



**South African
NATIONAL PARKS**

SOUTH AFRICAN NATIONAL PARKS

**PROVISION OF POTABLE WATER FOR TWEE RIVIEREN,
NOSSOB AND MATA-MATA REST CAMPS,
KGALAGADI TRANSFRONTIER PARK**

CONTRACT NO: CI-KH-0028/1

TENDER DOCUMENT

NOVEMBER 2023

ISSUED BY:

Mr. Garret Kobe
Manager SCM: Infrastructure and Special Projects
SOUTH AFRICAN NATIONAL PARKS
P.O. BOX 787
PRETORIA
0001

NAME OF TENDERER:

PROVISION OF POTABLE WATER FOR TWEE RIVIEREN, NOSSOB AND MATA-MATA REST CAMPS, K GALAGADI TRANSFRONTIER PARK

CONTRACT NO: CI-KH-0028/1

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The Tender



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The Tenderer is required to check the numbers of pages and should any be found to be missing or duplicated, or should any of the typing be distinct, or any doubt or obscurity arise as to the meaning of any description or particular of any item, or if the Tender Document contains any obvious errors, then the Tenderer must immediately inform the Employer and have them rectified or explained in writing as the case may be. No liability whatsoever will be admitted by reason of the Tenderer having failure to comply with the foregoing instructions.

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1: The Tender

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Part T1: Tendering procedures

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Tender Notice and Invitation to Tender (SBD1)

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE SOUTH AFRICA NATIONAL PARKS

BID NUMBER:	CI-KH-0028/1	CLOSING DATE:	17 May 2024	CLOSING TIME:	11h00
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DESCRIPTION	CI-KH-0028/1: Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps				
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BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT (STREET ADDRESS)

Location of tender box: SANParks Arid Regional Office Reception
Physical address: Bi-Lo Office, 9 Groenpunt Road, Keidebees Upington 8800
Identification: CI-KH-0028/1: Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

South African National Parks invites tenders for the **Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps.**

Only tenderers who comply with the following are eligible to submit tenders:

- Have the required and valid CIDB grading stated
- Achieved the minimum score for Functionality
- Tenderer is not listed in the Register of Tender Defaulters and prohibited from doing business with the public sector.
- The tenderer has not
 - abused the Employer’s supply chain management system or;
 - failed to perform on any previous contract with the employer.

ELIGIBILITY

1) CIDB Grading

The following tenderers who are registered with the CIDB, or are capable of being so registered prior to the evaluation of submissions are eligible to submit tenders:

- contractors who have a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered for **4ME** higher class of construction work; and Joint ventures are eligible to submit tenders provided that:
 1. every member of the joint venture is registered with the CIDB;
 2. the lead partner has a contractor grading designation in the **4ME** class of construction work; and
 3. the combined contractor grading designation 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 **4ME** class of construction work.

2) Functionality Criteria:

Tenderers are required to demonstrate their ability to undertake the work and provide proof of experience in water treatment plant projects. Tenderers are required to score a minimum of **21 points out of a possible 30 points** in order to qualify for the tender.

Tenderers who fail to meet the minimum threshold shall be declared non-responsive and subsequently rejected. The onus rests with the tenderer to supply sufficient information to allow for the proper scoring, evaluation and award of points.

The functionality criteria and maximum score in respect of each of the criteria as follows:

Quality criteria	Maximum number of points
Plant & Equipment	10
See detailed sub-criteria in Tender Data	
Technical Expertise	10
See detailed sub-criteria in Tender Data	
Reverse Osmosis Water Treatment experience	10
See detailed sub-criteria in Tender Data	
Maximum possible score	30

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SPECIFIC GOALS

Preferential Procurement Regulations, 2022

The following Specific Goals forms part of this tender:

The specific goals allocated points in terms of this tender	Number of points allocated (80/20 system)
1) Enterprises with B-BBEE Procurement Recognition	
<i>Level 1</i>	4
<i>Level 2</i>	3
<i>Level 3</i>	2
<i>Level 4</i>	1
2) Locality	
To Qualify bidder must include proof of business address in the Northern Cape Province older than two years and proof of business address in the Northern Cape in the month of closing of tender	16
Maximum Total Points	20

Bidders with B-BBEE Level 5-8 and is not located in the Northern Cape Province can still tender but will not claim points for specific goals.

Tender documents will ONLY be available at the compulsory clarification meeting.

A non-refundable tender deposit of R 300-00 payable in cash is required on collection of the tender documents. There are no EFT facilities.

Queries relating to the issue of these documents may be addressed to:

All Queries

Mr Garret Kobe

Tel No: (012) 426 5132 / 076 481 8604

e-mail garret.kobe@sanparks.org

A compulsory clarification meeting with representatives of the Employer will take place at the SANParks Arid Regional Office, **Bi-Lo Office, 9 Groenpunt Road, Keidebees in Upington** on **26 April 2024 starting at 11:00 hrs**. The Tenderer shall inspect and examine the site and its surroundings and shall satisfy himself before submitting his tender as to the form and nature of the Site, the quantities and nature of the work and materials necessary for the completion of the Works and the means of access of the Site, the accommodation he may require and in general shall himself obtain all necessary information as to risk, contingencies and other circumstances which may influence or affect his tender. The tenderer must be represented at the site inspection by a person who is suitably qualified and experienced to comprehend the implications of the work involved. Attendance of the site inspection is compulsory and a tender will be disqualified if the site inspection is not attended by a representative of the tenderer.

The closing time for receipt of tenders is 17 May 2024 @ 11:00 hrs. Telephonic, telex facsimile, e-mail and late tenders will not be accepted.

Tenders may only be submitted on the tender documentation that is issued.

Requirements for sealing, addressing, delivery, opening and assessment of tenders are stated in the Tender Data.

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BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO		TECHNICAL ENQUIRIES MAY BE DIRECTED TO:	
CONTACT PERSON	Garret Kobe	CONTACT PERSON	Marius Reinhardt
TELEPHONE NUMBER	012-426 5132	TELEPHONE NUMBER	082 796 9986
E-MAIL ADDRESS	garret.kobe@sanparks.org	E-MAIL ADDRESS	Marius.reinhardt@sanparks.org
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			
SUPPLIER COMPLIANCE STATUS	TAX COMPLIANCE SYSTEM PIN:	OR	CENTRAL SUPPLIER DATABASE No: MAAA
ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	<input type="checkbox"/> Yes <input type="checkbox"/> No [IF YES ENCLOSE PROOF]	ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?	<input type="checkbox"/> Yes <input type="checkbox"/> No [IF YES, ANSWER PART B:3]
QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS			
IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?		<input type="checkbox"/> YES <input type="checkbox"/> NO	
DOES THE ENTITY HAVE A BRANCH IN THE RSA?		<input type="checkbox"/> YES <input type="checkbox"/> NO	
DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?		<input type="checkbox"/> YES <input type="checkbox"/> NO	
DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?		<input type="checkbox"/> YES <input type="checkbox"/> NO	
IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?		<input type="checkbox"/> YES <input type="checkbox"/> NO	
<p>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 BELOW.</p>			

NB: FAILURE TO PROVIDE / OR COMPLY WITH ANY OF THE ABOVE PARTICULARS MAY RENDER THE TENDER INVALID.

SIGNATURE OF BIDDER:

CAPACITY UNDER WHICH THIS BID IS SIGNED:
(Proof of authority must be submitted e.g. company resolution)

DATE:

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T1.1: Tender Data

The conditions of tender are the Standard Conditions of Tender as contained in **Annex C of the CIDB Standard for Uniformity in Construction Procurement (August 2019)** which are reproduced without amendment or alteration for the convenience of tenderers as an Annex to the Tender Data.

The Standard Conditions of Tender 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 the Tender Data given below is cross-referenced to the clause in the Standard Conditions of Tender to which it mainly applies.

Clause number	
C.1.1	The employer is the South African National Parks.
C.1.2	<p>The following documents form part of this tender:</p> <p>VOLUME 1 : The General Conditions of Contract for Construction Works, Third Edition, 2015, prepared by the South African Institution of Civil Engineering (SAICE). This publication is available and tenderers must obtain copies at their own cost from the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House 1685, Tel: (011) 805 5947, Fax: (011) 805 5971, e-mail: civilinfo@saice.org.za.</p> <p>VOLUME 2: The Standard Specifications SANS/SABS-1200 as prepared by the South African Bureau of Standards (SABS) are applicable to this Contract. This publication is available and tenderers must obtain copies at their own cost from the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House 1685, Tel: (011) 805 5947, Fax: (011) 805 5971, e-mail: civilinfo@saice.org.za.</p> <p>VOLUME 3: The Contract Document in which is bound:</p> <p>THE TENDER</p> <p>Part T1: Tendering procedures</p> <p>T1.1 - Tender notice and invitation to tender T1.2 - Tender data</p> <p>Part T2: Returnable documents</p> <p>T2.1 - List of returnable documents T2.2 - Returnable schedules</p> <p>THE CONTRACT</p> <p>Part C1: Agreements and Contract data</p> <p>C1.1 - Form of offer and acceptance C1.2 - Contract data C1.3 - Performance Bond</p> <p>Part C2: Pricing data</p> <p>C2.1 - Pricing assumptions C2.2 - Bill of Quantities</p> <p>Part C3: Scope of work</p> <p>C3 - Scope of work and Drawings</p> <p>Part C4: Site information</p> <p>C4 - Site information</p>

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	<p>Part C5 : Drawings C5 - Drawings</p>
<p>C.1.4</p>	<p>The employer's agent is:</p> <p>Name: BVI Consulting Engineers Northern Cape (Pty) Ltd. Address: 55 Bult Street Die Rand Upington 8800 Tel: 072 221 9098 E-mail: gertm@bvinc.co.za</p>
<p>C.2.1</p>	<p>Only those tenders who satisfy the following eligibility criteria and who provide the required evidence in their tender submission are eligible to submit and have their tenders evaluated: PPPFA: Pre-qualification criteria</p>
<p>C.2.1</p>	<p>The following tenderers who are registered with the CIDB, or are capable of being so registered prior to the evaluation of submissions, are eligible to have their tenders evaluated:</p> <p>Only those tenderers who satisfy the following eligibility criteria and who provide the required evidence in their tender submissions are eligible to submit tenders and have their tenders evaluated:</p> <p>The following tenderers who are registered with the CIDB, or are capable of being so registered prior to the evaluation of submissions, are eligible to have their tenders evaluated:</p> <p>a) It is estimated that tenderers must have a CIDB contractor grading designation of 4ME or higher.</p> <p>Joint ventures are eligible to submit tenders provided that:</p> <ol style="list-style-type: none"> 1. every member of the joint venture is registered with the CIDB; 2. the lead partner has a contractor grading designation in the 4ME class of construction work; and 3. the combined contractor grading designation 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 4ME class of construction work or a value determined in accordance with Regulation 25 (1B) of 25(7A) of the Construction Industry Development Regulations

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C 2.1

As part of the eligibility criteria, tenderers shall further be required to satisfy the following functionality criteria and be required to demonstrate their ability to undertake the works considered to be complex and to provide proof of experience, expertise, personnel, plant and equipment to undertake work of this nature.

Tenderers are required to score a **minimum of 21 points out of a possible 30 points (i.e. 70%)** in order to be eligible and qualify for the tender. Tender offers that fail to score the minimum number of functionality points shall be rejected. The onus rests with the tenderer to supply sufficient information to allow for the proper scoring, evaluation and award of points. Where insufficient information is provided, zero points will be awarded for such particular criterion.

Functionality points shall be awarded in accordance with the following provisions:

1. Plant and Equipment [10 Points]
2. Technical Expertise [10 Points]
3. Experience in water treatment utilizing Reverse Osmosis processes [10 Points]

Bidders must achieve **21 out of 30 points or 70%** to qualify for the tender. Tender offers that fail to score the minimum number of functionality points shall be rejected.

QUALITY CRITERIA	SUB-CRITERIA	MAX. POINTS	
Plant and Equipment	Points will be awarded for Plant and Equipment owned or hired by tenderer within the categories listed and which must be available for the execution and completion of the works. Where the tenderer elects to hire-in some or all of the above:	Up to 1 Light Duty Vehicle (LDV).	1
	<ul style="list-style-type: none"> • Points will be awarded within the applicable category, the same as listed above. Further, the allocation of points for Plant and Equipment to be hired will only be awarded should the tenderer submit an original “Letter of Intent” , as an attachment to the tender, from a Plant Hire Company who is registered within the Contractors Plant Hire Association (CPHA). The “Letter of Intent” shall clearly state that the Plant intended for the project will be available for the full duration of the project. The “Letter of Intent” shall further be unqualified and certified by a registered Commissioner of Oaths. Ownership details as well as those items to be hired-in, shall be declared and listed on the “Schedules of Returnables” that will be incorporated into the Contract.	Up to 1 No. 8-ton truck with mounted crane.	2
		Up to 1 Portable Welding Equipment.	2
		Up to 1 Thread Cutting Equipment for steel plumbing Pipes.	1
		Up to 1 No Laser type Pump shaft alignment equipment.	1
		Up to 1 No Set of Hand Tools suitable for pump installation.	1
		Up to 1 Core Drilling Equipment 50mm dia. to 300mm dia.	1
		Up to 1 Electrical Power Tools (Angle Grinder, Drill, Sanding Equipment, etc.)	1
SUB-TOTAL POINTS 1:		10	

QUALITY CRITERIA	SUB-CRITERIA	MAX. POINTS	
Technical Expertise	Points will be awarded for Technical Expertise applicable to the key personnel and individual construction staff members within the categories listed and who must be available for the execution and completion of the works. [See NOTE 1 below]	Contracts Manager - Who has a minimum of 5 years Mechanical Construction experience.	4
		Site Agent – Who has a minimum of 3 years Mechanical Construction experience.	3

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		Site Foreman – Who has a minimum of 3 years Mechanical Construction experience.	3
	SUB-TOTAL POINTS 2:		10
QUALITY CRITERIA	SUB-CRITERIA		MAX. POINTS
Reverse Osmosis Water Treatment experience	The tenderer shall indicate and declare their past track record in relation to design and manufacture of Reverse Osmosis Water Treatment Systems.	Reverse Osmosis system contracts of value between R3 million and R5 million, Inclusive of VAT – max 4 points (2 points per contract)	4
	Particulars and details of each mechanical construction contract shall be declared and listed on the “Schedule of the Returnables” that will be incorporated into the Contract”. [See NOTE 2 below]	Reverse Osmosis system contracts of value exceeding R5 million , Inclusive of VAT – max 6 points (3 points per contract)	6
	SUB-TOTAL POINTS 3:		10
MAXIMUM POSSIBLE SCORED:			30
<p>NOTE 1: “Technical Expertise”: Curriculum Vitae’s (CV’s) of the Contracts Manager, Site Agent and Site Foreman that will be employed on this contract must be submitted with the tender document. The various individuals may be in the permanent employ of the tenderer or on contract to be awarded points.</p> <p><i>Should the key personnel not be available at the time of appointment for any reasonable reason, the Contractor will submit to the Client and Engineer, his proposed change in key personnel which will have to be approved. The Client and Engineer may on their discretion reject personnel proposed by the Contractor at such time.</i></p>			
<p>NOTE 2: Reverse Osmosis (RO) Treatment Experience: <i>Tenderer to submit list of past and current projects for functionality information – information must clearly state project information, contractor to submit “letter of award” for current projects, and “completion certificates” for completed projects. Project details shall include telephone contact details of either the client or the engineer for the project.</i></p> <p><i>Contractors who provide minimum two (2) contracts above R5 million will claim full 6 points. Should the contractor fail to provide contracts of between R3m and R5m, but provide additional two (2) contracts above R5m, they will still be considered for the 4 points on the sub-criteria for contracts between R3m and R5m.</i></p>			
<p>TENDERER TO SUBMIT LIST OF PAST AND CURRENT PROJECTS FOR FUNCTIONALITY INFORMATION – INFORMATION MUST CLEARLY STATE PROJECT INFORMATION, CONTRACTOR TO SUBMIT “LETTER OF INTENT” FOR CURRENT PROJECTS, AND “COMPLETION CERTIFICATES” FOR COMPLETED PROJECTS. PROJECT DETAILS SHALL INCLUDE TELEPHONE CONTACT DETAILS OF EITHER THE CLIENT OR THE ENGINEER FOR THE PROJECT.</p> <p>Curriculum Vitae’s (CV’s) of the Contracts Manager, Site Agent and Site Foreman that will be employed on this contract must be submitted with the tender document. The various individuals must be in the permanent or fixed term employment of the tenderer to be awarded points</p> <p>During further evaluation the Employer shall evaluate the remaining responsive tenders using the tender evaluation method and associated evaluation criteria and weightings that are specified in the tender data under C.3.11.1</p>			
C.2.7	<p>The arrangements details for the compulsory clarification meeting are stated under Part T1.1: Tender Notice and Invitation to Tender.</p> <p>Tenderers must complete and sign the attendance register at the clarification meeting in the name of the tendering entity.</p>		
C.2.8	<p>Should it be necessary for a bidder to obtain clarity on any matter arising from or referred to in this tender document, please refer queries, in writing, to the contact person listed below. Under no circumstances may any other employee within the SANParks be approached for any information. Any such action may result to disqualification of a response submitted in competition to the tender process.</p>		

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	<p>Enquiries should reference specific page and or paragraph numbers, where appropriate.</p> <ul style="list-style-type: none"> All questions/enquiries must be forwarded in writing not later than 10 May 2024. <p>Questions/enquiries received after 12:00 on 10 May 2024 will not be considered.</p> <p>Name: Garret Kobe Capacity: Manager SCM: Infrastructure and Special Projects. Address: PO Box 787, PRETORIA, 0001 Tel: 012 426 5132 Fax: 086 416 2121 E-mail: Garret.kobe@sanparks.org</p>						
C.2.12	No alternative proposals will be accepted.						
C.2.13.2	Electronic tender offers will not be accepted.						
C.2.13.3	Parts of each tender offer communicated on paper shall be submitted as an original, plus Nil copies.						
C.2.13.7	<p>The employer's address for delivery of tender offers and identification details to be shown on each tender offer package are:</p> <table border="1"> <tr> <td>Location of tender box:</td> <td>SANParks Arid Regional Offices</td> </tr> <tr> <td>Physical address:</td> <td>Bi-Lo Offices, 9 Groenpunt Road, Keidebees, Upington 8800</td> </tr> <tr> <td>Identification details:</td> <td>Contract no: CI-KH-0028/1 - Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps.</td> </tr> </table>	Location of tender box:	SANParks Arid Regional Offices	Physical address:	Bi-Lo Offices, 9 Groenpunt Road, Keidebees, Upington 8800	Identification details:	Contract no: CI-KH-0028/1 - Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps.
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Identification details:	Contract no: CI-KH-0028/1 - Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps.						
C.2.15.9	Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.						
C.2.15.1	The closing time for submission of tender offers is as per Notice and Invitation to Tender T1.1.						
C.2.16	The tender offer validity period is 12 Weeks.						
C.2.19	Access shall be provided for inspections, tests and analysis as may be required by the employer.						
C.2.23	<p>The tenderer is required to submit with his tender:</p> <ol style="list-style-type: none"> A valid Tax Clearance verification pin issued by the South African Revenue Services; Proof of Contractor Registration issued by the Construction Industry Development Board Compulsory An original and valid B-BBEE Status Level verification Certificate or certified copy thereof Proof of registration of Closed Corporation or Company or other legal entities applicable to tender - Certified copy Letter of good standing from the Compensation Commissioner – Compulsory National Treasury Central Supplier Database (CSD) Registration Report - Compulsory All other certificates as listed in the List of Returnable Documents. Letter of Good Standing from Compensation Commissioner. A copy of Joint Venture Agreement if applicable. Form C1.1 – Form of Offer and Acceptance Form T2.1 – Certificate of Authority for Signature. For JV's a JV Agreement shall be provided (if applicable) Form T2.1 – Certificate of attendance at site inspection. Form T2.1 F - Record of addenda to tender documents. Signed acknowledgment of the Base Line Risk Assessment Functionality requirements. 						
C.3.4.1	<p>The time and location for opening of the tender offers are:</p> <ul style="list-style-type: none"> 17 May 2024 @ 11:00 hrs. The tender box situated at Reception, BVI Consulting Engineers Northern Cape. 						

