughout the progress of the Contract, all latrines shall be maintained by the Contractor in a clean sanitary condition to the satisfaction of the Engineer. ***The use of pit latrines will not be permitted***.

Laboratory Facilities

No testing laboratory is required on-site for use by the Engineer. The Contractor shall arrange for process control testing to be undertaken by a laboratory to be approved by the Engineer.

A provisional sum will be allowed for in the schedules to allow for the use of an independent laboratory to effect check tests as detailed by the Engineer.

Temporary Offices

An office is required by the Engineer.

Disposal of Waste

The Contractor shall be responsible for disposal of refuse and waste generated by his staff on a daily basis in an approved manner. The site is to be kept clean, neat and tidy to the Engineer's satisfaction.

4.4 Features Requiring Special Attention

Existing Services

The Contractor shall take all necessary steps to ascertain the exact location of existing services before commencing any section of the Works and shall exercise the greatest care when working in the vicinity of such services.

The Contractor shall so carry out all his operations as not to encroach on, or interfere with, trespass on, or damage adjoining lands, buildings, properties, road structures, pipelines, places and things, in the vicinity of the Works and so as not to interfere in any way at any time with the smooth and continuous operation of the exisitng facilities.

The Contractor shall take all necessary steps to protect any existing works whatsoever against damage which may arise as a result of his operations on Site and shall bear the cost of the repair of damage to any service the possible existence of which could reasonably have been ascertained by him in good time. If services or other items are so located that they interfere with the execution of the Works and require removal or relocation, the Contractor shall advise the Engineer timeously and obtain instructions regarding the action to be taken.

Where the Contractor is responsible for the cost of repairs carried out by the Employer the costs will be recovered by means of a deduction from the Contractor's monthly Payment Certificate.

Where existing services are to be relocated, this operation will be carried out by the service owner concerned or by the Contractor under the service owner's supervision as directed by the Engineer.

It is the Contractor's responsibility to ensure the timeous relocation of affected services. No extension of time will be granted because of service relocations being delayed due to delays on behalf of the Contractor.

5. CONSTRUCTION AND MANAGEMENT REQUIREMENTS

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.

5.2 Programme

The contractor will be required to programme activities related to reservoirs to allow for a minimum period of 2 weeks once excavations are completed to design platform levels to enable the Engineer to undertake Geotechnical Investigations for foundation investigations.

5.3 Finishing and Tidying and Site Maintenance

During the progress of the work and upon its completion, the site of the works shall be kept and left in a clean and orderly condition. The Contractor shall at all times store materials and equipment for which he is responsible in an orderly manner, and shall keep the site free from debris and obstruction.

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

Finishing and tidying must not be deferred to the end of the Contract. The works will not be certified as practically complete, until the whole of the works including all finishing and tidying, has been fully completed to the satisfaction of the Engineer.

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

5.4 Courtesy

In all dealings with the public the Contractor shall bear in mind their right to enjoy the use of the roads and services and access to their properties. The Employer desires to interfere as little as possible with these rights. At all points of contact with the public, the Contractor and his staff are requested to handle discussions and disputes with deliberate courtesy and understanding.

The Contractor shall organise his work in such a manner so as to cause the least possible inconvenience to the public and to the property owners adjacent to or affected by the work included in this Contract.

5.5 Dealing with Water

The Contractor shall be responsible for dealing with all water during construction from whatever source, and the cost of all dewatering unless otherwise itemised in the Schedule of Quantities shall be deemed to be included in the tender price.

5.6 Survey Beacons

The Contractor shall protect all survey beacons during construction of the Works as required by SANS 1200A Sub-Clause 5.1.2.

Where proper execution of the Works requires the removal of beacons or pegs the Contractor shall give notice to this effect to the Engineer allowing sufficient time for the listing and relocation, removal or reference marking of such beacons.

At completion of construction the Contractor shall expose the pegs that were listed and the Engineer shall arrange for any such pegs that are missing or damaged to be replaced at the Contractor's expense.