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C.3.11.1	<p>Evaluation of tenders offers. The procedure for the evaluation of responsive tenders is Method: Price and Specific Goals</p> <p style="text-align: center;">PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2022</p> <p>1) POINTS AWARDED FOR PRICE The total number of tender evaluation points (TEV) will be calculate in accordance with the following formula: TEV = NFO + NP where; NFO is the number of tender evaluation points awarded for the financial offer made in accordance with;</p> <p>80/20 preference point system for acquisition of goods or services for Rand value equal to or above R30 000 and up to R50 million</p> <p>The following formula will be used to calculate the points out of 80 for price in respect of a tender with a Rand value equal to or above R30 000 and up to a Rand value of R50 million, inclusive of all applicable taxes:</p> $P_s = 80 \left(1 - \frac{P_t - P_{\min}}{P_{\min}} \right)$ <p>Where- Ps = Points scored for price of tender under consideration; Pt = Price of tender under consideration; and Pmin = Price of lowest acceptable tender.</p> <p>2) POINTS AWARDED FOR SPECIFIC GOALS Specific goals for the tender and points claimed are indicated per the table below.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">The specific goals allocated points in terms of this tender</th> <th style="width: 30%;">Number of points allocated</th> </tr> </thead> <tbody> <tr> <td colspan="2">1) Enterprises with B-BBEE Procurement Recognition</td> </tr> <tr> <td style="text-align: center;"><i>Level 1</i></td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;"><i>Level 2</i></td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;"><i>Level 3</i></td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;"><i>Level 4</i></td> <td style="text-align: center;">1</td> </tr> <tr> <td colspan="2">2) Locality</td> </tr> <tr> <td>To Qualify bidder must include proof of business address in the Northern Cape Province older than two years and proof of business address in the Northern Cape in the month of closing of tender</td> <td style="text-align: center;">16</td> </tr> <tr> <td style="text-align: center;">Maximum Total Points</td> <td style="text-align: center;">20</td> </tr> </tbody> </table> <p>Note to tenderers: 1) The tenderer must indicate how they claim points for each Specific Goal in SBD6.1 2) Bidders with B-BBEE Level 5-8 and is not located in the Northern Cape Province can still tender but will not claim points for specific goals</p>	The specific goals allocated points in terms of this tender	Number of points allocated	1) Enterprises with B-BBEE Procurement Recognition		<i>Level 1</i>	4	<i>Level 2</i>	3	<i>Level 3</i>	2	<i>Level 4</i>	1	2) Locality		To Qualify bidder must include proof of business address in the Northern Cape Province older than two years and proof of business address in the Northern Cape in the month of closing of tender	16	Maximum Total Points	20
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<i>Level 2</i>	3																		
<i>Level 3</i>	2																		
<i>Level 4</i>	1																		
2) Locality																			
To Qualify bidder must include proof of business address in the Northern Cape Province older than two years and proof of business address in the Northern Cape in the month of closing of tender	16																		
Maximum Total Points	20																		
C.3.13	<p>Tender offers will only be accepted if: a) the tenderer is registered with the Construction Industry Development Board in an appropriate</p>																		

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	<p>contractor grading designation;</p> <p>b) 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;</p> <p>c) the tenderer has not:</p> <p>i) abused the employer's supply chain management system; or</p> <p>ii) failed to perform on any previous contract and has been given a written notice to this effect; and</p> <p>e) has completed the Compulsory Enterprise Questionnaire, SBD4, 6.1, 7.2, 8, 9 and the 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.</p> <p>f) Has submitted the documentation listed in F2.23</p>
C.3.17	Provide to the successful tenderer one copy of the signed contract document.

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Annex C

Standard conditions of tender

(As per Construction Development Board, Government Gazette No42622, 08 August 2019)

C.1 General

C.1.1 Actions

C.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 C.2 and C.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

C.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.

C.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.

C.1.2 Tender Documents

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

C.1.3 Interpretation

C.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.

C.1.3.2 These conditions of tender, the tender data and tender schedules which are required for tender evaluation purposes, shall form part of any contract arising from the invitation to tender.

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

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

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- i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfill his or her duties impartially;
 - ii) an individual or tenderer 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 tenderer who 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;

C.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.

C.1.5 Cancellation and Re-Invitation of Tenders

C.1.5.1 An employer 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 engineering and construction works specified in the invitation;
- b) funds are no longer available to cover the total envisaged expenditure; or
- c) no acceptable tenders are received.
- d) there is a material irregularity in the tender process.

C.1.5.2 The decision to cancel a tender invitation must be published in the same manner in which the original tender invitation was advertised

C.1.5.3 An employer may only with the prior approval of the relevant treasury cancel a tender invitation for the second time.

C.1.6 Procurement procedures

C.1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to C.3.13, be concluded with the tenderer who in terms of C.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.

C.1.6.2 Competitive negotiation procedure

C.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 C.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of C.8 relating to the

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material deviations or qualifications which affect the competitive position of tenderers shall not apply.

C.1.6.2.2 All responsive tenderers or at least a minimum of not less than three responsive tenderers that are highest ranked in terms of the evaluation criteria stated in the tender data shall be invited to enter into competitive negotiations based on the principle of equal treatment, keeping confidential the proposed solutions and associated information.

Notwithstanding the provisions of C.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.

C.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to revise their 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.

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

C.1.6.3 Proposal procedure using the two stage-system

C.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.

C.1.6.3.2 Option 2

C.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.

C.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.

C.2 Tenderer's obligations

C.2.1 Eligibility

C.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.

C.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.

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C.2.2 Cost of tendering

C.2.2.1 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.

C.2.2.2 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.

C.2.3 Check documents

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

C.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.

C.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.

C.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.

C.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.

C.2.8 Seek clarification

Request clarification of the tender documents, if necessary, by notifying the employer at least five (5) working days before the closing time stated in the tender data.

C.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.

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C.2.10 Pricing the tender offer

- C.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 fourteen (14) days before the closing time stated in the tender data.
- C.2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.
- C.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.
- C.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.

C.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.

C.2.12 Alternative tender offers

- C.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.
- C.2.12.2 Accept that an alternative tender offer must be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.
- C.2.12.3 An alternative tender offer must only be considered if the main tender offer is the winning tender.

C.2.13 Submitting a tender offer

- C.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 identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.
- C.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.
- C.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.
- C.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.

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- C.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.
- C.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.
- C.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.
- C.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.
- C.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.

C.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.

C.2.15 Closing time

- C.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.
- C.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.

C.2.16 Tender offer validity

- C.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.
- C.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.
- C.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. If the validity period stated in
- C.2.16 lapses before the employer evaluating tender, the contractor reserves the right to review the price based on Consumer Price Index (CPI).
- C.2.16.4 Where a tender submission is to be substituted, a tenderer must submit a substitute tender in accordance with the requirements of C.2.13 with the packages clearly marked as "SUBSTITUTE".

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C.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 C.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.*

C.2.18 Provide other material

C.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.

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

C.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.

C.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.

C.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.

C.2.22 Return of other tender documents

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

C.2.23 Certificates

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

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C.3 The employer’s undertakings

C.3.1 Respond to requests from the tenderer

C.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five (5) working days before the tender closing time stated in the Tender Data and notify all tenderers who collected tender documents.

C.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.

C.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 (3) working 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 collected tender documents.

C.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.

C.3.4 Opening of tender submissions

C.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.

C.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.

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

C.3.5 Two-envelope system

C.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

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at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

C.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.

C.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.

C.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.

C.3.8 Test for responsiveness

C.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.

C.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.

C.3.9 Arithmetical errors, omissions and discrepancies

C.3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

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- C.3.9.2 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with C.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.

C.3.9.3 Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

- C.3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:
- a) 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.
 - b) 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.

C.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.

C.3.11 Evaluation of tender offers

The Standard Conditions of Tender standardize the procurement processes, methods and procedures from the time that tenders are invited to the time that a contract is awarded. They are generic in nature and are made project specific through choices that are made in developing the Tender Data associated with a specific project.

Conditions of tender are by definition the document that establishes a tenderer's obligations in submitting a tender and the employer's undertakings in soliciting and evaluating tender offers. Such conditions establish the rules from the time a tender is advertised to the time that a contract is awarded and require employers to conduct the process of offer and acceptance in terms of a set of standard procedures.

The CIDB Standard Conditions of Tender are based on a procurement system that satisfies the following system requirements:	
Requirement	Qualitative interpretation of goal
Fair	The process of offer and acceptance is conducted impartially without bias, providing simultaneous and timely access to participating parties to the same information.
Equitable	Terms and conditions for performing the work do not unfairly prejudice the interests of the parties.

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Transparent	The only grounds for not awarding a contract to a tenderer who satisfies all requirements are restrictions from doing business with the employer, lack of capability or capacity, legal impediments and conflicts of interest.
Competitive	The system provides for appropriate levels of competition to ensure cost effective and best value outcomes.
Cost effective	The processes, procedures and methods are standardized with sufficient flexibility to attain best value outcomes in respect of quality, timing and price, and least resources to effectively manage and control procurement processes.

The activities associated with evaluating tender offers are as follows:

- a) Open and record tender offers received
- b) Determine whether or not tender offers are complete
- c) Determine whether or not tender offers are responsive
- d) Evaluate tender offers
- e) Determine if there are any grounds for disqualification
- f) Determine acceptability of preferred tenderer
- g) Prepare a tender evaluation report
- h) Confirm the recommendation contained in the tender evaluation report

C.3.11.1 General

The employer must appoint an evaluation panel of not less than three persons conversant with the proposed scope of works to evaluate each responsive tender offer using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

C.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.

C.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,
- a) 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 No. 2008, bankrupt or being wound up, has his/her affairs administered by a court or a judicial officer, has suspended his/her 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

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g) of interest.

C.3.14 Prepare contract documents

C.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

C.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.

C.3.16 Registration of the award

An employer must, within twenty-one (21) working days from the date on which a contractor's offer to perform a construction works contract is accepted in writing by the employer, register and publish the award on the CIDB Register of Projects.

C.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.

C.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.

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Part T2: Returnable Schedules

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T2.1: List of Returnable Documents

The complete tender document as received from the employer, together with all additional documentation as requested, must be submitted. No documentation must be removed from the tender document.

The tenderer must complete the following returnable documents:

- 1 Returnable Schedules required only for tender evaluation purposes**
 - Resolution of board of directors / members / partners
 - Resolution of Board of Directors / Members / Sole Proprietor/ Partners of Partnership (if applicable)
 - Special Resolution of Joint Venture Partners
 - Compulsory Enterprise Questionnaire
 - Record of Addenda to Tender Documents
 - Proposed Amendments and Qualifications
 - Schedule of Subcontractors
 - Capacity of Tenderer
 - Site inspection certificate
 - Health and Safety Specification acknowledgement receipt
- 2 Other documents that must be submitted for tender evaluation purposes**
 - A valid Tax Compliance Status pin as issued by the South African Revenue Services
 - Proof of active Contractor Registration issued by the Construction Industry Development Board - Compulsory
 - An original and valid B-BBEE Status Level verification Certificate, SANAS approved or certified copy thereof or DTIC / CIPC certificate or sworn affidavit. JV B-BBEE Certificate or sworn affidavit to be submitted
 - Proof of registration of Closed Corporation/Company or other legal entities applicable to tender - Certified copy
 - Letter of good standing from the Compensation Commissioner - Compulsory
- 3 Returnable Schedules that will be incorporated into the contract and are compulsory to be completed**
 - Form SBD 1: Invitation to Bid
 - Form SBD 4: Bidder's Declaration of Interest
 - Form SBD 6.1: Preference points claim form in terms of the preferential procurement regulations, 2022
- 4 Other documents that will be incorporated into the contract:**
 - Health and Safety Specification for General Construction Activities.
 - Code of Conduct for outside organisations working in a National Park.
 - Environmental Management Plan for General Construction Activities.
- 5 C1.1 Offer and Acceptance (the offer portion of C1.1)**
- 6 C1.2 Contract Data (Part 2)**
- 7 C2.2 Bills of Quantities**

This returnable schedule needs to be completed if the tenderer is a company or other legal person.

Contractor

Witness for
Contractor

Employer

Witness for
Employer

Site Inspection Certificate

This is to certify that I,

Representing

Company

Position

Visited the site on

I have made myself familiar with all local conditions likely to influence the work and the cost thereof. I further certify that I am satisfied with the description of the work and explanations given at the site inspection meeting and that I understand perfectly the work to be done, as specified and implied, in the execution of this contract.

Name Tenderer's Representative	Position	Signed

Name of Tenderer	Date

Name of Employer's Representative	Signature	Date

Contractor

Witness for Contractor

Employer

Witness for Employer



This returnable schedule needs to be completed if the tenderer is a company or other legal person.

Resolution of Board of Directors / Members / Partners

RESOLUTION of a meeting of the Board of *Directors / Members / Partners of:

(legally correct full name and registration number, if applicable, of the Enterprise)

Held at _____ (place)

On _____ (date)

RESOLVED that:

1. The Enterprise submits a Tender to the South African National Parks in respect of the following project:

(project description as per Tender Document)

Tender Number: _____ (Tender Number as per Tender Document)

2. *Mr/Mrs/Ms: _____

in *his/her Capacity as : _____ (Position in the Enterprise)

and who will sign as follows: : _____

be, and is hereby, authorised to sign the Tender, and any and all other documents and/or correspondence in connection with and relating to the Tender, as well as to sign any Contract, and any and all documentation, resulting from the award of the Tender to the Enterprise mentioned above.

	Name	Capacity	Signature
1			
2			
3			
4			
5			
6			

Note:

- * Delete which is not applicable
- NB.** This resolution must be signed by all the Directors / Members / Partners of the Tendering Enterprise
- Should the number of Directors / Members/Partners exceed the space available above, additional names and signatures must be supplied on a separate page

ENTERPRISE STAMP

Contractor

Witness for Contractor

Employer

Witness for Employer



This returnable schedule needs to be completed if the tenderer is a joint venture. This form must be completed by each partner of the joint venture. The name of the principal partner must be stated under Point 2.

Resolution of Board of Directors / Members / Sole Proprietor/ Partners of Partnership (i.e. of each legal person to comprise the Joint Venture Partnership)

RESOLUTION of a meeting of the Board of *Directors / Members / Sole Proprietor/ Partners of:

(Legally correct full name and registration number, if applicable, of the Enterprise)

Held at _____ *(place)*

On _____ *(date)*

RESOLVED that:

- 1. The Enterprise submits a Tender, in Joint Venture with the following Enterprises:

(List all the legally correct full names and registration numbers, if applicable, of the Enterprises forming the Joint Venture)

to the South African National Parks in respect of the following project:

(Project description as per Tender Document)

Tender Number: _____ *(Tender Number as per Tender Document)*

- 2. The Principal Partner of the Joint Venture will be

(Legally correct full name and registration number, if applicable, of the Principal Partner of Joint Venture)

- 3. *Mr/Mrs/Ms: _____

in *his/her Capacity as: _____ *(Position in the Enterprise)*

and who will sign as follows: _____

be, and is hereby, authorized to sign a joint venture agreement with the parties listed under item 1 above, and any and all other documents and/or correspondence in connection with and relating to the joint venture, in respect of the project described under item 1 above.

- 4. The Enterprise accepts joint and several liability with the parties listed under item 1 above for the due fulfilment of the obligations of the joint venture deriving from, and in any way connected with, the Contract to be entered into with the South African National Parks in respect of the project described under item 1 above.

- 5. The Enterprise chooses as its *domicilium citandi et executandi* for all purposes arising from this joint venture agreement and the Contract with the South African National Parks in respect of the project under item 1 above:

Physical address: _____

Contractor

Witness for Contractor

Employer

Witness for Employer



 _____ (code)

Postal Address: _____

 _____ (code)

Telephone number: _____ (code)

Fax number: _____ (code)

	Name	Capacity	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Note:

- * Delete which is not applicable*
- NB.** *This resolution must be signed by all the Directors / Members / Partners of the Bidding Enterprise*
- Should the number of Directors / Members/Partners exceed the space available above, additional names and signatures must be supplied on a separate page*

ENTERPRISE STAMP

 Contractor

 Witness for Contractor

 Employer

 Witness for Employer

This returnable schedule needs to be completed if the tenderer is a joint venture.

Special Resolution of Joint Venture Partners

RESOLUTION of a meeting of the duly authorised representatives of the following legal entities who have entered into a joint venture to jointly tender for the project mentioned below: *(legally correct full names and registration numbers, if applicable, of the Enterprises forming a Joint venture)*

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

Held at _____ (place) On _____ (date)

RESOLVED that:

A. The above-mentioned Enterprises submit a tender in joint venture partnership to the South African National Parks in respect of the following project:

(Project description as per Tender Document)

Tender Number: _____ *(Tender Number as per Tender Document)*

B. Mr/Mrs/Ms: _____

in *his/her Capacity as: _____ *(Position in the Enterprise)*

and who will sign as follows: _____

Contractor

Witness for Contractor

Employer

Witness for Employer



be, and is hereby, authorised to sign the Tender, and any and all other documents and/or correspondence in connection with and relating to the Tender, as well as to sign any Contract, and any and all documentation, resulting from the award of the Tender to the Enterprises in joint venture mentioned above.