5.7 Liaison with Property Owners

The Contractor is responsible for liaison with property owners or an elected representative, prior to commencing construction activities through any property. Adequate advance warning is to be given to property owners to allow them to relocate or remove any crops etc. which may be affected by such activities.

5.8 Facilities to other Contractors

In accordance with the provisions of Clause 4.8 of the General conditions of Contract, the Contractor shall make allowance for the presence of other Contractors engaged on other Contracts on the Site, which may involve, inter alia, the adaptation of his programme to fit in with work to be done by such contractors, as well as assuring other Contractors accesses to their sites along prescribed routes which may fall within the site of this Contract.

5.9 Source of Material

The Contractor shall be responsible for the location and supply of all materials for the Works.

The Contractor will be required, by selection if necessary, to ensure that the materials are suitable, for their various uses, in terms of the specification.

5.10 Spoil Material

No indiscriminate spoiling of material will be allowed. All surplus or unsuitable material shall be spoiled in designated areas as directed by the Engineer, in accordance with the Project Specifications.

5.11 Drawings

Any information in the possession of the Contractor which is necessary for the Engineer's Representative to complete his "as built" drawings must be submitted to the Engineer's Representative before a certificate of completion will be issued.

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

5.12 Requirements for Accommodation of Traffic

5.12.1 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.

5.12.2 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.

5.12.3 Traffic Safety Officer

Where warranted by traffic conditions on or near the site, the Contractor shall nominate a suitable member of his staff as traffic safety officer to be responsible for the arrangement and maintenance of all the measures for

the accommodation of traffic for the duration of the project. Duties of the traffic safety officer shall be as set out in SANS 1921 Part 2 and shall also be in compliance with the Occupational Health and Safety Act 1993 and the Construction Regulations 2003.

5.12.4 Payment

The Contractor's tendered rates for the relevant items in the Bill of Quantities shall include full compensation for all possible additional costs which may arise from this, and no claims for extra payment due to inconvenience as a result of the modus operandi will be considered.

Items that may be considered for payment will be specified in SANS 1200 A and the related project specification

5.13 Testing and Materials (Read with SANS 1921 – 1 : 2004 Sub-Clause 4.11 and 4.12)

5.13.1 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.

5.13.2 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.

5.14 Adverse Weather Conditions

The rainfall records applicable in respect of this Contract shall be based on the following:

1) The Contract will be based on the table included under Clause 5.12, Section C1.2 of this document, showing the working days per month, which the Contractor can expect to lose due to normal rainfall. Abnormal rainfall shall be the total aggregate of working days in the month under consideration during which the Contractor is unable to proceed with the majority of his operations as specified under (2), less the number of days from the table as being due to normal rainfall for the month under consideration.

2) The claim for extension of time shall be the sum of the positive net monthly number of days over the contract period. Negative monthly totals will not be carried forward. A day shall be considered as lost when the Engineer agrees that no work was done or capable of being done on any item shown on the critical path of the updated construction programme. Items which are not shown on the critical path and have been affected by rainfall shall not be considered for extension of time. Public holidays, builders holidays and Sundays shall be considered as non-working days.

Accurate rain gauging shall be taken at a suitable point on Site and the Contractor shall, at his own expense, take all necessary precautions to ensure that the rain gauges cannot be interfered with.

5.15 Occupational Health and Safety (Read with SANS 1921 - 1: 2004 Sub-Clause 4.14)

5.15.1 General statement

It is a requirement of this contract that the Contractor shall provide a safe and healthy working environment and to direct all his activities in such a manner that his employees and any other persons, who may be directly affected by his activities, are not exposed to hazards to their health and safety. To this end the Contractor shall assume full responsibility to conform to all the provisions of the Occupational Health and Safety Act No 85 of 1993, Construction Regulations 2014.

For the purpose of this contract the Contractor is required to confirm his status as mandatary and employer in his own right for the execution of the contract by entering into an agreement with the Employer in terms of the Occupational Health and Safety Act in the form as included in SECTION T2.2, Form U.

5.15.2 Health and Safety Specifications and Plans to be submitted at tender stage

(a) Employer's Health and Safety Specification

The Employer's Health and Safety Specification is included in Section C3.2 of the tender documents as part of the Project Specifications.

(b) Tenderer's Health and Safety Plan

The successful Tenderer will be required to compile his own documented Health and Safety Plan he proposes to implement for the execution of the work under the contract. His Health and Safety Plan must at least cover the following:

(i) a proper risk assessment of the works, risk items, work methods and procedures in terms of Regulations 7 to 28;
(ii) pro-active identification of potential hazards and unsafe working conditions;
(iii) provision of a safe working environment and equipment;
(iv) statements of methods to ensure the health and safety of subcontractors, employees and visitors to the site, including safety training in hazards and risk areas (Regulation 5);
(v) monitoring health and safety on the site of works on a regular basis, and keeping of records and registers as provided for in the Construction Regulations;
(vi) details of the Construction Supervisor, the Construction Safety Officers and other competent persons he intends to appoint for the construction works in terms of Regulation 6 and other applicable regulations; and
(vii) details of methods to ensure that his Health and Safety Plan is carried out effectively in accordance with the Construction Regulations 2003.

The Contractor's Health and Safety Plan will be subject to approval by the Employer, or amendment if necessary, before commencement of construction work. The Contractor will not be allowed to commence work, or his work will be suspended if he had already commenced work, before he has obtained the Employer's written approval of his Health and Safety Plan.

Time lost due to delayed commencement or suspension of the work as a result of the Contractor's failure to obtain approval for his safety plan, shall not be used as a reason to claim for extension of time or standing time and related costs .

5.15.3 Cost of compliance with the OHSA Construction Regulations

The rates and prices tendered by the Contractor shall be deemed to include all costs for conforming to the requirements of the Act, the Construction Regulations and the Employer's Health and Safety Specification as applicable to this contract. A copy of the Employer’s Health and Safety specification is included and will form part of the contract. Should the Contractor fail to comply with the provisions of the Construction Regulations,

he will be liable for penalties as provided in the Construction Regulations and in the Employer's Health and Safety Specification.

Items that may qualify for remuneration will be specified in the Safety Specifications included or in the Project specifications.

15.16 Environmental Management Programme

A copy of the EMPr for the Bhekuzulu – Epangweni Bulk Water Supply scheme and associated information and requirements are included and will form part of the Contract.

15.16.1 Cost of compliance with the Environmental Management Programme (EMPr)

The rate tendered under Section 1 of the Schedule of Quantities shall be deemed to include all costs for conforming to the requirements of the EMPr as applicable to this contract. A copy of the EMPr is included and will form part of the contract. Should the Contractor fail to comply with the provisions of the EMPr, he will be liable for fines and / or penalties as provided in Section 8 of the EMPr.

PART 4

SITE INFORMATION

C O N T E N T S

PART 5

ANNEXURES
FORMS AND SECURITIES

C O N T E N T S

C5.1.1 FORM OF GUARANTEE

General Conditions of Contract for Construction Works, Second Edition, 2015
PRO FORMA PERFORMANCE GUARANTEE

For use with the General Conditions of Contract for Construction Works, Second Edition, 2015.

DETAILS AND DEFINITIONS

"Guarantor" means: .....

Physical address: .....

"Employer" 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: .....

"Contractor" means: .....

"Engineer" means: .....

"Works" means: .....

"Site" means: .....

"Guaranteed Sum" means: The maximum aggregate amount of R.....

Amount in words: .....

"Expiry Date" means: (insert date) and any other period instructed by the Contractor and/or the Employer, Provided that; such instruction has been received prior to the said expiry date.

CONTRACT No: 25/2025 AMANGWE WATERWORKS, RISING MAIN AND HIGH LIFT PUMPS

Engineer issues: Interim Payment Certificates, Final Payment Certificate and the Certificate Completion of the Works as defined in the Contract.