- C. The Enterprises constituting the Joint Venture, notwithstanding its composition, shall conduct all business under the name and style of: _____
- D. The Enterprises to the Joint Venture accept joint and several liability for the due fulfilment of the obligations of the Joint Venture deriving from, and in any way connected with, the contract entered into with the South African National Parks in respect of the project described under item A above.
- E. Any of the Enterprises to the Joint Venture intending to terminate the Joint Venture agreement, for whatever reason, shall give the South African National Parks 30 days written notice of such intention. Notwithstanding such decision to terminate, the Enterprises shall remain jointly and severally liable to the South African National Parks for the due fulfilment of the obligations of the Joint Venture as mentioned under item D above.
- F. No Enterprise to the Joint Venture shall, without the prior written consent of the other Enterprises to the Joint Venture and of the South African National Parks, cede any of its rights or assign any of its obligations under the Joint Venture agreement in relation to the contract with the South African National Parks referred to herein.
- G. The Enterprises choose as the *domicilium citandi et executandi* of the Joint Venture for all purposes arising from the Joint Venture agreement and the contract with the South African National Parks in respect of the project under item A above:

Physical address: _____

 _____ (code)

Postal Address: _____

 _____ (code)

Telephone number: _____ (code)

Fax number: _____(code)

	Name	Capacity	Signature
1			
2			
3			
4			
5			
6			
7			

 Contractor

 Witness for Contractor

 Employer

 Witness for Employer



	Name	Capacity	Signature
8			
9			
10			
11			
12			
13			
14			
15			

Note:

- * Delete which is not applicable*
- NB.** *This resolution must be signed by all the Duly Authorised Representatives of the Legal Entities to the Joint Venture submitting this Tender*
- Should the number of Duly Authorised Representatives of the Legal Entities joining forces in this Tender exceed the space available above, additional names and signatures must be supplied on a separate page*
- Resolutions, duly completed and signed, from the separate Enterprises who participate in this Joint venture must be attached to the Special Resolution*

Contractor

Witness for Contractor

Employer

Witness for Employer



Capacity of Tenderer

1. **WORK CAPACITY:** *(The Tenderer is requested to furnish the following full particulars, attach additional pages if more space is required. Failure to furnish the particulars may result in the Tender being disregarded.)*

Skilled artisans employed		Unskilled employees employed	
Categories of artisans	Number	Categories of employees	Number
Machinery	Plant	Workshops	

Contractor

Witness for Contractor

Employer

Witness for Employer

2. QUALIFICATIONS AND EXPERIENCE OF PROPOSED SITE SUPERVISION TEAM FOR THE PROJECT

Tenderer to provide name(s), key qualifications and experience of site supervision team that will supervise the project on behalf of the Contractor.

Contractor

Witness for
Contractor

Employer

Witness for
Employer



3. PARTICULARS OF COMMITMENTS WHICH THE TENDERER HAS PREVIOUSLY COMPLETED AND PRESENTLY ENGAGED WITH:

3.1. Current projects:

Project	Place (town)	Reference / Contact person	Contact Tel. No.	Contract amount	Contract period	Date of commencement	Scheduled date of completion
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

Contractor

Witness for Contractor

Employer

Witness for Employer

3.2. Previous projects:

Project	Place (town)	Reference / Contact person	Contact Tel. No.	Contract amount	Contract period	Date of commencement	Scheduled date of completion	Actual date of completion
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Contractor

Witness for Contractor

Employer

Witness for Employer

Tender Sum Breakdown

Category	Amounts included in the Tender Sum	% of TS
Overheads		
Supervision		
Materials		
Plant		
Labour		
Daywork provision		
Total = Tender Sum (TS)		

Example of application of F.4.1 of the Tender Data

Category	Portion of TS	Portion of AT	% of AT
Overheads	150,000	131,250	13.125
Supervision	150,000	131,250	13.125
Materials	400,000	350,000	35.00
Plant	100,000	87,500	8.75
Labour	200,000	175,000*	17.5
Total = Tender Sum (TS)	1,000,000	875,000	
Daywork provision	N/a	125,000*	12.5.
Total Adjusted Tender (AT)	N/a	1,000,000	100.0

***Note:** In this example the amount that is to be paid to labour is R300,000.

Contractor

Witness for
Contractor

Employer

Witness for
Employer



Proposed Subcontractors

In order to complete the Works under this Contract, I/we propose to employ the following subcontractors to carry out the portion/type of work as detailed.

There is a portion of the works which will require the services of either a Building subcontractor, a Civil Works subcontractor and possibly an Electrical subcontractor.

It is envisaged that the Mechanical Contractor will be the principal contractor and that the civils and/or building and /or electrical contractor will be the subcontractors.

(Note: All proposed subcontractors must be listed. Contractors must note that should they be successful, the subcontractors listed MUST be the subcontractors employed on the contract.)

Subcontractor: Name, Address and Telephone No.	Portion/type of work to be undertaken	Estimated value of work

Name	Position	Signed

Name of Tenderer	Date

Contractor

Witness for
Contractor

Employer

Witness for
Employer

Proposed Amendments and Qualifications

Should the Tenderer desire to make any departures from or modifications to the General Conditions of Contract, Contract Specific Data, Specifications, Bill of Quantities or Drawings, or to qualify his tender in any way, he must set out his proposals clearly hereunder, or alternatively state them in a covering letter attached to his tender and referred to hereunder, failing which the tender will be deemed to be unqualified.

If no departure or modifications are desired, the schedule hereunder must be marked "NIL", and signed by the Tenderer.

Page	Clause or item	Proposed amendment and/or qualification

Name	Position	Signed

Name of Tenderer	Date

Contractor

Witness for
Contractor

Employer

Witness for
Employer



Compulsory Enterprise Questionnaire

The following particulars must be furnished. In the case of a joint venture, separate enterprise questionnaires in respect of each partner must be completed and submitted.

Section 1: Name of enterprise:

Section 2: VAT registration number, if any:

Section 3: CIDB registration number, if any:

Section 4: Particulars of sole proprietors and partners in partnerships

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
- an employee, director or board member of or otherwise employed by or contracted to the South African National Parks, or had or has any contractual relationships of any kind with the South African National Parks.

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

Contractor

Witness for Contractor

Employer

Witness for Employer



* insert separate page if necessary

Section 7: Record of spouses, children and parents in the service of the state

Indicate by marking the relevant boxes with a cross, if any spouse, child or parent of a 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 been 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
- an employee, director or board member of or otherwise employed by or contracted to the South African National Parks, or had or has any contractual relationships of any kind with the South African National Parks.

Name of spouse, child or parent	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

*insert separate page if necessary

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise:

- i) authorizes the Employer to obtain a tax clearance certificate from the South African Revenue Services that my / our tax matters are in order;
- ii) confirms that the neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act of 2004;
- iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption;

Contractor

Witness for Contractor

Employer

Witness for Employer



iv) confirms that I / we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the tenderers or those responsible for compiling the scope of work that could cause or be interpreted as a conflict of interest; and
iv) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

Name	Position	Signed

Name of Tenderer	Date

--

Contractor

--

Witness for Contractor

--

Employer

--

Witness for Employer



Record of Addenda to tender documents

I / We confirm that the following communications received from the South African National Parks before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer: *(Attach additional pages if more space is required)*

	Date	Title or Details
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

Attach additional pages if more space is required.

Name	Position	Signed

Name of Tenderer	Date

Contractor

Witness for Contractor

Employer

Witness for Employer



HEALTH AND SAFETY SPECIFICATION ACKNOWLEDGEMENT RECEIPT

Contractor's Acknowledgement:

I, _____ representing

_____ (Contractors), have satisfied myself with the content of this Health and Safety Specification and Baseline Risk Assessment and have made the relevant provision under my Preliminary & General Section C6 for any and all costs involved to ensure compliance of this Specification and shall we be the successful contractor, we shall ensure that our employees and contractors on site comply with the requirements of these documents, our safety documentation and health and safety legislation

Signature of Contractor

Date

Comments:

Contractor

Witness for Contractor

Employer

Witness for Employer

BIDDER'S DISCLOSURE

1. PURPOSE OF THE FORM

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

2. BIDDER'S DECLARATION

2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest¹ in the enterprise, employed by the state? **YES/NO**

2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

Full Name	Identity Number	Name of State institution

2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution? **YES/NO**

2.2.1 If so, furnish particulars:

.....
.....

¹ the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

Contractor

Witness for Contractor

Employer

Witness for Employer



2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract? **YES/NO**

2.3.1 If so, furnish particulars:

.....
.....

3 DECLARATION

I, the undersigned, (name) in submitting the accompanying bid, do hereby make the following statements that I certify to be true and complete in every respect:

- 3.1 I have read and I understand the contents of this disclosure;
- 3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;
- 3.3 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 consortium² will not be construed as collusive bidding.
- 3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 3.4 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.
- 3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.
- 3.6 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.

² 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.

[Signature box for Contractor]

Contractor

[Signature box for Witness for Contractor]

Witness for Contractor

[Signature box for Employer]

Employer

[Signature box for Witness for Employer]

Witness for Employer



I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....
Signature

.....
Date

.....
Position

.....
Name of bidder

Contractor

Witness for Contractor

Employer

Witness for Employer

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 invitations to tender:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included)

1.2 To be completed by the organ of state

- a) The applicable preference point system for this tender is the **80/20** preference point system.
- b) The **80/20 preference point system** will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.

1.3 Points for this tender (even in the case of a tender for income-generating contracts) 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 organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

- (a) **“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;

Contractor

Witness for
Contractor

Employer

Witness for
Employer

- (b) **“price”** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;
- (c) **“rand value”** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;
- (d) **“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; and
- (e) **“the Act”** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

3.2. FORMULAE FOR DISPOSAL OR LEASING OF STATE ASSETS AND INCOME GENERATING PROCUREMENT

3.2.1. POINTS AWARDED FOR PRICE

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

80/20

$$Ps = 80 \left(1 + \frac{Pt - P_{max}}{P_{max}} \right)$$

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmax = Price of highest acceptable tender

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.

Contractor

Witness for
Contractor

Employer

Witness for
Employer

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

(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.)

Note to service provider: The service provider must indicate how they claim points for each preference point system. Points will be allocated according to the points claimed in the table below.

The specific goals allocated points in terms of this tender	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (80/20 system) (To be completed by the tenderer)
1) Enterprises with B-BBEE Procurement Recognition		
Enterprises with B-BBEE Procurement Recognition <i>Level 1</i>	4	
Enterprises with B-BBEE Procurement Recognition <i>Level 2</i>	3	
Enterprises with B-BBEE Procurement Recognition <i>Level 3</i>	2	
Enterprises with B-BBEE Procurement Recognition <i>Level 4</i>	1	
2) Locality		
To Qualify bidder must include proof of business address in the Northern Cape Province older than two years and proof of business address in the Northern Cape in the month of closing of tender	16	
Maximum Total Points	20	

Note to service provider: The service provider must indicate how they claim points for each preference point system. Points will be allocated according to the points claimed in the table below.

DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/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:

Contractor

Witness for Contractor

Employer

Witness for Employer



- 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 organ of state 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, if deemed necessary.

SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME: _____

DATE: _____

ADDRESS: _____

Contractor

Witness for Contractor

Employer

Witness for Employer

Local content:

South African National Parks (SANParks) supports the inclusion of locally manufactured materials and goods in the Construction of **CONTRACT NO: CI-GK-0028/1** Kgalagadi Transfrontier Park - Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps.

The list of materials as specified for this contract is provided and tenderers are requested to complete it in full.

Declaration by bidder:

Description of item (s)	Product Description	Percentage threshold for local content required	Bidders' declaration (%) on local content to be used during construction	Comment if lower content is specified
Cement	Pure Portland cement with 95-100% clinker (Cem I)	100%		
Steel Products and Components for Construction	All Wire Products: All barbed wire and mesh fencing; fabric/mesh reinforcing; gabions; wire; rope/tacks; springs and screws	100%		
Company name				
Name & surname of the signatory				
Signing Capacity				
Signature				
Date				

Contractor

Witness for Contractor

Employer

Witness for Employer

2: The Contract

Contractor

Witness for
Contractor

Employer

Witness for
Employer

Part C1: Agreement and contract data

Contractor

Witness for
Contractor

Employer

Witness for
Employer



C1.1 Form of Offer and Acceptance

Offer

The employer, identified in the acceptance signature block, has solicited offers to enter into a contract for the procurement of:

CONTRACT CI-KH-0028/1 Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps.

The tenderer, identified in the offer signature block, has examined the documents listed in the tender data and addenda thereto as listed in the returnable 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:

..... Rand (in words);

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 form of offer to the tenderer before the end of the period of validity stated in the tender data, whereupon the tenderer becomes the party named as the contractor in the conditions of contract identified in the contract data.

Signature(s)		Date	
Name(s)			
Capacity			
For the Tenderer			
Name of tenderer (Company)			
Address of tenderer			
Name of witness			
Signature of witness		Date	

Contractor

Witness for Contractor

Employer

Witness for Employer



Acceptance

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

The terms of the contract, are contained in:

- Part C1: Agreements and contract data, (which includes this agreement)
- Part C2: Pricing data
- Part C3: Scope of work.
- Part C4: Site information

and drawings and documents or parts thereof, which may be incorporated by reference into Parts 1 to 4 above.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as 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.

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. Failure to fulfil 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 signed and fully completed Form of Offer and Acceptance, including the schedule of deviations (if any). Unless the tenderer (now contractor) within five working days of the date of such receipt notifies the employer in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the parties.

Signature(s)		Date	
Name(s)			
Capacity			
For the Employer			
Name of Employer	South African National Parks		
Address of tenderer	643 Leyds Street Muckleneuk 0002 P O Box 787 Pretoria 0001		
Name of witness			
Signature of witness		Date	

Contractor

Witness for Contractor

Employer

Witness for Employer



Schedule of Deviations

Notes

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

1	Subject
	Details

2	Subject
	Details

3	Subject
	Details

4	Subject
	Details

5	Subject
	Details

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

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

Contractor

Witness for Contractor

Employer

Witness for Employer



For the Tenderer:

Signature(s)

Name(s)

Capacity

(Name of organization/tenderer)

(Address of organization/tenderer)

.....

Name and signature of witness

Date

.....

For the Employer:

Signature(s)

Name(s)

Capacity

(Name and address of organization) The South African National Parks

Name and signature of witness

Date

.....

Contractor signature box

Contractor

Witness for Contractor signature box

Witness for Contractor

Employer signature box

Employer

Witness for Employer signature box

Witness for Employer



Confirmation of Receipt

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

the.....(day) of (month) 20.....(year) at (place)

For the Contractor:

Signature(s)

Name(s)

Capacity

Name and signature of witness

Date

.....

Contractor

Witness for Contractor

Employer

Witness for Employer

Part 1: Contract Data provided by the Employer

The General Conditions of Contract for Construction Works, Third Edition, 2015 published by the South African Institution of Civil Engineering, Private Bag X200, Halfway House, 1685, is applicable to this Contract and copies of these Conditions of Contract may be obtained from the South African Institution of Civil Engineering (Tel 011-805 5947) www.saice.org.za.

The General Conditions of Contract make several references to the Contract Data for specific data, which together with these conditions collectively describe the risks, liabilities and obligations of the contracting parties and the procedures for the administration of the Contract. The Contract Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the General Conditions of Contract.

Each item of data given below is cross-referenced to the clause in the General Conditions of Contract for Construction Works, Third Edition, 2015, to which it mainly applies.

The variations to the General Conditions of Contract are:

CLAUSE	DESCRIPTION / WORDING
1.1.1	The term “the Engineer” shall be taken to mean “the Employer’s Agent” as defined in clause 1.1.1.16, where “the Engineer” is used in other documentation (for example SANS / SABS standardised specifications and particular specifications in this tender document – see also C3 Scope of Work, Construction, Specifications for further “mapping of definitions”).
1.1.1.13	The Defects Liability Period is 12 (twelve) months.
1.1.1.14	The maintenance works of each financial cycle must be completed between beginning April and end July (or as per mutual agreement with the Clients representative). The time for achieving Practical Completion for each financial cycle will be the end of July of the applicable financial cycle, e.g.; <ul style="list-style-type: none"> • Financial year 2022/23 – 31 October 2023, • Financial year 2023/24 – 31 July 2024 and • Financial year 2024/25 – 31 July 2025.
1.1.1.15	The name of the Employer is: the Chief Executive Officer, SOUTH AFRICAN NATIONAL PARKS represented by The General Manager: Infrastructure & Special Projects and/or such other person or persons duly authorised thereto by the Employer in writing.
1.1.1.16	The name of the Employer’s Agent is: Infrastructure & Special Projects or their successors duly appointed by the Employer.
1.1.1.26	The Pricing Strategy is a Re-measurement Contract .
1.2.1.2	The Employer’s address for receipt of communications and notices is: <p>Physical address: South African National Parks The General Manager: Infrastructure & Special Projects. 643 Leyds Street Muckleneuk Pretoria 0002</p> <p>Postal Address: Postal Address: PO Box 787 Pretoria 0001 Telephone: (012) 426 5260</p>