PERFORMANCE GUARANTEE

1. The Guarantor's liability shall be limited to the amount of the Guaranteed Sum.

2. The Guarantor's period of liability shall be from and including the date of issue of this Performance Guarantee and up to and including the date of issue by the Engineer of the Certificate of Completion of the Works or the date of payment in full of the Guaranteed Sum, whichever occurs first. The Engineer 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. The Guarantor hereby acknowledges that:

3.1 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;

3.2 Its obligation under this Performance Guarantee is restricted to the payment of money.

4. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 4.1 to 4.3:

4.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Engineer 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 4.2;

4.2 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 4.1 and the sum certified has still not been paid;

4.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 4.

5. Subject to the Guarantor's maximum liability referred to in 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:

5.1 The Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or

5.2 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 5; and

5.3 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.

6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.

7. Where the Guarantor has made payment in terms of 5, 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.

8. Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.

9. Payment by the Guarantor in terms of 5 will only be made against the return of the original Performance Guarantee by the Employer.

10. The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may deem fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.

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

12. This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 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.

13. This Performance Guarantee, with the required demand notices in terms of 4 or 5, shall be regarded as a liquid document for the purposes of obtaining a court order.

14. Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's 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 (2)

C5.1.2 HEALTH AND SAFETY CONTRACT

BETWEEN EMPLOYER AND CONTRACTOR IN TERMS OF SECTION 37(2)

OF THE OCCUPATIONAL HEALTH AND SAFETY ACT NO 85 OF 1993

Written agreement between uThukela District Municipality (hereinafter referred to as "the Employer) and _____ (hereinafter referred to as "the Mandatory") as envisaged by Section 37(2) of the Occupational Health and Safety Act, No. 85, of 1993 as amended.

I _____ representing _____ (Mandatory) do hereby acknowledge that _____ (Mandatory) is an employer in its own right and shall be regarded as the employer for purposes of the contract work specified in the body of the principal agreement with duties as prescribed in the Occupational Health and Safety Act, No. 85 of 1993 as amended so as to ensure that all work will be performed or machinery and plant used in accordance with the provisions of the said Act. I furthermore agree to comply with the requirements of the Employer as contained in the Occupational Health and Safety Specification included with the principal agreement and to liaise with the employer should I, for whatever reason, be unable to perform in terms of this agreement.

Signed this _____ day of _____ at _____

Signature on behalf of Mandatory _____

Signature on behalf of Employer _____

Compensation Fund Registration No. of Mandatory _____

Good Standing Certificate : ☐ yes ☐ no (tick one box)

HEALTH AND SAFETY CONTRACT: GENERAL INFORMATION

1. The Occupational Health and Safety Act comprises Sections 1 to 50 and all un-repealed regulations promulgated in terms of the former Machinery and Occupational Safety Act No 6 of 1983 as amended, as well as other regulations which may be promulgated in terms of the OHS Act
2. 'Mandatory' is defined as including an agent, a contractor or a subcontractor for work, but without derogating from his status in his own right as an employer or user of plant and machinery
3. Section 37 of the Occupational Health and Safety Act potentially punishes employers (principals) for the unlawful acts or omissions of Mandatories (contractors) save where a written agreement between the parties has been concluded containing arrangements and procedures to ensure compliance with the said Aid by the mandatory
4. All documents attached or referred to in the above agreement form an integral part of the agreement
5. To perform in terms of this agreement Mandatories must be familiar with the relevant provisions of the Act
6. Mandatories who utilise the services of their own Mandatories (subcontractors) are advised to conclude a similar written agreement
7. Be advised that this agreement places the onus on the mandatory to contact the employer in the event of inability to perform as per this agreement. The employer, however, reserves the right to unilaterally take any steps as may be necessary to enforce this agreement
8. The contractor shall be responsible for the full and proper implementation of the terms and provisions of the Act and its regulations in the area in which the work is to be undertaken by the contractor.
9. The contractor shall be responsible for the well-being, in relation to health and safety, of all persons coming upon or into such area in accordance with that legislation, including the implementation of any directives issued by management of uMgungundlovu District Municipality in this respect.
10. The work to be done is: Trustfeed Water Reticulation Phase 1.
11. The area in which the work is to be conducted is: Trustfeed, near Wartburg.
12. The contractor shall familiarise himself with such area and all risks existing thereon and undertakes to report to the representative of uMgungundlovu District Municipality any hazard or risk to health and safety which arises during the contract work in the area concerned and over which the contractor may have no control. All necessary and appropriate safety / health equipment shall be issued by the contractor to all persons working on or coming into the area.

C5.1.3 OCCUPATIONAL HEALTH AND SAFETY INDEMNITY UNDERTAKING

I, the undersigned _____

in my capacity as _____

of the firm _____

1. hereby undertakes to ensure that I/my firm and/or employees and/or subcontractors and/or his employees -

   1.1 comply strictly with the provisions of the Occupational Health and Safety Act of 1993 (as amended) and/or the regulations promulgated in terms thereof, with specific reference to section 37(2) of the said act, as well as any relevant legislation, in the course of the performance/execution of any service and/or work in, to or on any uMgungundlovu District Municipality buildings, construction sites and/or premises;

   1.2 ensure that consultants and/or visitors comply with any instructions and measures relating to occupational health and safety, as prescribed by uMgungundlovu District Municipality; and

   1.3 comply strictly with the statutorily prescribed work systems, operational equipment, machinery and occupational health and safety conditions;

2. and as an independent employer and contractor, hereby indemnify, in terms of the above undertakings, uThukela District Municipality;

   2.1 in respect of any costs that I/my firm and/or employees and/or subcontractors and their employees may incur of necessity in compliance with the above undertakings; and

   2.2 against any claims that may be instituted against uThukela District Municipality and/or any liability that uThukela District Municipality may incur, whether instituted and/or caused by me/my firm's employees, agents, consultants, subcontractors and/or their employees and visitors or uThukela District Municipality's clients or neighbours in respect of any incidents related to my/my firm's activities and as a result of which the occupational health and safety of the persons involved have been detrimentally affected; and

   2.3 against similar claims that I, managers or directors of my firm may have against uThukela District Municipality and any damages for which I, managers or directors of my firm hold uThukela District Municipality liable.

3. My firm's compensation commissioner number is _____
   and I confirm that my firm and its subcontractors' fees have been paid up and obligations in respect of the compensation commissioner have been complied with and further that I shall furnish proof thereof in writing on request.

4. I hereby confirm that I have the authority to sign this indemnity undertaking and that uThukela District Municipality is not obliged to confirm such confirmation.

Signed at _____ this _____ day

of _____ 20

_____ _____

Signature Capacity

As witnesses:

1 _____

2 _____

C5.1.4 AGREEMENT ON OCCUPATIONAL HEALTH AND SAFETY

WRITTEN AGREEMENT ON OCCUPATIONAL HEALTH AND SAFETY IN TERMS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT 1993
(hereinafter referred to as the Act)

This Agreement is entered into and between uThukela District Municipality hereinafter referred to as the Employer) and

_____
(hereinafter referred to as the Contractor).

1. The Contractor warrants that:

   (a) he is familiar with the requirements of the Act and that he will not endanger the health and safety of the Employer's employees in any way whilst performing any work on the Site.

   (b) all his and his sub-contractor's workmen are covered in terms of the Compensation for Occupational Injuries and Diseases Act 1993, which cover shall remain in force whilst any such workmen are present on the Site.

   (c) he is in possession of the following insurance cover which shall remain in force whilst he and/or his Sub-Contractor and/or his employees are present on the Site or which shall remain in force for the duration of this contractual relationship with the Employer, whichever period is the longest:

      (i) Insurance covering his liability to any employees, his own or sub-contractor, whose earnings are in excess as defined in the Compensation for Occupational Injuries and Diseases Act 1993.