Contractor

Witness for
Contractor

Employer

Witness for
Employer

<p>1.2.1.2</p>	<p>The address of the Employer’s Agent is: BVI Consulting Engineers Northern Cape (Pty) Ltd</p> <p>Physical address: 55 Bult Street Die Rand Upington 8800</p> <p>Postal Address: Po Box 1155 Upington 8800</p> <p>E-mail: gertm@bvinc.co.za Telephone: (054) 337 6600</p>				
<p>3.1.3</p>	<p>The Employer’s Agent shall obtain the specific approval of the Employer before executing any of his functions or duties according to the following Clauses of the General Conditions of Contract:</p> <ol style="list-style-type: none"> 1. Clause 3.2.1 Nomination of Employer’s Agent’s Representative 2. Clause 3.2.4 Employer’s Agent’s authority to delegate 3. Clause 5.8.1 Non-working times 4. Clause 5.11.1 Suspension of the Works 5. Clause 5.12.4 Acceleration instead of extension of time 6. Clause 6.3.2 Orders for variations to be in writing 7. Clause 10.1.1 Contractor’s claim 				
<p>5.2.1</p>	<p>Add: The Employer’s Agent will issue a Site Instruction for the planned works. The Contractor must comply to the requirements as set out in clause 5.3.1 and commence the work within 14 days after the Site Instruction.</p>				
<p>5.3.1</p>	<p>The documentation to be submitted by the Contractor before commencement with Works execution are:</p> <ol style="list-style-type: none"> (1) Health and Safety Plan (Refer to Clause 4.3) (2) Initial programme (Refer to Clause 5.6)- a program must be submitted for each work order issued (3) Insurance (Refer to Clause 8.6) (4) Occupational Health and Safety Agreement (C1.4 of the Contract Document) (5) Letter of Good Standing from the Compensation Commissioner (if not insured with a Licensed Compensation Insurer) (6) A signed Agreement between the Employer and the Contractor for the Works to be completed by the Contractor in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act (Act No.85 of 1993) and the Construction Regulations promulgated thereunder (Refer to Clause 4.3). (7) Proof to the Employer, of payment, that the Contractor has paid all contributions required in terms of the Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993 (Refer to Clause 4.3). 				
<p>5.3.2</p>	<p>(a) The time to submit the documentation required before commencement with Works execution is 14 days.</p>				
<p>5.4.2</p>	<p>The access and possession of Site shall not be exclusive to the Contractor but shall be as set out elsewhere in the Contract.</p>				
<p>5.8</p>	<p>Delete the words “between sunrise and sunset” in the first line and replace with “within normal working hours”.</p> <p style="text-align: center;">Add the following:</p> <p>“Normal working hours shall be between 07h00 and 17h00 (season dependant) on weekdays from Monday to Friday and from 07h00 until 13h00 on Saturdays. Note that the parks access gates are locked after hours and the Contractor shall make provision for transporting his staff off site in good time. The park seasonal hours are;</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Winter: April - September</td> <td>07:00 - 17:00</td> </tr> <tr> <td>Summer: October - March</td> <td>06:00 - 18:00</td> </tr> </table>	Winter: April - September	07:00 - 17:00	Summer: October - March	06:00 - 18:00
Winter: April - September	07:00 - 17:00				
Summer: October - March	06:00 - 18:00				

Contractor

Witness for
Contractor

Employer

Witness for
Employer



<p>5.8.1</p>	<p>The non-working days are Saturday and Sundays.</p> <p>The special non-working days are: (1) All gazetted public holidays falling outside the year end break. (2) The year end-break as determined by the South African Forum of Civil Engineering Contractors (www.safcec.org.za).</p> <p>The special non-working days are:</p> <p>Any statutory public holiday in terms of the Public Holidays Act, and, where such statutory public holiday falls on a Sunday, and the next Monday subsequently becomes a statutory public holiday in terms of the Public Holidays Act, then both the relevant Sunday and the relevant Monday shall be special non-working days under the contract;</p> <p>And any proclaimed statutory day of mourning</p> <p>And any proclaimed statutory election day which is proclaimed as a statutory public holiday</p> <p>And all annual year-end shutdown periods as recommended by the South African Bargaining Council for the Civil Engineering Industry.</p>																										
<p>5.12.2.2</p>	<p>A delay caused by inclement weather conditions will be regarded as a delay only if, in the opinion of the Employer's Agent, all progress on an item or items of work on the critical path of the working programme of the contractor has been brought to a halt. Delays on working days only (based on a five-day working week) will be taken into account for the extension of time, but the Contractor shall make provision in his programme of work for an expected delay of "n" working days caused by normal rainy weather, for which he will not receive any extension of time, where "n" equals days per month.</p> <table border="1"> <thead> <tr> <th>Month</th> <th>"n" Working days</th> </tr> </thead> <tbody> <tr><td>January</td><td>2 days</td></tr> <tr><td>February</td><td>2 days</td></tr> <tr><td>March</td><td>2 days</td></tr> <tr><td>April</td><td>3 days</td></tr> <tr><td>May</td><td>3 days</td></tr> <tr><td>June</td><td>4 days</td></tr> <tr><td>July</td><td>4 days</td></tr> <tr><td>August</td><td>4 days</td></tr> <tr><td>September</td><td>3 days</td></tr> <tr><td>October</td><td>2 days</td></tr> <tr><td>November</td><td>2 days</td></tr> <tr><td>December</td><td>2 days</td></tr> </tbody> </table> <p>Extension of time during working days will be granted to the degree to which actual delays, as defined above, exceed the number of "n" working days.</p> <p>It shall be further noted that where the critical path is not affected, no extension of time for <u>abnormal</u> climatic conditions or for any other reason will be entertained.</p>	Month	"n" Working days	January	2 days	February	2 days	March	2 days	April	3 days	May	3 days	June	4 days	July	4 days	August	4 days	September	3 days	October	2 days	November	2 days	December	2 days
Month	"n" Working days																										
January	2 days																										
February	2 days																										
March	2 days																										
April	3 days																										
May	3 days																										
June	4 days																										
July	4 days																										
August	4 days																										
September	3 days																										
October	2 days																										
November	2 days																										
December	2 days																										
<p>5.13.1</p>	<p>The penalty for failing to complete the Works is R 3 500 per calendar day.</p>																										
<p>5.14.1</p>	<p>The requirements for achieving Practical Completion are when the works is fit for the intended purpose and occupation without danger or undue inconvenience to the employer.</p>																										
<p>5.16.3</p>	<p>The latent defects period is 5 Years, commencing on the day after the date of certification of Practical Completion.</p>																										
<p>6.2.1</p>	<p>No performance guarantee is required.</p>																										
<p>6.8.2</p>	<p>Contract Price Adjustment shall be applicable.</p> <p>The value of the certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule with the following values: The value of "x" is 0.10 The values of the coefficients are:</p>																										

Contractor

Witness for Contractor

Employer

Witness for Employer

	<p>a = [0.45] (labour) b = [0.30] (contractor's equipment) c = [0.15] (material) d = [0.10] (fuel – wholesale index) The urban area nearest Kimberley/ Northern Cape Province. The base month and year is the month prior to the month in which tenders close: April 2024</p>
6.8.3	Price adjustments for variations in the cost of special materials will not be allowed on this Contract.
6.8.4	<p><i>Add the following to Clause 6.8.4:</i></p> <p>Notwithstanding the above, in the event that a public holiday is proclaimed after 28 days before the closing date for Tenders, no costs other than those that can be claimed under Clause 5.12.3 shall be added to the contract price.</p>
6.10.1.5	The percentage advance on materials not yet built into the permanent Works is 0% .
6.10.3	The limit on retention is 10% total of the Contract Price (5% of cost payable at completion, and 5% after 12 month retention period – final completion). A guarantee in lieu of retention is not permitted.
6.10.4	<p>Replace the third paragraph of Clause 6.10.4 with the following:</p> <p>"The Employer shall pay the amount due to the Contractor within 30 days of receipt by the Employer of the payment certificate signed by the Engineer"</p>
8.6.1.1.2	The value of plant and materials supplied by the Employer to be included in the insurance sum is R0.
8.6.1.1.3	The amount to cover professional fees for repairing damage and loss to be included in the insurance sum is R200 000 (Two hundred thousand rand) .
8.6.1.2	A Coupon Policy for Special Risks Insurance issued by the South African Special Risks Insurance Association is not required.
8.6.1.3	The limit of indemnity for liability insurance is R10 000 000 for any single claim – the number of claims to be unlimited during the construction and Defects Liability Periods.
10.3.2	Amicable settlement in terms of Clause 10.4 shall be contemplated for all disputes prior to referring any dispute to adjudication or arbitration.
10.5.3	The number of Adjudication Board Members to be appointed is one .
10.7.1	The determination of disputes which are unresolved in terms of Clause 10.4.2 shall be by arbitration.

The additions to the General Conditions of Contract are:

Clause	Additions
A2	<p>Pro forma – Form of Offer and Acceptance The Form of Offer to be used shall be the Form of Offer bound in this document, which is not necessarily the same as that attached to the published version of the General Conditions of Contract.</p>
A3	<p>Pro forma - Deed of Guarantee The Deed of Guarantee shall be in the form bound in this document, which is not necessarily the same as that attached to the published version of the General Conditions of Contract.</p>

Contractor

Witness for
Contractor

Employer

Witness for
Employer

Part 2: Contract Data provided by the Contractor

Clause	Additions
Clause 1.1.1.9:	The name of the Contractor is
Clause 1.2.1.2:	The address of the Contractor is Physical :Postal :..... Address: Address:..... Telephone : Fax: Email :.....

Contractor

Witness for Contractor

Employer

Witness for Employer



Part 2: Contract Data provided by the Contractor

Clause	Item and data
1.2	The name of the Contractor is. The address of the Contractor is: Telephone: Facsimile: Cellphone: Address (physical): Address (postal): Email:

[Signature box for Contractor]

Contractor

[Signature box for Witness for Contractor]

Witness for Contractor

[Signature box for Employer]

Employer

[Signature box for Witness for Employer]

Witness for Employer



C1.3 Form of Guarantee

WHEREAS THE CHIEF EXECUTIVE, SOUTH AFRICAN NATIONAL PARKS (hereinafter referred to as "the Employer") entered into a Contract with

(hereinafter called "the Contractor") on the..... day of 20.... for **CONTRACT NO: CI-KH-0028/1 for PROVISION OF POTABLE WATER FOR TWEE RIVIEREN, NOSSOB AND MATA-MATA REST CAMPS.**

AND WHEREAS it is provided by such Contract that the Contractor shall provide the Employer with security by way of a guarantee for the due and faithful fulfilment of such Contract by the Contractor;

WHEREAS WE, (*name of Insurance Company/Bank*) have at the request of the Contractor, agreed to give such guarantee;

NOW THEREFORE WE do hereby guarantee and bind ourselves jointly and severally as Guarantor and Co principal Debtors to the Employer under renunciation of the benefits of division and excussion for the due and faithful performance by the Contractor of all the terms and conditions of the said Contract, subject to the following conditions:

1. The Employer shall, without reference and/or notice to us, have complete liberty of action to act in any manner authorized and/or contemplated by the terms of the said Contract, and/or to agree to any modifications, variations, alterations, directions or extensions of the Due Completion Date of the Works under the said Contract, and that its rights under this guarantee shall in no way be prejudiced nor our liability hereunder be affected by reason of any steps which the Employer may take under such Contract, or of any modification, variation, alterations of the Due Completion Date which the Employer may make, give, concede or agree to under the said Contract.
2. This guarantee shall be limited to the payment of a sum of money.
3. The Employer shall be entitled, without reference to us, to release any guarantee held by it, and to give time to or compound or make any other arrangement with the Contractor.
4. This guarantee shall remain in full force and effect until the issue of the Certificate of Completion in terms of the Contract, unless we are advised in writing by the Employer before the issue of the said Certificate of his intention to institute claims, and the particulars thereof, in which event this guarantee shall remain in full force and effect until all such claims have been paid or liquidated.

Contractor

Witness for Contractor

Employer

Witness for Employer



5. Our total liability hereunder shall not exceed the sum of
.....(In words)
(R)

6. The Guarantor reserves the right to withdraw from this guarantee by depositing the Guarantee Sum with the beneficiary, whereupon the Guarantor's liability hereunder shall cease.

7. We hereby choose our address for the serving of all notices for all purposes arising hereof as
.....
.....

IN WITNESS WHEREOF this guarantee has been executed by us at
.....

on this day of 20...

As witnesses:

1. Signature

2. Duly authorised to sign on behalf of

..... Address

.....
.....
.....

Contractor signature box

Contractor

Witness for Contractor signature box

Witness for Contractor

Employer signature box

Employer

Witness for Employer signature box

Witness for Employer



C1.4: Pro-Forma – OHS Mandatory Form

TO BE COMPLETED AND SIGNED BY ALL MANDATARIES

OCCUPATIONAL HEALTH AND SAFETY ACT NO. 85 OF 1993

Note: Section 1(1)(xxviii) of the Act defines a "Mandatory" as including "an Agent, a Contractor or a Subcontractor for Work."

The Employer and the Contractor hereby agree, in terms of the provisions of Section 37 (2) of the Occupational Health and Safety Act, Act No.85 of 1993, hereinafter referred to as "the Act", that the Contractor as an employer in its own right and in its capacity as Contractor for the execution of the works, shall have certain obligations and that the following arrangement shall apply between them to ensure compliance by the Contractor with the provisions of the Act, namely:-

- i. The Contractor undertakes to acquaint the appropriate officials and the employees of the Contractor with all relevant provisions of the Act, and the regulations promulgated in terms of the Act, and
- ii. The Contractor undertakes that all relevant duties, obligations and prohibitions imposed in terms of the Act and regulations will be fully complied with, and
- iii. The Contractor hereby accepts sole liability for such due compliance with the relevant duties, obligations and prohibitions imposed by the Act and regulations in respect of the work included in the Contract, and
- iv. The Contractor shall be obliged to report forthwith to the Employer any investigation, complaint, or criminal charge which may arise as a consequence of the provisions of the Act and regulations pursuant to work performed on behalf of the Employer, and shall, on written demand, provide full details in writing of such investigation, complaint or criminal charge.

Signed aton the day of 20.....

WITNESS:

.....
for and on behalf of **Contractor**

WITNESS:

.....
For and on behalf of the **Chief Executive Officer**
South African National Parks

Contractor

Witness for Contractor

Employer

Witness for Employer



C1.5: Pro-Forma – Declaration of Ownership of Unused Materials

DECLARATION OF OWNERSHIP OF UNUSED MATERIAL

FOR

CERTIFICATE OF PAYMENT NO:

I/We, the undersigned,

.....(Name of Contractor)

hereby declare that the materials for which payment is claimed in terms of Clause 6.10.1.5 of the General Conditions of Contract are:

(a) as described

* (i) on the copy of Invoice No. annexed hereto

* (ii) as set out in detail below

.....
.....
.....
.....

*delete whichever is not applicable.

(b) located at

.....
.....

c) totally owned by me/us and that no other party has any claim or right in respect of the above materials and that I am/we are free to pass ownership upon receipt of payment for such materials

(d) intended for incorporation into the permanent works of this Contract.

Signed at.....on this day of 20....

Witnesses:

Signature:

1.

Capacity:

2.

On behalf of:

Address:

.....
.....

Contractor

Witness for Contractor

Employer

Witness for Employer

Part C2: Pricing data

Contractor

Witness for
Contractor

Employer

Witness for
Employer

C2.1: Pricing Instructions

C2.1.1 PREAMBLE TO THE BILL OF QUANTITIES

- C2.1.1.1 The method of measurement published by the South African Bureau of Standards in Clause 8 of the Standardised Specifications for Civil Engineering Construction is applicable, subject to the variations and amendments contained in the section “Applicable SANS 1200 standardised specifications”.
- C2.1.1.2 Descriptions in the Schedule/Bill of Quantities are abbreviated and comply generally with those in the Standardised Specifications. Clause 8 of each Standardised Specification, read together with the relevant clauses of the Scope of Work, set out what ancillary or associated activities are included in the rates for the operations specified. Should any requirements of the measurement and payment clause of the applicable Standardised Specification, or the Scope of Work, conflict with the terms of the Schedule/Bill, the requirements of the Standardised or Scope of Work, as applicable, shall prevail.
- C2.1.1.3 The clauses in a specification in which further information regarding the schedule/bill item can be obtained appear under “Reference clause” in the Schedule. The reference clauses indicated are not necessarily the only sources of information in respect of schedule items. Further information and set specifications may be found elsewhere in the contract documents. Standardised Specifications are identified by the letter or letters which follow SANS in the SANS 1200 series of specifications, e.g. G for SANS 1200 G.
- C2.1.1.4 Unless otherwise stated, items are measured nett in accordance with the drawings, and no allowance is made for waste.
- C2.1.1.5 The quantities set out in the Schedule/Bill of Quantities are the estimated quantities of the Contract Works, but the Contractor will be required to undertake whatever quantities may be directed by the Engineer from time to time. The Contract Price for the completed contract shall be computed from the actual quantities of work done, valued at the relevant unit rates and prices.
- C2.1.1.6 The prices and rates to be inserted in the Schedule/Bill of Quantities are to be the full inclusive prices for the work described under the several items. Such prices and rates shall cover all costs and expenses that may be required in and for the execution of the work described, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the documents on which the tender is based, as well as overhead charges and profit. Reasonable prices shall be inserted as these will be used as a basis for assessment of payment for additional work that may have to be carried out.
- C2.1.1.7 A price or rate is to be entered against each item in the Schedule/Bill of Quantities, whether the quantities are stated or not. An item against which no price is entered will be considered to be covered by the other prices or rates in the Schedule.
- C2.1.1.8 Except where rates only are required, the Tenderer shall insert all amounts to be included in his total tendered price in the “Amount” column and show the corresponding total tendered price.
- C2.1.1.9 The units of measurement described in the Schedule/Bill of Quantities are metric units. Abbreviations used in the Schedule/Bill of Quantities are as follows:

mm	=	millimetre	h	=	hour
m	=	metre	kg	=	kilogram
km	=	kilometre	t	=	ton (1 000 kg)
m ²	=	square metre	No.	=	number
m ² .pass	=	square metre-pass	sum	=	lump sum
ha	=	hectare	MN	=	MegaNewton
m ³	=	cubic metre	MN.m	=	MegaNewton-metre
m ³ .km	=	cubic metre-kilometre	P C sum	=	Prime Cost sum
ℓ	=	litre	Prov sum	=	Provisional sum
kℓ	=	kilolitre	%	=	per cent
MPa	=	MegaPascal	kW	=	kilowatt

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- C2.1.1.10 The Tenderer must price each item in the schedule of quantities in **BLACK INK**.
- C2.1.1.11 All prices and rates shall exclude value added tax (VAT). The Tenderer shall calculate value added tax and enter it at the end of the summary of the Bill of Quantities.
- C2.1.1.12 Those parts of the contract to be constructed using labour-intensive methods have been marked in the Bills 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.
- C2.1.1.13 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 unauthorised use of plant to carry out work which was to be done labour-intensively will not be condoned and any works so constructed will not be certified for payment.