      (ii) Liability insurance cover as required in terms of the Contract and such other insurance cover that will adequately make provision for any possible losses and/or claims arising from his and/or his sub-contractors and/or his employees' acts and/or omissions on the Site.

2. The Contractor undertakes to:

   (a) assume the responsibility in terms of Section 16(1) of the Act and ensure that any delegations of duties in terms of Section 16(2) shall be in writing and that copies of any such delegation shall immediately be forwarded to the Employer.

   (b) ensure that all work performed on the site by himself and/or his sub-contractors and/or their respective employees shall be performed in compliance with the Act and under the supervision of the contractor's employees who are trained to understand the hazards associated with any work that the contractor performs on the Site.

   (c) appoint competent employees who shall be trained on any Occupational Health and Safety aspect pertinent to them or to the work that is to be performed.

(d) ensure that safe work practices shall be enforced, that all employees shall be made conversant with the contents of these practices and that discipline regarding occupational health and safety is strictly enforced.

(e) issue all such personal protective equipment as may be necessary for the type of work being performed.

(f) ensure that no unsafe equipment / machinery and/or articles shall be used on the Site.

(g) ensure that all incidents referred to in the Occupational Health and Safety Act shall be reported by the Contractor to the Department of Manpower as well as to the Employer and provide the Employer with copies of any written documentation relating to any incident.

(h) ensure that the Employer obtains an interest in any formal inquiry conducted in terms of Section 32 of the Occupational Health and Safety Act regarding any incident involving a contractor and/or his sub-contractor.

(i) ensure that no use shall be made of any of the employer's machinery, materials or equipment without written approval.

(j) ensure that work for which the issuing of a permit is required shall not be performed prior to the obtaining of such a permit.

(k) ensure that no alcohol or other intoxicating substance shall be allowed on the Site and that anyone suspected to be under the influence of alcohol or any other intoxicating substance shall not be allowed on the premises.

(l) give his full participation if and when Employer's employees inquire into Occupational Health and Safety issues.

(m) report to the Employer's management (in writing) anything that he deems to be unhealthy and/or unsafe.

……	…….
SIGNED BY THE CONTRACTOR	SIGNED BY THE EMPLOYER
Date: ……	Date: …….
Name (Print): ……..	Name (Print): ……..
Capacity: ……..	Capacity: ……..

C5.1.5 NOTIFICATION OF CONSTRUCTION WORK

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993
Regulation 3 of the Construction Regulations, 2003

1. (a) Name and postal address of principal contractor:

_____

_____

1. (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:

_____

_____

3. (b) Name and telephone number of client's contact person or agent:

_____

4. (a) Name and postal address of designer(s) for this project:

_____

_____

4. (b) Name and telephone number of designer(s) contact person:

_____

5. Name and telephone number of principal contractor's construction supervisor on site appointed in terms of regulation 6.(1).

_____

_____

6. Name/s of principal contractor's sub-ordinate supervisors on site appointed in terms of regulation 6.(2):

_____

7. Exact physical address of the construction site or site office:

_____

8. Nature of construction work:

_____

9. Expected commencement date: _____

10. Expected completion date: _____

11. Estimated maximum number of persons on the construction site: _____

12. Planned number of contractors on the construction site accountable to principal contractor: _____

13. Name(s) of contractors already chosen:

_____

_____

_____ _____
Principal Contractor Date

_____ _____
Client Date

- This document is to be forwarded to the Department of Labour and the uMgungundlovu District Municipality prior to commencement of work on site.
- All principal contractors that quality to notify must do so even if another principal contractor on the same site had done so prior to the commencement of work.

C5.1.6 ADJUDICATOR'S AGREEMENT

[Note to Tenderer: This form should not be completed for the tender, but will be completed by the appointed Contractor.]

This agreement is made on the ..... day of ..... 20 .....

between the Employer *(name of company / organization)* .....

of (*address)* .....