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C2.2 Bill of Quantities

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C2.2 Bill of Quantities

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CONTRACT No. : CI-KH 0028/01 : SANPARKS
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Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

Schedule 1

SECTION 1 : PRELIMINARY AND GENERAL

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
1	SANS 1200A	SECTION 1 : PRELIMINARY AND GENERAL					
		<i>As specified in SANS 1200A and project specifications.</i>					
1.1	8.3	FIXED-CHARGE AND VALUE- RELATED ITEMS					
1.1.1	8.3.1	Contractual Requirements	Sum	1.0			
1.1.2	8.3.2	Establish facilities for Contractor on Site	Sum	1.0			
		Living accommodation	Sum	1.0			
		Ablution and latrine facilities (camp site)	Sum	1.0			
		Tools and equipment	Sum	1.0			
		Water supplies, electric power (where needed) and communications on site	Sum	1.0			
		Access (Subclause 5.8)	Sum	1.0			
1.1.3	8.3.3	Other fixed-charge obligations including Special Risk insurance (Specify).....	Sum	1.0			
1.1.4	SK12	Provide casualty insurance	Sum	1.0			
1.1.5	PS25	Compliance to OHS Act including all site programmes, inductions, etc	Sum	1.0			
1.1.6	PS19	Compliance to the Environmental Management Plan	Sum	1.0			
1.1.7		Remove Contractor's Site establishment on completion	Sum	1.0			
1.2	8.4	TIME-RELATED ITEMS					
1.2.1	8.4.1	Contractual Requirements	Sum	1.0			
1.2.2	8.4.2	Operate and maintain facilities on site	Sum	1.0			
1.2.3	8.4.3	Construction Supervision	Sum	1.0			
1.2.4	8.4.4	Company and head office overhead costs	Sum	1.0			
1.2.5	8.4.5	Other fixed-charge obligations including Special Risk insurance (Specify).....	Sum	1.0			
1.2.6	SK12	Maintain of casualty insurance	Sum	1.0			
1.2.7	PS7.2	Communication during contract	Sum	1.0			
Total Carried Forward							

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Schedule 1

SECTION 1 : PRELIMINARY AND GENERAL

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
1.2.8	PS25	Maintaining of OSH Act including all site programmes, inductions, etc	Sum	1.0			
1.2.9	PS19	Maintaining of Environmental Management Plan	Sum	1.0			
1.2.10		Regulating of traffic and safeguard of pipe trenches	Sum	1.0			
	PSAB5.6	<i>Provide and maintain equipment on site:</i>					
1.2.11		Levelling instrumentation, 100m measuring tape and Troxler.	Sum	1.0			
1.3		MISCELLANEOUS ITEMS:					
1.3.1		Protection and Maintenance of fencing in the vicinity of sites	Sum	1.0			
1.3.2		Locate and protect existing services by hand excavation at the Tweerivieren, Nossob and Mata-Mata Water Storage facilities.	Sum	1.0			
1.3.3		Compliance with Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and Construction Regulations, 2014	Sum	1.0			
Total Carried Forward To Summary							

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Schedule 1

SECTION 2 : PIPE TRENCHES

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
2	SANS 1200 DB	SECTION 2 : PIPE TRENCHES					
2.1	8.3.2(a)	HAND EXCAVATION <i>Hand excavation in all material, select, backfill, compact and dispose of all surplus material for 50mm HDPE pipes in open terrain for depths of:</i>					
2.1.1		0 - 0,5 meter	m	50.0			
2.2	8.3.2(a)	MACHINE EXCAVATION <i>Excavate in all materials for trenches 400mm wide, select, backfill, compact and dispose of all surplus material within 1 km for pressure pipes up to 50 mm diameter, with depths over and up to: (inclusive of side battering)</i>					
2.2.1		0,0 m to 1,0m	m	1,100.0			
2.2.2		1,0 m to 1,5 m	m	50.0			
2.2.4	8.3.2(b)	<i>Extra-over items 2.2.1 to 2.2.1 for:</i> Hard rock Excavation	m ³	10.0			
2.3		CONTROL OF WATER INGRESS INTO TRENCHES					
2.3.1		<i>Supply of equipment and additional material for ingress of drainage water into pipe trenches including removal of equipment from site.</i>	Sum	1.0			
2.3.2		Operate and maintain	Days	7.0			
2.4	SABS 1200 LB	BEDDING (PIPES) <i>Provision of bedding material compacted to 93% of MOD AASHTO density (100% for sand) with material from trench excavation.</i>					
2.4.1	8.2.1 (a)	Selected granular material for bedding	m ³	48.0			
2.4.2	8.2.1 (a)	Selected fill material for blanket	m ³	118.0			
Total Carried Forward To Summary							

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Schedule 1

SECTION 3 : PIPELINES

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
3		SECTION 3 : PIPELINES					
3.1	SABS 1200 L	PRESSURE PIPES					
	8.2.1	<i>Supply, lay, bed on class C bedding and testing of HDPE PE100 pressure pipes c/w Electrofusion field joints:</i>					
3.1.1.		50mm dia HDPE PN 6	m	1,200.0			
3.2	8.2.2	Extra-over Item 3.1.1 for supplying, Laying and Bedding of Specials c/w Electrofusion couplings:					
3.2.1		50mm dia HDPE Electrofusion Bends 45°	No.	6.0			
3.2.2		50mm dia. HDPE Electrofusion Bends 90°	No.	6.0			
3.2.3		50mm dia. HDPE Electrofusion T-Pieces	No.	2.0			
3.2.4		50mm x 25mm Concentric Reducer	No.	3.0			
3.3	8.2.3	Extra-over Item 3.1.1 for supplying, Laying, Bedding of Valves c/w Electrofusion stub flange and backing ring couplings:					
3.3.1		Isolating Valves: 50mm dia RSV flanged PN6	No.	3.0			
3.3.2		Air Valves: ARI D-040 Combination Air Valve 20mm dia c/w 500mm x 20mm dia uPVC Riser Tube, 20mm dia ball valve and 50mm x 20mm dia Clamp Saddle	No.	5.0			
3.3.3		Scour Valves: 50mm PN6 Resilient Seal Gate Valves (complete with fittings and galvanized scour pipe and endcap)	No.	4.0			
3.4	8.2.11	Anchor/Thrust Blocks and Pedestals					
3.4.1		90°Bend	No.	6.0			
3.4.2		45° Bends	No.	6.0			
3.5	8.2.13	Valve and Hydrant Chambers					
3.5.1		Air Valve Chamber as per standard drawing	No.	5.0			
3.5.2		Isolating Valve Chamber (bell toby)	No.	3.0			
Total Carried Forward To Summary							

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SECTION 4 : EVAPORATION PONDS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
4	SANS 1200 DA PG SPEC	SECTION 4 : EVAPORATION PONDS					
4.1		EARTHWORKS					
		<i>Excavate in all materials, backfilling, trimming and shaping of 1:1.5 side slopes and compaction to 93% Mod AASHTO.</i>					
4.1.1	8.3.1 (b)	Cut to fill	m ³	90.0			
4.1.2	8.3.1 (b)	Cut to spoil	m ³	156.0			
4.1.3	8.3.1 (c)	E.O. item 4.1.1 and Item 4.1.2 for Hard rock excavation	m ³	10.0			
4.1.4		Finishing, preparation and compaction of exposed surfaces to 95% Mod.AASHTO density for HDPE lining.	m ²	228.0			
4.1.5	8.3.2 (a)	Restricted Excavation, backfill and compaction to 95% Mod AASHTO of 300 x 300 mm anchor trench.	m	175.0			
4.2	PG SPEC	GEOSYNTHETIC MEMBRANES					
		<i>Supply and Installation of Geosynthetic Membranes complete including all welds, etc. to comply to Specific Specifications (Final areas to be confirmed on site) for the following:</i>					
4.2.1		Bidim A5, non-woven needle-punched geotextile protection layer.	m ²	450.0			
4.2.2		1.5mm HDPE liner	m ²	450.0			
4.2.3		Fixing of boot strap around 50 mm dia Membrane Flush and Reject Water pipes, complete with all accessories.	No.	6.0			
4.5		MISCELLANEOUS					
4.5.1		Geomembrane Manufacturer and Installation Guarantee	Sum	1.0			
Total Carried Forward To Summary							

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Schedule 1

						SECTION 5: WATER TREATMENT PLANT BUILDING	
ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R	
5	SANS 2001-CM1: 2007	SECTION 5: WATER TREATMENT PLANT ENCLOSURE (X3)					
5.1	SABS 1200DA	EARTHWORKS					
	8.3.1 (a)	Clear vegetation and strip site to 150mm depth	m ²	90.0			
5.2	8.3.2 (a)	Excavate for restricted foundations in all materials and use for backfill or dispose inclusive of compaction to 93% Mod AASHTO					
5.2.1	8.3.2 (a)	Concrete Plinths (Container) 400mm x 400mm x 200mm deep	m ³	0.6			
5.2.2	8.3.2 (b) (2)	Column Footings for Steel Structure (400mm x	m ³	1.0			
5.3	SABS 1200 GA	CONCRETE					
	8.4.3	Preparation, supply, mixing, placing, finishing, curing and testing of concrete for:					
5.3.1		Mass concrete in plinths for container: (Class 20/19)	m ³	1.5			
5.3.2		Mass concrete in column footings for steel structure (Class 20/19)	m ³	1.5			
5.3.3	8.4.3	RC Floor slabs 100mm thick with "smooth steel float finish" (Class 20/19mm)	m ³	4.5			
5.3.4	8.2.4	Shaping of concrete pipe & cable channel 400mm deep x 500mm wide c/w Rectagrid OG Floor cover and supporting angles.	m	18.0			
5.4		REINFORCING					
5.4.1	8.3.2	Mesh Ref 617 (single layer: 100mm RC floors Floors slab) incl 20% overlap	m ²	18.0			
5.4.2	8.3.2	Mesh Ref 617 (single layer: RC pipe & cable	m ²	24.0			
5.5		STANDARD SHIPPING CONTAINER (6m)					
		Purchase, refurbish, transport to site and install on concrete plinths 3 number standard 2,40m x 6.058 m steel shipping containers complete with Water Treatment Plant equipment installed.					
5.5.1		Purchase of Second Hand Shipping Container (6m)	No.	3.0			
5.5.2		Refurbishment of shipping containers complete with two coats brilliant white paint inside and outside and repairs to floors and walls	Sum	3.0			
5.5.3		Transport of shipping container to Tweerivieren Rest Camp WTP site	Sum	1.0			
Total Carried Forward							

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SECTION 5: WATER TREATMENT PLANT BUILDING

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
5.5.4		Transport of shipping container to Nossob Rest Camp WTP site	Sum	1.0		
5.5.5		Transport of shipping container to Mata-mata Rest Camp WTP site	Sum	1.0		
5.6	SANS 2001-CT2	ROOF STRUCTURAL ELEMENTS				
		Manufacture, supply, deliver, install and paint (Brilliant White) 3 number lightweight mild steel canopy structures for fitment over shipping containers as per drawing				
5.6.1		150 x 50 x 20 x 2.5 Cold Formed Mild Steel Lip Channel trusses	m	66.5		
5.6.2		75 x 50 x 20 x 2.5mm Cold Formed Purlins	m	155.0		
5.6.3		Steel Columns 75mm x 75mm x 1.6mm Square Tubing painted with Red Oxide Undercoat	m	80.0		
		Supply and installation of Chromadek IBR Roof Sheeting (0.6mm thc) Fish eagle White c/w fixings and trimmings	m ²	105.0		
5.7		PERIMETER FENCING				
5.7.1	Drw No.34496-134-01-0	Supply all material, plant and labour for the installation of a 2.1m high Clearvu fencing as per detail drawing 34496-134-01-0.	m	450.0		
5.7.2	Drw No.34496-134-01-0	Supply all material, plant and labour for the installation of a 2.1m high Clearvu 5m sliding gate as per detail drawing 34496-134-01-0.	No.	6.0		
5.8		CONTAINER VENTILATION				
		Supply and install onto standard shipping container walls the following mild steel ventilation louvres for				
5.8.1		600mm x 300mm Mild Steel Ventilation Louvres fixed just below ceiling at opposite end to door	No.	9.0		
5.8.2		600mm x 600mm Mild Steel Ventilation Louvres fixed 300mm above floor level on side wall of container at 1.50m spacing	No.	12.0		
5.8.3		Sealing and burglar proofing of Ventilaition Louvres for container.	Sum	3.0		
Total Carried Forward To Summary						

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SECTION 6: K GALAGADI TNP: WATER TREATMENT PLANTS: MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
6	SPEC BVMECH01/8	SECTION 6: K GALAGADI TNP: WATER TREATMENT PLANTS: MECHANICAL WORKS				
6.1		Pumps: <i>Supply, delivery and installation on site of 3-Phase electrically powered Vertical multistage configuration centrifugal pumps as follows:</i>				
6.1.1		Media Feed / Backwash Pump: 0.25kW Duty: 1 - 9m ³ /h @ 2.5bar	No.	3.0		
6.1.2		CIP / Flush Pump: 0.25kW Duty: 2 m ³ /h @ 3bar	No.	3.0		
6.1.3		RO High Pressure Pump: 0.37kW Duty: 1m ³ /h @ 7bar	No.	3.0		
6.1.4		Grundfos Scala Pressure Pump 0.45kW Duty: 1m ³ /h @ 3bar	No.	3.0		
6.2	SPEC BVMECH01/8	Media Filters <i>Supply, delivery and installation on site of self contained sand media filter c/w sand, distribution manifold, inlet, outlet and backwash connections as specified.</i>				
6.2.1		Sand media filter: 500mm dia x 2.027m high: 1m ³ /h capacity	No.	3.0		
6.2.2		Quartzitic Filter Sand: 0.6mm dia grain size	kg	240.0		
6.3	SPEC BVMECH01/8	Cartridge Filters <i>Supply, delivery and installation on site of cartridge filters c/w cartridge pressure vessel, mounting brackets and process connections + spare cartridges per set:</i>				
6.3.1		Cartridge Filter Pressure Vessel: 250mm dia x 500mm long	No.	6.0		
6.3.1		5 micron Filtration Cartridge to fit 250mm dia x 500mm long pressure vessel	No.	24.0		
6.4	SPEC BVMECH01/8	Reverse Osmosis Membranes <i>Supply, delivery and installation on site of reverse osmosis membranes c/w pressure vessel, brine seal, interconnector and o-rings, mounting brackets and process connections as per specification:</i>				
Total Carried Forward						

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SECTION 6: K GALAGADI TNP: WATER TREATMENT PLANTS: MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
6.4.1		FRP RO Pressure Vessel of endport configuration: 4" dia x 40" long as per specification	No.	3.0		
6.4.2		Composite Polyamide spiral wound RO membrane in Single Stage configuration as per specification	No.	3.0		
6.5		Valves <i>Supply, delivery and installation on site of various manual and actuated valves complete with bolts, nuts, washers, mounting brackets and process connections as per specification:</i>				
6.5.1		50mm dia Butterfly Valve Manually operated Wafter Type: PN6	No.	63.0		
6.5.2		20mm dia Rotating Ball Bibcock Sampling Valve BSPT : PN6	No.	18.0		
6.5.3		50mm dia Wafer Type Non-Return Valve: PN10	No.	15.0		
6.5.4		50mm dia Actuated Butterfly Valve c/w AVA Electrical Actuator: PN10	No.	48.0		
6.5.5		50mm dia 24V DC Actuated Globe Type Flow Control Valve c/w positioner controlled by 4-20mA analogue signal. (Samson Controls or similar) PN10	No.	3.0		
6.5.6		25mm dia Vent-o-mat Dual Action Air Valve: PN6	No.	3.0		
6.6	SPEC BVMECH01/7	Chemical Dosing Equipment <i>Supply, install, test and commission the following chemical dosing equipment as per specification:</i>				
6.6.1		200 liter Day tank complete with manual hand mixer	No.	9.0		
6.6.2		Dosing Pumps (1-30 l/h) (Citric Acid / High pH liquid / Chlorine solution)	No.	9.0		
6.6.3		Installation set for above pump	No.	9.0		
6.6.4		Pulsation damper on above pumps	No.	9.0		
6.6.5		Pressure sustaining valve for above pump	No.	9.0		
6.6.6		Pressure relief valve for above pump	No.	9.0		
6.6.7		Calibration pot on suction line	No.	9.0		
6.6.8		Corrosion resistant wall mounted dosing panel c/w bund area and drain to house all dosing equipment	Sum	9.0		
Total Carried Forward						

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SECTION 6: K GALAGADI TNP: WATER TREATMENT PLANTS: MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
6.6.9		uPVC Pipework and manual uPVC Ball valves for connection to dosing points	Sum	9.0		
6.7		Small Diameter Pipework <i>Supply, install and pressure testing of small diameter connector pipework between mechanical equipment items c/w holder bats, mounting brackets, bends, fittings and fasteners as required.</i>				
6.7.1		50mm dia uPVC pipework CI.9 for all Low Pressure Piping on RO Plant as per P&ID diagram. (uPVC piping can be glue joints, flanged or BSPT threaded).	Sum	3.0		
6.7.2		25mm dia Gr316 Stainless Steel Piping with 1.5mm wall thickness for High Pressure piping between High Pressure Feed Pump and Flow Control Valve as per P&ID diagram. (Gr316 piping can be welded, flanged or BSPT threaded).	Sum	3.0		
6.7.3		Miscellaneous pipe fittings, brackets, U-bolts, as required to produce a neat and properly installed pipe installation	Sum	3.0		
6.7.4		Galvanized Mild Steel Skid frame custom designed and manufactured in controlled conditions for mounting of RO plant mechanical equipment	Sum	3.0		
6.8	SPEC BVMECH01/7	Polypropylene Storage Tanks <i>Supply, deliver and install polypropylene water storage tanks c/w 400mm dia. Ventilated screw on access cover, 50mm dia BSPT overflow connection, 50mm dia BSPT top inlet connection, 50mm dia BSPT bottom outlet connection as required.</i>				
6.8.1		Permeate / Clean Water Storage Tank: 5000 liter	No.	3.0		
6.9		Clean Water Dispensing Valves <i>Supply, deliver and install 15mm dia Self-closing / Demand Wall tap mounted on a 1000mm x 20mm galvanized Mild Steel standpipe cast into a concrete pedestal as per detail c/w bends/elbows and fittings to connect to 50mm dia mains supply pipe.</i>				
6.9.1		Self-closing / Demand Wall Tap as per specification	No.	4.0		
Total Carried Forward To Summary						

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SECTION 7: K GALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
7	SPEC BVELEC01/0	SECTION 7: K GALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS				
7.1		Electrical Mains Supply: <i>Contractors to liaise with Park Technical Officer to arrange tie-in from existing 3-Phase 400V electrical reticulation cable network. Provision is made as follows:</i>				
7.1.1		Tie into existing electrical reticulation network at Tweerivieren, Nossob and Mata-Mata c/w MCCB, terminations, etc.	Sum	1.0		
7.2	SPEC BVELEC01/2	Excavate cable trench (400 mm wide x 900 mm deep) , supply bedding, backfill, compaction and disposal of surplus material of unsuitable material:				
7.2.1		Soft soil Excavation	m ³	80.0		
7.2.2		Hard Rock Excavation	m ³	8.0		
7.2.3		Excavations by hand for the recovery of existing cable/ services	m ³	25.0		
7.2.4		Soft red soil bedding (200 mm deep)	m ³	18.0		
7.2.5		Danger tape (300 mm above cable)	m	220.0		
7.2.6		Concrete cable markers	No.	10.0		
7.3	SPEC BVELEC01/2	Supply, install, terminate and connect PVC SWA LV cable and BCEC complete with glands and lugs as specified:(Quantities to be verified with engineer before ordering) 16mm² x 4 core Cu, SANS 1507-3				
7.3.1		Supply	m	220.0		
7.3.2		Install	m	220.0		
7.4	SPEC BVELEC01/2	LV cable termination kit including gland at WTP Local DB (Quantities to be verified with engineer before ordering)				
7.4.1		Supply	No.	3.0		
7.4.2		Install	No.	3.0		
7.5		LV cable joint kit for: 16mm ² x 4 core Cu, SANS 1507-3				
7.5.1		Supply	No.	3.0		
7.5.2		Install	No.	3.0		
7.6		16mm² BCEC				
Total Carried Forward						

Contractor

Witness for Contractor

Employer

Witness for Employer



CONTRACT No. : CI-KH 0028/01 : SANPARKS
Kgalagadi Transfrontier Park :
Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

Schedule 1

SECTION 7: K GALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
7.6.1		Supply	m	220.0		
7.6.2		Install	m	220.0		
7.7		BCEC termination at tie-in and DB:				
7.7.1		Supply	m	3.0		
7.7.2		Install	m	3.0		
7.8	BVELEC01/1	Electrical Reticulation for WTP Buildings				
		Supply, deliver, install and commission the following basic electrical equipment as per electrical layout drawing.				
7.8.1		Surface Mounted distribution board c/w Earth Leakage unit:	No.	3.0		
7.8.2		Surface mounted light switches	No.	6.0		
7.8.3		220V 16A Single switch socket outlet	No.	6.0		
7.8.4		3-Phase welding Socket outlet	No.	3.0		
7.8.5		Earthing installation inclusive of earth spike and conductors	No.	3.0		
7.9		Luminaires:				
		<i>Supply, deliver and install c/w conduit, conductors, switches, ect</i>				
7.9.1		Pioled LED Linear Fitting 4ft Cool White c/w lamps horizontally surface mounted on wall	No.	12.0		
7.9.2		50W LED Wall Mounted Flood Light for Outdoor surface mounting	No.	6.0		
7.9.3		Photocell mounted outdoors on wall to control floodlights	No.	3.0		
7.9.4		Allowance for 20mm dia surface mounted BOSAL galvanized mild steel conduit inclusive of junction boxes, offsets, bends, saddles and cover plates as required.	No.	3.0		
7.9.5		Allowance for 100mm wide galvanized mild steel welded mesh cable trays c/w bends, mountings and fasteners	m	15.0		
7.10	SPEC BVMECH01/8	RO WTP Motor Control Centre				
		<i>Supply, deliver, install, test and commission of materials, equipment and components housed in a single floor mounted indoor mild steel enclosure with separate cubicles for various functions as specified below:</i>				
Total Carried Forward						

Contractor

Witness for Contractor

Employer

Witness for Employer



CONTRACT No. : CI-KH 0028/01 : SANPARKS

Kgalagadi Transfrontier Park :

Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

Schedule 1

SECTION 7: K GALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
7.10.1		Mains Incomer Cubicle : Door mounted isolator for connection from supply cable from DB to MCC panel				
		Cubicle for 0.25kW Medi filter pump Variable Speed Drive				
		Cubicle for 0.25kW CIP/Flush pump Variable Speed Drive				
		Cubicle for 0.37kW RO High Pressure pump Variable Speed Drive	No.	3.0		
		Domestic Pressure Pump electrical supply				
		Cubicle for 3 x chemical dosing pumps (0.5kW ea.)				
		Cubicle for Plant automation inclusive of backwash cycle control, RO Flow Control, CIP process, etc inclusive of PLC, backup battery, UPS, etc				
		HMI for interface between system and Process Controller				
		Feed cables to pumps inclusive of cable racks, mountings etc.				
7.10.2		Communication cables, interfaces etc complete with connectors, terminations, etc between instrumentation, PLC and plant HMI	Sum	3.0		
7.11	SPEC BVMECH01/8	Instrumentation				
		<i>Supply, deliver, install, test and commission of materials, equipment and components as specified as follows:</i>				
		Flow Meters and Pressure Transducers				
7.11.1		Raw Water Flow Meter 25mm dia Electromagnetic PN6	No.	3.0		
7.11.2		RO Feed Water Flow Meter: 25mm dia Electromagnetic PN10	No.	3.0		
Total Carried Forward						

Contractor

Witness for Contractor

Employer

Witness for Employer



CONTRACT No. : CI-KH 0028/01 : SANPARKS

Kgalagadi Transfrontier Park :

Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

Schedule 1

SECTION 7: KGALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
7.11.3		Permeate Flow Meter: 25mm dia Electromagnetic PN 10	No.	3.0		
7.11.4		Raw Water Pressure Transducer before Media Filter	No.	3.0		
7.11.5		Filtered Water Pressure Transducer after Media Filter	No.	3.0		
7.11.6		Cartridge Filter Inlet Pressure Transducer	No.	3.0		
7.11.7		Cartridge Pressure Outlet Pressure Transducer	No.	3.0		
7.11.8		RO Membrane Feed Pressure Transducer	No.	3.0		
		Analytical Instrumentation				
		<i>Supply, deliver, install, test and commission of materials, equipment and components as specified as follows:</i>				
7.11.9		E+H Liquiline Analysis Transmitter: 4 Port	No.	3.0		
7.11.10		Raw Water Feed Temperature Sensor	No.	3.0		
7.11.11		Raw Water Feed Conductivity Sensor	No.	3.0		
7.11.12		Raw Water Feed pH sensor	No.	3.0		
7.11.13		Permeate Temperature Sensor	No.	3.0		
7.11.14		Permeate Conductivity Sensor	No.	3.0		
		Level Sensors				
		<i>Supply, deliver, install, test and commission of materials, equipment and components as specified as follows:</i>				
7.11.15		Existing Raw Water Storage Reservoir: Ultrasonic Level Sensor 0 - 4m	No.	3.0		
7.11.16		Permeate/ Clean Water Storage Reservoir: Ultrasonic Level Sensor 0 - 4m	No.	3.0		
7.11.17		High Level float switch: CIP Tank	No.	3.0		
7.11.18		Low Level float switch: CIP Tank	No.	3.0		
7.11.19		Low Level float switch: Citric Acid Tank	No.	3.0		
7.11.20		Low Level float switch: High pH liquid Tank	No.	3.0		
7.12		Pressure Gauges				
		<i>Supply, deliver, install, test and commission of 63mm dia Stainless Steel Pressure Gauges G½B process connection, c/w brass pressure gauge stopcock, galv BSSPT fittings, etc as required:</i>				
Total Carried Forward						

Contractor

Witness for Contractor

Employer

Witness for Employer



CONTRACT No. : CI-KH 0028/01 : SANPARKS

Kgalagadi Transfrontier Park :

Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

Schedule 1

SECTION 7: K GALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
7.12.1		Pressure Gauge 63mm dia : 0 - 400 kPa (Feed Water Pump delivery)	No.	3.0		
7.12.2		Pressure Gauge 63mm dia : 0 - 400 kPa (Upstream of Media Filter)	No.	3.0		
7.12.3		Pressure Gauge 63mm dia : 0 - 400 kPa (Downstream of Media Filter)	No.	3.0		
7.12.4		Pressure Gauge 63mm dia : 0 - 400 kPa (CIP/Flush Pump delivery)	No.	3.0		
7.12.5		Pressure Gauge 63mm dia : 0 - 400 kPa (Downstream of Cartridge Filters)	No.	3.0		
7.12.6		Pressure Gauge 63mm dia : 0 - 1000 kPa (High Pressure Pump delivery)	No.	3.0		
7.12.7		Pressure Gauge 63mm dia : 0 - 1000 kPa (RO membrane permeate outlet)	No.	3.0		
7.12.8		Pressure Gauge 63mm dia : 0 - 1000 kPa (RO membrane reject outlet)	No.	3.0		
7.13		Remote Diagnostic and Control Facility				
7.13.1		Supply, deliver, install and commission a GPRS modem dial-up facility for each Restcamp's WTW complete with functionality to access PLC, HMI and instrumentation online for diagnostic and monitoring purposes.	No.	3.0		
7.14	SPEC BVMECH01/8	Handheld Water Quality Testing Instruments				
		LOVIBOND PC Checkit portable turbidity meter complete with set of calibration standards (0 NTU, 10 NTU, 100 NTU, 1000 NTU)	No.	3.0		
		LOVIBOND PC Checkit IR Free Chlorine meter (Range: 0 to 4mg/l Cl ₂)	No.	3.0		
		Reagent Tablets: DPD No.1	No.	3 000.0		
		Lovibond Portable pH-meter complete with probe (pH Range: 0 - 14, Temperature Range: (0 - 70°C)	No.	3.0		
		Spare replacement pH probe for the above	No.	3.0		
		Set of pH Buffer solutions (pH4, 7 and 10) 1000ml each	No.	3.0		
		Lovibond Portable Conductivity Meter complete with probe (Range: 0 - 1000mS/m)	No.	3.0		
		Spare replacement Conductivity probe for the above	No.	3.0		
Total Carried Forward						

Contractor

Witness for Contractor

Employer

Witness for Employer



CONTRACT No. : CI-KH 0028/01 : SANPARKS
Kgalagadi Transfrontier Park :
Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

Schedule 1

						SECTION 8: MISCELLANEOUS EQUIPMENT AND ITEMS
ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
8	SPEC BVMECH01/8	SECTION 8: MISCELLANEOUS EQUIPMENT AND ITEMS				
8.1		Consumables:				
8.1.1		Supply of Calcium Hypochlorite (HTH) granules in 40kg drums	kg	960.0		
8.1.2		Supply of Citric Acid for CIP in 25kg bags	kg	600.0		
8.1.3		Supply of Avista ROClean L211 high pH cleaning fluid for CIP in 200kg drums	kg	600.0		
8.1.4		Replacement oil of suitable grade and quality for pumps	ℓ	60.0		
8.1.5		Grease for lubrication of pump & motor bearings	ℓ	30.0		
8.1.6		Operations & Maintenance Manuals (3 Sets for each WTP bound in Hard Cover files)	No.	3.0		
8.2	SPEC BVMECH01/8	Extended Operation and Training of Client Process Controllers				
		Contractor to Provide 2 x Process Controllers for a period of 6 months to operate RO Water Treatment Plants and train the Clients' Process Controllers to ensure technology transfer and reliable future operations				
8.2.1		Process Controller 1 (inclusive of salary, site allowances'etc) per month	Months	6.0		
8.2.2		Process Controller 2 (inclusive of salary, site allowances'etc) per month	Months	6.0		
8.2.3		Living accommodation for Process Controllers per month (arrangement to be made with SAN Parks for existing accomodation, or as alternative Contractor to provide own accommodation)	Months	6.0		
8.2.4		Process Controller Transport (Contractor to provide at least 1 x LDV for transport between Rest Camps'Water Treatment Plants on a weekly basis.)	km	12 500.0		
8.2.5		Quarterley Maintenance Visits during retention period (Visit to include full maintenance of all electrical and mechanical equipment)	No.	3.0		
8.2.6		Quarterley Sampling & Analysis of Raw and Final Water produced to prove compliance with SANS 241: 2015 Drinking Water quality standard.	Sample s	24.0		
Total Carried Forward To Summary						

Contractor

Witness for Contractor

Employer

Witness for Employer

CONTRACT No. : CI-KH 0028/01 : SANPARKS

Kgalagadi Transfrontier Park :

Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

Schedule 1

SECTION	SUMMARY OF SECTIONS DESCRIPTION	AMOUNT R
1	SECTION 1 : PRELIMINARY AND GENERAL	
2	SECTION 2 : PIPE TRENCHES	
3	SECTION 3 : PIPELINES	
4	SECTION 4 : EVAPORATION PONDS	
5	SECTION 5: WATER TREATMENT PLANT	
6	SECTION 6: K GALAGADI TNP: WATER TREATMENT PLANTS: MECHANICAL WORKS	
7	SECTION 7: K GALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS	
8	SECTION 8: MISCELLANEOUS EQUIPMENT AND	
	SUBTOTAL	
	Add 15% VAT	
Total Carried Total Carried Forward To Summary Of Schedules		

Contractor

Witness for
Contractor

Employer

Witness for
Employer



Contract No: CI-KH-0028/1

Kgalagadi Transfrontier Park: Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps

SUMMARY OF BILL OF QUANTITIES

Section 1	PRELIMINARY AND GENERAL	R
Section 2	PIPE TRENCHES	R
Section 3	PIPELINES	R
Section 4	EVAPORATION PONDS	R
Section 5	WATER TREATMENT PLANT BUILDING	R
Section 6	KGALAGADI TNP: WATER TREATMENT PLANTS: MECHANICAL WORKS	R
Section 7	KGALAGADI TNP: WATER TREATMENT PLANTS: ELECTRICAL WORKS	
Section 8	MISCELLANEOUS EQUIPMENT AND ITEMS	

CALCULATION OF CONTRACT PRICE

A :	TOTAL OF SCHEDULES	R
B:	CONTRACT PRICE ADJUSTMENT	R R 50,000.00
C :	TOTAL (A+B)	R
D :	TOTAL VALUE ADDED TAX (14%) ON C ABOVE	R
E :	CONTRACT PRICE	R

I/We, the undersigned, do hereby declare that these are the properly priced Bill / Schedules of Quantities forming part of this Contract Document containing Pages in consecutive order upon which my/our Tender for:

SIGNED ON BEHALF OF
TENDERER:.....

Contractor

Witness for
Contractor

Employer

Witness for
Employer



DAYWORK SCHEDULE

1. 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 day work basis, all in agreement with Clause 6.5 of the General Conditions of Contract for Construction Works 2010. All the rates are fixed and shall be binding until and with the issuing of the final certificate.

No day work shall be undertaken unless specific written authorization is obtained from the engineer.

2. LABOUR COSTS

Rates for labour as listed below shall include all the allowances as specified in the General Conditions of Contract for Construction Works 2010. The extra allowance applicable on labour costs listed below, is stated in the Contract Data and must not be included in this list.

Overtime costs attached to this contract shall be paid in the same relation as to that which the employees are actually paid.

Only the net working hours will be measured under Day work and it will be held that the Contractor has made provision in his rates for possible interruptions and standing time.

Prior to the commencement of any work by the labourers the contractor must obtain written consent from the engineer regarding the classification and composition of all labourers in terms of "unskilled" and "skilled" labourers required for the work as ordered by the engineer."

DESCRIPTION	UNIT	RATE
Unskilled labour	hour	
Semi-skilled labour	hour	
Ganger	hour	
Foreman/Section leader	hour	

3. EQUIPMENT COSTS

Full comprehensive hourly rates, which also include the cost of the operators and other equipment, 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 allowances that is applicable. No further percentage allowances shall be applicable on equipment. The Tenderer must list under each heading the fabrication and specification of the equipment available.

The Contractor will be paid the actual net cost of plant hired by him for Day work and in addition will be paid a percentage allowance on the net cost of such hire which allowance will cover the Contractors overhead costs and profit.

DESCRIPTION	UNIT	RATE
1. Excavators		
.....	hour	
.....	hour	
.....	hour	

Contractor

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DESCRIPTION	UNIT	RATE
2. Front-end loaders	hour hour hour	
3. Rollers Vibratory Roller Tamping Roller Grid Roller	hour hour hour	
4. Motor Graders	hour hour hour	
5. Trucks (m3 specified)	hour hour hour	
6. Water truck (litres specified)	hour hour	
7. Tractor and trailer	hour hour	
8. Compressor	hour hour	
9. Concrete mixer (litres specified)	hour hour	

Contractor

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DESCRIPTION	UNIT	RATE
10. "Dumper" (m3 specified)		
.....	hour	
.....	hour	
11. Compactors (Plate)		
Pedestrian Roller (Bomag BW90)	hour	
Vibratory Plate	hour	
Rammers	hour	
12. Other equipment		
.....	hour	
.....	hour	
.....	hour	
.....	hour	

Contractor

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Employer

Witness for Employer

Part C3: Scope of Work

Contractor

Witness for
Contractor

Employer

Witness for
Employer

C3: Scope of Work

C.3.1. Project Specifications

Gives a general view of the project, the facilities available and the requirements to be met.

C.3.2. Standardized Specifications and Additions to SANS

Gives amendments and additions to the specifications as listed. These clauses are lettered using alphabetical identification of the applicable specification.

C.3.3. Particular Specifications

This section consist of Particular specifications with regards to this contract.

C.3.4. Specification Data

The following Standard and Particular Specifications, as bound in this document, and as amended of the Specification Data, shall apply:

	No. of pages
OCCUPATIONAL HEALTH AND SAFETY SPECIFICATION	19
ENVIRONMENTAL MANAGEMENT SPECIFICATION	20
CODE OF CONDUCT FOR WORKING IN THE NATIONAL PARKS	7

Should any requirement of the Specification Data conflict with any requirement of the specifications listed below, the requirement of the Specification Data shall prevail.

Contractor

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Contractor

Employer

Witness for
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C3.1 : PROJECT SPECIFICATIONS

PS1 GENERAL DESCRIPTION

This contract covers all the work in connection with the construction of engineering services for the **PROVISION OF POTABLE WATER FOR TWEE RIVIEREN, NOSSOB AND MATA-MATA REST CAMPS, K GALAGADI TRANSFRONTEIR PARK.**

The Kgalagadi Transfrontier Park is located in the Kalahari, which is an arid, semi-desert area. The only sustainable sources of water being groundwater abstracted from boreholes. The geology of the aquifers is such, that the water quality of the all the water sources is saline in nature. This is due to high concentrations of soluble salts present in the water. The water is suitable for basic purposes such as bathing, cleaning and cooking, but not for human drinking water. The salinity in all of the available sources exceeds the SANS 241-2015 limit of 1200mg/l Total Dissolved Salts as well as the Electrical Conductivity limit of 150mS/m. Beyond this threshold limit, the water becomes brackish in taste and not acceptable for human consumption.

Given the above, SAN Parks has taken a decision to treat a small quantity of the available water at each rest camp to acceptable potable standard specifically for drinking water for their personnel, who live in the rest camps on a permanent basis, and are exposed to this water continuously. The tourist population seldom visit the park for longer than 5 days, and typically utilize bottled water for drinking water purposes. Subsequently, the exposure of tourists to the saline water is minimal compared to the exposure of SAN Parks personnel, who live there on a permanent basis.

The aim of this project is therefore for the supply, manufacture, transport, installation on site and commissioning of water treatment plants for each of the Rest Camps, utilizing the reverse osmosis process. The idea being to prefabricate the treatment equipment, complete with piping and electrical installation for installation at each Rest Camp in a 2.4m x 6m refurbished Shipping Container. Each Water Treatment Plant to have basically only 4 connections:

- Raw Water Inlet;
- Brine reject Outlet;
- Permeate or Treated Water Outlet;
- Electrical Supply connection.