.....

and the Contractor *(name of company / organization)* .....

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

(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 duly authorized to sign for and on behalf of the **First Party** in and on behalf of the presence of	who warrants that he/ she is duly authorized to sign for and on behalf of the **Second Party** presence of	the **Adjudicator** in the presence of
Witness:	**Witness:**	**Witness:**
(Signature):	*(Signature):*	*(Signature):* .....
Name:	**Name***:*	***Name****:* .....
Address:	Address*:*	Address*:* .....
.....	.....	.....
Date:	Date:	Date:

C5.2. LIST OF DRAWINGS

Description	Drawing Number
DRAWING SCHEDULE	6055-9B2-100
GENERAL LAYOUT	
AMANGWE WATERWORKS, RISING MAIN AND HIGH LIFT PUMPS: GENERAL LAYOUT PLAN	6055-9B2-GA1
SCHEMATICS	
AMANGWE ABSTRACTION AND WATER TREATMENT WORKS SCHEMATIC: INTERIM SUPPLY ARRANGEMENT	6055-9B2-SCH1
AMANGWE ABSTRACTION AND WATER TREATMENT WORKS SCHEMATIC: FINAL SUPPLY ARRANGEMENT	6055-9B2-SCH2
RISING MAINS	
LONGITUDINAL SECTION AND LAYOUT PLAN: INTERMEDIATE P/S TO PONDS: SHEET 1 OF 4	6055-9B2-LS1
LONGITUDINAL SECTION AND LAYOUT PLAN: INTERMEDIATE P/S TO PONDS: SHEET 2 OF 4	6055-9B2-LS2
LONGITUDINAL SECTION AND LAYOUT PLAN: INTERMEDIATE P/S TO PONDS: SHEET 3 OF 4	6055-9B2-LS3
LONGITUDINAL SECTION AND LAYOUT PLAN: INTERMEDIATE P/S TO PONDS: SHEET 4 OF 4	6055-9B2-LS4
WATER TREATMENT WORKS	
WATER TREATMENT WORKS: SITE LAYOUT	6055-9B2-TW1
WATER TREATMENT WORKS: PUMP STATION	6055-9B2-TW2
WATER TREATMENT WORKS: PIPEWORK DETAILS	6055-9B2-TW3
WATER TREATMENT WORKS: CHAMBERS DETAILS	6055-9B2-TW4
WATER TREATMENT WORKS: CHLORINE DOSING BUILDING	6055-9B2-TW5
WATER TREATMENT WORKS: LAYOUT PLAN	6055-9B2-TW6
STANDARD DETAILS	
PIPELINE STANDARD DETAILS: AIR VALVE DETAILS	6055-9B2-SD1
PIPELINE STANDARD DETAILS: GATE AND SCOUR VALVES	6055-9B2-SD2
PIPELINE STANDARD DETAILS: PIPE TRENCH AND ROAD CROSSING DETAILS	6055-9B2-SD3
PIPELINE STANDARD DETAILS: ANCHOR BLOCKS DETAILS	6055-9B2-SD4
PIPELINE STANDARD DETAILS: PIPE PEDESTAL DETAILS	6055-9B2-SD5
PIPELINE STANDARD DETAILS: MISCELLANEOUS DETAILS	6055-9B2-SD6

Description	Drawing Number
PIPELINE STANDARD DETAILS: HEADWALL DETAILS	6055-9B2-SD7
PIPELINE STANDARD DETAILS: METER CHAMBER DETAILS	6055-9B2-SD8
PIPELINE STANDARD DETAILS: METER CHAMBER - REINFORCING DETAILS	6055-9B2-SD9
PIPELINE STANDARD DETAILS: STORMWATER DETAILS	6055-9B2-SD10
PIPELINE STANDARD DETAILS: CATCHPIT AND V-DRAIN	6055-9B2-SD11

C5.3 LOCALITY PLAN

C5.4 CONTRACT SIGNBOARD