Contractor is required to provide a secure, self-contained solution with a “plug and play” type functionality. See the particular specification for detail requirements.

PS2 DESCRIPTION OF SITE AND ACCESS

The location of the 3 (three) sites are shown on the Locality Plan for each Rest Camp and in more detail on the Layout drawings.

Access to the Twee Rivieren site can be obtained by the R360 regional road, about 250km north of Upington, while access to the Nossob Site can be obtained by gravel road of approximately 160km from Twee Rivieren. Similarly, the Mata-Mata Rest camp is accessible by gravel road of approximately 120km north of Twee Rivieren.

The Contractor shall be responsible for providing his own access within the confines of the Site of the Works.

Contractor

Witness for
Contractor

Employer

Witness for
Employer

PS3 DETAILS OF CONTRACT

This Contract covers the supply of all materials, plant and labour for, and the installation of the following as specified:

Twee Rivieren Rest Camp:

- (i) The supply, transport and installation of a 2.4m x 6m refurbished Shipping Container, with a light steel canopy structure covering it as per drawing.
- (ii) The construction a 14.50m x 14.50m x 1m deep HDPE-lined evaporation pond for discharge and disposal of wastewater from the water treatment plant.
- (iii) Supply, delivery, installation and commissioning of a fully automated Reverse Osmosis Water Treatment unit with a **nominal treatment capacity of 1000 liters per day**, comprising the following unit processes:
 - Transfer Pump
 - Media Filtration
 - Low Pressure Pump
 - 5-micron Cartridge Filter
 - High Pressure Pump
 - Reverse Osmosis membrane unit
 - Chemical Tanks for CIP process
 - Chemical Tank for liquid Chlorine disinfection
 - Chemical Dosing Pumps x 3
 - All actuated valves and handvalves
 - All instrumentation such as flow meters, pH probes, Conductivity probes, pressure Transducers and Ultrasonic Level Sensors
 - Automated control system comprising a PLC and HMI
 - Motor Control Center for pumps comprising variable speed drives
 - 50mm dia uPVC Class 9 connector piping
 - 25mm dia Stainless Steel pressure piping
 - All of the above to be securely mounted on a pre-manufactured galvanized mild steel skid.
- (iv) 5000 liter Clean Water Storage Tank
- (v) Automatic Pressure Pump for delivery of Clean Water to dispensing point
- (vi) Cut into the existing Raw Water Supply pipeline at the Twee Rivieren Storage Reservoir to allow abstraction of Raw Water to the treatment plant, and lay a 50mm dia uPVC pipe from tie-in point to the Water Treatment Plant inlet connection. Allow for maximum 25m.
- (vii) Construction of a 351m x 50mm dia HDPE Cl.6 Clean Water Pipeline from the Twee Rivieren Water Treatment Plant to the Junior Personnel residential area's Water Dispensing point
- (viii) Construction of a 200m x 50mm dia HDPE Cl.6 Clean Water Pipeline from the Twee Rivieren Water Treatment Plant to the Senior Personnel residential area's Water Dispensing point.
- (ix) Supply and underground installation in a trench of 40m of 3-phase Insulated PVC cable to provide 3-phase electrical power to the Water Treatment Plant Building. Cable to terminate in a wall mounted LV Kiosk inside the Container.

Contractor

Witness for
Contractor

Employer

Witness for
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- (x) Supply and install 2 x 50mm dia HDPE pipelines from the Water Treatment Plant Container to the Evaporation Pond. The first pipe is for the Filter Backwash wastewater, and the second pipe is for the Reverse Osmosis Membrane CIP washwater discharge. Allow a maximum of 10m for each of these pipes.
- (xi) Commissioning of Electrical supply
- (xii) Commissioning of Reverse Osmosis Water Treatment Plant
- (xiii) Supply of chemicals such as Sodium Hypochlorite, Citric Acid and alkaline pH membrane cleaner for a period of one year.
- (xiv) Supply of miscellaneous tools and equipment such as handheld analytical instruments for control purposes.

Nossob Rest Camp:

- (i) The supply, transport and installation of a 2.4m x 6m refurbished Shipping Container, with a light steel canopy structure covering it as per drawing.
- (ii) The construction a 14.50m x 14.50m x 1m deep HDPE-lined evaporation pond for discharge and disposal of wastewater from the water treatment plant.
- (iii) Supply, delivery, installation and commissioning of a fully automated Reverse Osmosis Water Treatment unit with **a nominal treatment capacity of 500 liters per day**, comprising the following unit processes:
 - Transfer Pump
 - Media Filtration
 - Low Pressure Pump
 - 5-micron Cartridge Filter
 - High Pressure Pump
 - Reverse Osmosis membrane unit
 - Chemical Tanks for CIP process
 - Chemical Tank for liquid Chlorine disinfection
 - Chemical Dosing Pumps x 3
 - All actuated valves and handvalves
 - All instrumentation such as flow meters, pH probes, Conductivity probes, pressure Transducers and Ultrasonic Level Sensors
 - Automated control system comprising a PLC and HMI
 - Motor Control Center for pumps comprising variable speed drives
 - 50mm dia uPVC Class 9 connector piping
 - 25mm dia Stainless Steel pressure piping
 - All of the above to be securely mounted on a pre-manufactured galvanized mild steel skid.
- (iv) 2500 liter Clean Water Storage Tank
- (v) Automatic Pressure Pump for delivery of Clean Water to dispensing point
- (vi) Cut into the existing Raw Water Supply pipeline at the Nossob Storage Tank complex to allow abstraction of Raw Water to the treatment plant, and lay a 50mm dia uPVC pipe from tie-in point to the Water Treatment Plant inlet connection. Allow for maximum 25m.

Contractor

Witness for
Contractor

Employer

Witness for
Employer

- (vii) Construction of a 370m x 50mm dia HDPE Cl.6 Clean Water Pipeline from the Nossob Water Treatment Plant to the Personnel residential area's Water Dispensing point.
- (viii) Supply and underground installation in a trench of 120m of 3-phase Insulated PVC cable to provide 3-phase electrical power to the Water Treatment Plant container. Cable to terminate in a wall mounted LV Kiosk inside the container.
- (ix) Supply and install 2 x 50mm dia HDPE pipelines from the Water Treatment Plant Building to the Evaporation Pond. The first pipe is for the Filter Backwash wastewater, and the second pipe is for the Reverse Osmosis Membrane CIP washwater discharge. Allow a maximum of 10m for each of these pipes.
- (x) Commissioning of Electrical supply
- (xi) Commissioning of Reverse Osmosis Water Treatment Plant
- (xii) Supply of chemicals such as Sodium Hypochlorite, Citric Acid and alkaline pH membrane cleaner for a period of one year.
- (xiii) Supply of miscellaneous tools and equipment such as handheld analytical instruments for control purposes.

Mata-Mata Rest Camp:

- (i) The supply, transport and installation of a 2.4m x 6m refurbished Shipping Container, with a light steel canopy structure covering it as per drawing.
- (ii) The construction a 14.50m x 14.50m x 1m deep HDPE-lined evaporation pond for discharge and disposal of wastewater from the water treatment plant.
- (iii) Supply, delivery, installation and commissioning of a fully automated Reverse Osmosis Water Treatment unit with **a nominal treatment capacity of 500 litres per day**, comprising the following unit processes:
 - Transfer Pump
 - Media Filtration
 - Low Pressure Pump
 - 5-micron Cartridge Filter
 - High Pressure Pump
 - Reverse Osmosis membrane unit
 - Chemical Tanks for CIP process
 - Chemical Tank for liquid Chlorine disinfection
 - Chemical Dosing Pumps x 3
 - All actuated valves and handvalves
 - All instrumentation such as flow meters, pH probes, Conductivity probes, pressure Transducers and Ultrasonic Level Sensors
 - Automated control system comprising a PLC and HMI
 - Motor Control Centre for pumps comprising variable speed drives
 - 50mm dia uPVC Class 9 connector piping
 - 25mm dia Stainless Steel pressure piping
 - All of the above to be securely mounted on a pre-manufactured galvanized mild steel skid.
- (iv) 2500 litre Clean Water Storage Tank

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- (v) Automatic Pressure Pump for delivery of Clean Water to dispensing point
 - (vi) Cut into the existing Raw Water Supply pipeline at the Mata-Mata Storage Tank complex to allow abstraction of Raw Water to the treatment plant, and lay a 50mm dia uPVC pipe from tie-in point to the Water Treatment Plant inlet connection. Allow for maximum 25m.
 - (vii) Construction of a 150m x 50mm dia HDPE Cl.6 Clean Water Pipeline from the Nossob Water Treatment Plant to the Personnel residential area's Water Dispensing point.
 - (viii) Supply and underground installation in a trench of 120m of 3-phase Insulated PVC cable to provide 3-phase electrical power to the Water Treatment Plant Container. Cable to terminate in a wall mounted LV Kiosk inside the container.
 - (ix) Supply and install 2 x 50mm dia HDPE pipelines from the Water Treatment Plant Building to the Evaporation Pond. The first pipe is for the Filter Backwash wastewater, and the second pipe is for the Reverse Osmosis Membrane CIP washwater discharge. Allow a maximum of 10m for each of these pipes.
 - (x) Commissioning of Electrical supply
 - (xi) Commissioning of Reverse Osmosis Water Treatment Plant
 - (xii) Supply of chemicals such as Sodium Hypochlorite, Citric Acid and alkaline pH membrane cleaner for a period of one year.
 - (xiii) Supply of miscellaneous tools and equipment such as handheld analytical instruments for control purposes.

PS4 GROUND AND SUBSOIL CONDITIONS

Soil conditions can typically be expected to consist of Kalahari sand, although calcrete formations can be encountered which can prove difficult to remove mechanically. The hardness of the excavated material can vary with depth beneath the surface.

Groundwater is not expected to be a problem due to the geological composition where excavation will take place, no provision is made in the Bill of Quantities for intermediate excavations.

The above data does not relieve the Contractor of his sole responsibility to have satisfied himself as to all matters related to ground and subsoil conditions, but merely serves as an indication of what can be expected on the site.

PS5 WATER AND ELECTRICITY

The Contractor shall make his own arrangements with the SANParks, for the supply of water and power to the site and is responsible for all costs incurred.

PS6 LOCATIONS OF CAMP

The contractor may establish his camp on part or parts of the construction site, but before establishing his camp the Contractor must obtain approval from the Engineer and the SANParks management for the position

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of his camp. The camp and site shall be kept in a neat and orderly state at all times during the duration of the contract.

PS7 STORES

Suitable stores shall be provided by the Contractor at his own cost for the storing of damageable and valuable material. Cement stores must be well ventilated, weatherproof and shall have a raised wooden floor.

PS8 SANITARY FACILITIES

Lavatory facilities shall comply with the requirements of the SANParks, and must be provided and kept in a clean and sanitary condition at the Contractor's cost at all times.

PS9 EXISTING SERVICES

The positions of existing civil engineering services shown on the drawings have been obtained from the SANParks, and local surveys. This information is given in good faith and without liability by the Employer.

Excavation shall not be done by mechanical means within 3 meter of cables or other existing underground services, where hand excavation shall be adopted.

Before any work is started, the underground pipes shall be exposed by the Contractor and the positions and invert levels checked. The Contractor shall arrange with the relevant authorities to have the exact position of water mains as well as electrical and telecommunication cables pointed out on site and shall comply with all requirements imposed.

The Contractor shall be held responsible for any damage to existing services above or below ground. Should any service be damaged, the contractor shall immediately notify the appropriate authority and shall have such damage repaired immediately at his own cost.

PS10 CONNECTIONS TO EXISTING SERVICES

The Contractor shall liaise with SANParks, regarding the time and the manner of making the connections to either pipelines or water storage facilities.

PS11 PLOT BOUNDARY PEGS

The Contractor shall verify and check that all plot pegs are placed before construction starts. The Contractor will be held responsible for the cost of replacement, by the Land Surveyor, of any plot pegs disturbed during the contract period unless prior agreement is obtained from the Employer, in writing, that disturbance of boundary pegs was necessary for the due performance of the construction. All pegs must be visible and marked at the completion of the Contract.

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PS12 CONSTRUCTION PROGRAMME

The Contractor shall within 14 days of the acceptance of his tender submit to the Employer his programme for the completion of the Works which shall take cognisance of the fact that vehicular movement is to be maintained on the existing roads at all times.

PS13 ACCOMMODATION OF TRAFFIC, WATCHING, LIGHTING AND BARRICADING

The onus for accommodation of traffic, watching, lighting and barricading in conformity with the General Conditions of Contract, the Factories Act, local regulations and any conditions of insurance rest solely with the Contractor.

The price tendered shall include for all labour, plant, materials and overheads for conforming with these requirements.

PS14 SETTING OUT OF WORK

The Contractor will be responsible for the correct setting out of the works in accordance with the lines and levels as specified on the drawings. Approximate coordinates will be provided on drawings for positions of building corners, evaporation pond corners, etc.

PS15 PLANT AND EQUIPMENT

The Contractor's plant and equipment shall be in a sound working condition and must be suitable to do the work which will be required of such plant.

PS16 PREVENTION OF DUST NUISANCE

The Contractor's attention is drawn to the presence of existing accommodation facilities in close proximity to the works that are vulnerable to dust nuisance that might arise from the Contractor's operations. The Contractor is particularly required to take all necessary precautions, including watering where appropriate, to prevent dust blowing from soil heaps and/or ground stripped of vegetation cover. The Contractor is to allow for the cost of this work as a time-related item in the Preliminary & General section of the Pricing Data.

PS17 HOUSING OF CONTRACTOR'S STAFF

The Contractor shall make all necessary arrangements for the housing of his staff at his own cost. Due to the nature and isolated locality of the sites within a National Wildlife Park, it is essential that the contractor liaise with SANParks in good time to ensure safe housing, to the satisfaction of the client. Special care should be taken not to adversely affect visitors to the park, especially in terms of noise and visual pollution. Approval from SANParks and the engineer must be obtained before any housing will be allowed.

PS18 OCCUPATIONAL HEALTH AND SAFETY

The Contractor shall at all times comply with the safety requirements as laid down by the Factories, Machinery and Building Work Act and any amending legislation as well as the Occupational Health and Safety Act of 1993. Safety measures and arrangements within the park must comply with the requirements from SANParks at all times.

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C3.2: Standardized Specification

Although not bound in nor issued with this document, the following Standardized Specifications for Civil Engineering Construction, as amended in Portion 2 of the Specification Data, form part of this document and, notwithstanding Sub-clause 2.2 of SANS 1200 A*, the edition specified below shall apply:

SANS 1200 A -	1986	:	GENERAL
SANS 1200 AA -	1986	:	GENERAL (SMALL WORKS)
SANS 1200 C -	1980 (as amended 1982):		SITE CLEARANCE
SANS 1200 D -	1988 (as amended 1990):		EARTHWORKS
SANS 1200 DA -	1988 (as amended 1990):		EARTHWORKS (SMALL WORKS)
SANS 1200 DE -	1984	:	SMALL EARTH DAMS
SANS 1200 GA -	1982	:	CONCRETE (SMALL WORKS)
SANS 1200 L -	1983	:	MEDIUM-PRESSURE PIPE LINES
SANS 1200 LB -	1983	:	BEDDING (PIPES)

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SECTION A: GENERAL

A 3 MATERIALS

PS A 3.1 QUALITY

Substitute the second sentence of the first paragraph of A 3.1 with the following:

Materials shall bear the official mark of the appropriate standard.

Substitute the second paragraph with the following:

Samples on which laboratory testing is required, shall be delivered free of charge to an approved laboratory. The Contractor is responsible for the cost of all testing to ascertain that the materials do comply with the specified minimum requirements of the relative materials and no additional payment will be made for such testing.

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

A 5 CONSTRUCTION

A 5.1 SURVEY

PS A 5.1.1 Setting Out Of The Works

Substitute the first sentence in A 5.1.1 with the following:

Setting out of the works is the sole responsibility of the Contractor and shall be done from survey pegs along the street reserve boundaries and from bench marks as indicated on the drawings. The Contractor shall, within two (2) weeks after the site has been handed over to him, ascertain himself of the correctness of all pegs and bench marks. Any discrepancy shall immediately be reported in writing to the Engineer. Any costs or subsequent costs arising from discrepancies which had not been reported to the Engineer within the aforementioned period, shall be the sole responsibility of the Contractor.

PS A 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

Add the following to A 5.4:

The Contractor shall as soon as possible after handing over of the site, commence with the detection to existing services, continue with it without interruption and finalise it at least 7 days before excavation starts at that particular section.

PS A 5.5 DEALING WITH WATER ON WORKS

Add the following to A 5.5:

Special treatment of water on site shall where necessary, be specified separately.

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A 7 TESTING

PS A 7.4 STATISTICAL ANALYSIS OF CONTROL TESTS

Substitute A 7.4 with the following:

Test results shall not be evaluated by statistical methods. All results shall comply with the specified minimum requirements of the materials concerned.

A 8 MEASUREMENT AND PAYMENT

A 8.2 PAYMENT

PS A 8.2.5 Adjusted Payment For Time-related Items

The payment to the Contractor for time-related items shall be adjusted in accordance with the following formula in the event of the contract being extended by means of a variation order:

$$\text{Sum of Tendered amounts for time -related items X } \frac{\text{Extended contract period as authorised by variation order}}{\text{Tendered contract period}}$$

The above-mentioned adjustment of the payment for time-related items shall be made in the Completion Payment Certificate and shall be the only payment for additional time-related costs.

PS A 8.4.6 Standing Time Costs

- a) plant Unit : Sum per working day
- b) labour Unit : Sum per working day
- c) other resources (to be specified by Contractor) Unit : Sum per working day

The tendered sum for each item shall include full compensation for all standing time costs of the specified resource of whatever nature and approved by the Engineer, which are not recoverable by way of the provision made in PS A 8.2.5 for the adjusted payment of time-related items.

For the purposes of calculating the total standing time cost, a working week shall be held to consist of five working days and a working day of 9 hours.

Payment for the partial standing of any of the scheduled resources for a day or part thereof, or the standing of a complete resource for a part day, will be made pro rata in proportion to an appropriate factor assessed by the Engineer.

The amount by which the standing time costs is adjusted shall be subject to the contract price adjustment formula as defined in the conditions of contract.

The Contractor shall take note that this payment item shall only apply to delays, which **in the opinion of the Engineer**, are incurred as a result of riot, commotion, politically motivated

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sabotage and acts of terrorism or disorder outside the Contractor's control. This item shall also apply to standing time incurred as a result of labour boycotts, except that only sub-items (a) and (c), as applicable, will be paid where the Contractor did not pay his labour for the time boycotted. Costs for delays incurred for all other circumstances shall be treated as provided for in the conditions of contract.

The provision of this clause shall in no way prejudice the right of either the Employer or the Contractor to determine the contract in terms of the provisions of clause 57 of the general conditions of contract.

The Contractor shall take note that no payment will be considered for additional cost or time lost for any daily removal of plant and equipment from the site, any additional costs incurred in protecting his plant and site establishment, or loss incurred in respect of damage to construction plant, equipment and materials supplied and the works.

In the event that GCC 46(1) becomes applicable, the time on which such penalties are calculated shall be reduced by the total standing time approved by the Engineer.

PS A 8.7 DAY WORK

Replace A 8.7 with the following:

Day work will be paid according to the percentage allowance method. For calculating the total remuneration the general conditions of contract for the construction of civil engineering work, sixth edition (1990) shall apply, with the amendments as in the appropriate special conditions of contract which is bound into this document. A day work schedule will be provided for filling in the necessary information.

A 8.8 TEMPORARY WORKS

PS A 8.8.2 Accommodation Of Traffic Unit: Sum

Add the following to A 8.8.2:

The rate shall cover all costs pertaining to the provision, erection, moving, re-erection and maintenance of all temporary barricades, road signs, lights, flagmen, etc. as required, for the guarding and protection of the works, for the construction, gravelling and maintenance of access roads and detours to the site of the works, borrow pits or spoil sites, as well as for the later removal or the cleaning and tidying up thereof, for making the necessary traffic arrangements and arrangements with regard to the moving and/or re-erection of existing traffic signs, as well as all other

PS A 8.8.4Existing Services

Add the following to A 8.8.4:

Where the Contractor is responsible for the cost of repairs carried out by the Employer or others, the costs will be recovered by means of a deduction from the Contractor's monthly payment certificate. The Employer will attend to the payment of monies due to others

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SECTION C: SITE CLEARANCE

C 3 MATERIAL

PS C 3.1 DISPOSAL OF MATERIAL

Substitute the first sentence of C 3.1 with the following:

Material obtained from clearing and grubbing and demolition structures shall be disposed of at the dump site.

C 5 CONSTRUCTION

PS C 5.1 AREAS TO BE CLEARED AND GRUBBED

Substitute the first sentence of C 5.1 with the following:

Unless otherwise indicated by the Engineer, clearing and grubbing are limited to the demarcated areas required for the Water Treatment Plant Building and the Evaporation Pond. The Contractor may proceed with clearing and grubbing after the handing over of the site. Measurement and payment for clearing and grubbing shall only occur for areas as required in writing by the Engineer.

C 5.2 CUTTING OF TREES

C 5.2.3 Preservation Of Trees

PS C 5.2.3.2 Individual trees

Add the following to C 5.2.3.2:

Trees outside pipeline routes must be left standing and undamaged, except where otherwise ordered, in writing, by the Engineer. The Contractor shall make every possible effort to avoid the removal of any trees. A penalty of R1500-00 per tree for trees damaged and/or removed will be charged.

C 8 MEASUREMENT AND PAYMENT

C 8.2 SCHEDULED ITEMS

PS C 8.2.3 Remove And Grub All Trees And Tree Stumps Regardless

The Girth Unit: ha

Add the following to C 8.2.3:

The number of trees and/or stumps in the areas indicated on the drawings, is such that individual measurement is impractical. Individual trees that fall outside the indicated area, will be measured and paid for under C 8.2.2.

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SECTION D: EARTHWORKS

D 2 INTERPRETATIONS

PS D 2.3 DEFINITIONS

Add the following to D 2.3:

Sand (cohesionless and non-cohesive)

For the purposes of the compaction requirements, a non-plastic material of which not less than 95 % by mass passes a sieve of nominal aperture size 4,75 mm, and not more than 10 % passes a sieve of nominal aperture size 0,075 mm.

D 3 MATERIALS

D 3.3 SELECTION

PS D 3.3.1 General

Substitute the second paragraph of D 3.3.1 with the following:

The Contractor shall deal selectively with material from general excavation. Any imported material in road reserves that do not comply with the minimum requirements for the respective layers, shall be removed and replaced with suitable material, all at the Contractor's expense.

The Contractor shall deal in such a way with materials from all excavations for streets, channels or pipe trenches to ensure that usable material is not contaminated with unsuitable material. If usable material is contaminated, such contaminated material shall be removed and replaced with suitable material, all at the Contractor's expense. No additional payment shall be made in respect of this and all relevant costs shall be deemed to be included in the tendered rates.

All unsuitable material shall be removed prior to importing fill material to such areas.

D 4 PLANT

PS D 4.5 AVOIDING QUAGMIRE CONDITIONS

In order to prevent quagmire conditions occurring in the excavations, relatively static plant such as back-actors shall be used combined with hand trimming to complete the excavation to final level. Should the Contractor allow quagmire conditions to develop, he shall, at his own expense, take such steps to rectify the conditions as the Engineer may order.

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D 5 CONSTRUCTION

D 5.1 PRECAUTIONS

PS D 5.1.2 Existing Services

PS D 5.1.2.2 Detection, location and exposure

Add the following to D 5.1.2.2:

If existing services are not shown on the drawings but the existence thereof can be reasonably expected, the Contractor shall, in conjunction with all relevant authorities, determine the exact depth and location of such services before the commencement of construction. After locating the exact position of services, whether indicated on the drawings or not, such services shall be deemed to be known services and the Contractor shall be liable for all costs and subsequent costs arising from the damage thereof as a result of the Contractor's activities. These services must also be indicated on the "As Built" drawings.

PS D 5.1.2.3 Protection of Cables

Substitute "estimated position" in the second sentence of D 5.1.2.3 with "actual or exposed position".

PS D 5.1.4 Nuisance

PS D 5.1.4.1 Dust nuisance

Add the following to D 5.1.4.1:

The Contractor is responsible for dust control and is liable for all claims that may result from dust nuisance on all parts of the site and at all times from the date of handing over of the site to the completion date of the contract. No payment regarding the above-mentioned will be made and all costs shall be deemed to be covered by the tendered rates.

PS D 5.1.6 Road Traffic Control

Add the following to D 5.1.6:

- a) Sufficient road signs must be erected in such a way that motorists will be warned in time of works, e.g. at the closing of a street sufficient signs to direct traffic must be erected at the preceding intersection.
- b) Bypasses and/or road signs shall be provided and/or erected at all locations where the free flow of traffic is obstructed and shall be approved by the Engineer before the commencement of construction. Where main roads are crossed, detours and temporary traffic signs must be provided as shown on the attached drawings.
- c) Sufficient safety measures must be utilised for pedestrians.

D 5.2 METHODS AND PROCEDURES

D 5.2.1 Site Preparation

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PS D 5.2.1.2 Conservation of topsoil

Add the following to D 5.2.1.2:

Removal of topsoil shall only occur in areas as approved, in writing, by the Engineer. The topsoil shall be conserved for use elsewhere.

D 5.2.2 Excavation

PS D 5.2.2.3 Disposal

Substitute the second sentence of D 5.2.2.3 with the following:

All surplus and unsuitable material shall be disposed of at the dump site.

PS D 5.2.2.4 Excavation by hand around existing services

Where hand excavation is required around existing services it shall be done within 3,0 m above and on both sides of cables and within 300 mm above and on both sides of pipes, as well as underneath the services.

D 8 MEASUREMENT AND PAYMENT

D 8.3 SCHEDULED ITEMS

PS D 8.3.2 Bulk Excavation

a) Excavate in all materials and use for embankment or backfill or dispose, as ordered Unit : m³

Add the following to D 8.3.2(a):

There will also be distinguished between the different types of fill and backfill as well as the different densities to which each will be compacted.

PS D 8.3.2 c) Hand excavation in all materials and use for embankment or backfill or dispose, as ordered Unit : m³

The provisions of D 8.3.2(a) shall apply mutatis mutandis.

PS D 8.3.2 d) Extra-over for hand excavation in

- 1) Intermediate excavation Unit: m³
- 2) Hard rock excavation Unit: m³
- 3) Boulder excavation, Class A Unit: m³
- 4) Boulder excavation, Class B Unit: m³

The provisions of D 8.3.2(b) shall apply mutatis mutandis.

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D 8.3.8 Existing Services

PS D 8.3.8.1 Location

PS D 8.3.8.1 c) Excavate by hand in soft material to expose service Unit : m³ or day work

Add the following to D 8.3.8.1(c):

Measurement will be done in depth increments of 1 m.

PS D 8.3.8.1 c) Excavate by hand in soft material to expose service Unit : m³ or day work

Where hand excavation around existing services do occur it shall be measured within 3 m above and on both sides of cables, and within 500 mm above and on both sides of pipes, as well as all excavations underneath the services.

Measurement shall occur in depth increments of 1 m.

(Schedule various cables and pipes separately.)

PS D 8.3.8.1 d) Extra-over PS D 8.3.8.1(c) for excavation in Unit : m³

The provisions of PS D 8.3.2(d) shall apply mutatis mutandis

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SECTION DE : SMALL EARTH DAMS (SANS 1200DE)

PSDE6 TOLERANCES

PSDE6.2 Positions, Levels, Dimensions, and Moisture Content

a) Positions, Levels, and Dimensions

No Permissible Deviations is allowed under this contract and the positions, levels and dimensions of the drawings shall be strongly adhered to by the Contractor during the execution of the works. No installation and/or placing of any material shall commence on top of, or within dams without prior approval by the Engineer on site with regard to positions, levels and dimensions. Should any of the positions, levels and dimension found to be not as specified, the Contractor shall bear all responsibility and risks to adhere to the specified requirements, all at the Contractors expense.

b) Moisture Content

The Permissible Deviations allowed for with regard to optimum moisture content is 2% in percentage points for a type II degree of accuracy.

Should the results of the tests on any particular layer or part of a layer of a compacted fill show that the moisture content found in at least 90% of the tests is not within the appropriate of the limit given above, the compacted layer or part of the layer shall be harrowed and wetted or dried, as applicable, and recompacted to within the specified requirements all at the Contractors expense.

The Contractor's compliance with the abovementioned tolerances will not relieve the Contractor from any of his responsibilities and obligations under the contract.

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SECTION L : MEDIUM-PRESSURE PIPELINES

PSL3 **MATERIALS**

PSL3.1 **General**

The water pipeline shall be the blue **uPVC type, class 6** (6 bar) with rubber joints (Z-joints) for clean water pipes and rising mains, unless otherwise specified.

"No joints may be glued or welded; Proof of SANS certificates must be provided beforehand in which the quality of the pipes is confirmed. Quantities of different types and classes of pipe must be confirmed with the Engineer before final quantities are ordered.

PSL3.3 **STEEL-, CAST IRON AND METAL PIPES EN SPECIALS**

PSL3.3.1 **General**

The working pressure for a special shall not be less than the highest working pressure in any adjacent pipe or fitting.

All steel, cast iron and metal parts of pipes and fittings which are installed underground must be wrapped with "Denso inner and outer uPVC tape" or similar approved material which is approved by the Engineer. All steel pipe pieces which are provided with screw-thread must be produced from stainless **steel type 316 Grade**.

All steel pipes and steel accessories shall be "hot dip galvanised" as by the standard SANS 763 specifications prescribed.

PSL3.8.3 **Flanges and Accessories**

Add the following:

Flanges shall comply with SABS 1123 and have a minimum working pressure of 2 500 kPa, except where otherwise indicated. Holes shall be drilled to **Table 16** SABS 1123.

Any item of pipe work or special or valve, of which the flanges are incorrectly drilled, will be rejected. The reaming of bolt-holes to oversized dimensions to enable a particular item to fit will not be allowed.

PSL3.8.4 **Loose Flanges**

Add the following:

"Bolts and nuts must be of electroplated steel type and must comply with the applicable requirements of SANS 135."

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PSL3.10 **Valves**

PSL 3.10.1 **Isolating valves**

Add the following:

"All isolating valves must comply with SANS 664, must be of the water network type and must be suitable for work pressure of 16 bar depending on where it is being used. Valves must close clockwise and the direction of open and closed must be indicated on the valve permanently. Valves must be of the non-rising spindle type and must be provided with a square head, suitable for the use of a turnkey. All valves shall be tested for tightness."

A turnkey must be provided for each valve or an area with an amount of ten valves which are installed underground. Valves which are placed above ground must be provided with a standard removable hand wheel.

The tenderer must indicate in his tender which type of valves will be used and a copy of the specifications, in which will be indicated that the required pressure can be maintained must be submitted with the tender.

PSL 3.10.2 **Scour valves**

Add the following:

Scour valves must be installed as per drawing. The valve on the side-pipe of the t-piece must be flanged and must comply with the specifications of PSL 3.10.1.

PSL 3.10.3 **Non-return valve**

Add the following:

The "MaxiFlo" (Vent-O-Mat) type non-return valve or similar approved SANS valve with the required pressure ability to 16 bar where specified, must be installed with an isolation valve and the extra 25mm by-pass as specified.

PSL 3.10.4 **Air valves**

Add the following:

Vent-O-Mat model 025-RPS-1611 air-outlet valves which comply to SANS 664 and are suitable for a work pressure of 16 Bar shall be installed on the uPVC parts of the pipeline. Products of similar quality can be suggested as alternatives. See relevant drawing

PSL 3.10.5 **Float valves**

Add the following:

VOSA Equilibrium Float Valve Series 7354 which comply to SANS 936 and are suitable for a work pressure of 16 Bar shall be installed at the inlet of existing reservoirs. Products of similar quality can be suggested as alternatives.

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PSL4 **PLANT**

PSL 4.3 **TESTING**

PSL 4.3.1 *Add the following:*

The contractor must see to it that all test apparatus must be in a safe working condition. Calibration certificates of the pressure meters must be provided before any tests are accepted. The contractor must make his own arrangements to get water for testing. All water costs for testing purposes must be included in the rate for the installation of the pipes.

PSL5 **CONSTRUCTION**

PSL5.1.3 *Add the following:*

Special attention must be provided for sealing of pipes if the wind blows and provision must be made to prevent the intrusion of groundwater into pipes.

PSL5.1.4 **Excavation Depths and Cover**

PSL5.1.4.6 **Cover**

“a Minimum cover of 500 mm within residential erven and 800 mm in street reserves or underneath roads shall be required, unless otherwise stated on drawings and long sections. The pipes must be encased into concrete where instructed by the Engineer or specified on the drawings.

PSL7 **TESTING**

PSL7.3 **STANDARD HYDRAULIC TESTING**

PSL7.3.1. **Testing Pressure and Time of Test**

PSL7.3.1.2 **Testing Pressure**

Add the following:

Before any existing connections can be connected, all pipes must be tested at 1.25 times the maximum working pressure of the pipe class under consideration. The test pressures for class 6 pipes shall be 7.5 Bar and for class 4 pipes, 5 Bar.

PSL8 **MEASUREMENT AND PAYMENT**

PSL8.2.6 **Special Connections**

Add the following:

All the costs relating to excavation, removal of parts, cutting into, jointing, labour and complete finishing, shall be taken as incorporated into the tendered prices where connection are taking place onto existing pipelines or fittings.

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SECTION LB : BEDDING (PIPES)

PSLB3 MATERIALS

PSLB3.3 Bedding

Class C bedding, as applicable on none flexible pipes, is a requirement. Material for the fill blanket will only be imported, when there is not enough suitable gained from the excavated material. The selected fill blanket must cover the pipe with minimum of 200mm.

PSLB 3.4 Selection

PSLB 3.4.2 *Suitable Material not Available from Trench Excavation*

Add the following:

Selected material will only be imported, if enough suitable material cannot be gained from the excavated material, notwithstanding the fact that selective excavation methods and appropriate plant were used during excavations. After the Contractor has located a source for selected material, it must be approved by the Engineer. The acquisition of the borrow pit, loading, transport, placing and compaction of the imported material must be included in the tariff given by the Contractor in the priced Schedule of Quantities.

PSLB 5 Construction

PSLB 5.1.4 *Compaction*

Add the following:

After excavation of the trench the base of the trench must be levelled and compacted to 90% MOD. AASHTO Density.

The same density is applicable on the blanket fill, after instalment of the pipes. The final back fill can then be done to 50mm higher than the adjacent ground level. The area must be trimmed to an acceptable standard. Only on specific instructions of the Engineer, must walk ways be trimmed to a certain standard.

At street and road crossings subjected to vehicle load bearing conditions, with the exclusion of open spaces and/or the street reserve on both sides between the road edge and the erf boundary fencing demarcated for services with minimal vehicle load bearing and subject to pedestrian traffic, compaction must be done mechanically on the bedding and back fills to 98% MOD. AASHTO density.

PSLB8 MEASUREMENT AND PAYMENT

PSLB8.1.3 Volume of bedding material

The volume of imported bedding material will be measured net according to cross sectional drawings as specified in the Standard Specifications and on the construction drawings, excluding the volume occupied by the pipe.

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SECTION GA : CONCRETE (SMALL WORKS)

GA 5 CONSTRUCTION

GA 5.2 FORMWORK

PS GA 5.2.1 Classification Of Finishes

Add the following to GA 5.2.1:

The following surface conditions are required on the finished concrete:

a) Rough

Concealed surfaces and surfaces lower than 100 mm below finished ground level.

b) Smooth

All surface finishes not classified as rough in paragraph a) shall be classified as smooth. All exposed areas, unless otherwise indicated on the drawings, shall be chamfered 20 mm x 20 mm by means of triangular fillets fixed to the formwork.

GA 8 MEASUREMENT AND PAYMENT

GA 8.1 MEASUREMENT AND RATES

PS GA 8.1.2 Reinforcement

Substitute GA 8.1.2 with the following:

Reinforcement shall be measured and paid for by mass. Valuation of variations shall not be applicable.

No allowance shall be made for individual reinforcement bar sizes.

GA 8.2 SCHEDULED FORMWORK ITEMS

PS GA 8.2.3 Narrow Widths Unit: m

Substitute GA 8.2.3 with the following:

No payment shall be made for narrow widths.

GA 8.3 SCHEDULED REINFORCEMENT ITEMS

PS GA 8.3.2 High-tensile Welded Mesh Unit: kg

Substitute GA 8.3.2 with the following:

Welded mesh shall be measured and paid for by mass.

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GA 8.4 SCHEDULED CONCRETE ITEMS

PS GA 8.4.1 Prescribed Mix Concrete Unit: m³

Add the following to GA 8.4.1:

The rate for installation of concrete slabs shall include for the compaction of the in situ material to 90 % of MAASHTO density.

PS GA 8.9 WEEP-HOLES Unit: No

The rate for installation of weep-holes as shown on the drawings shall include all material, plant and labour.

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C3.3: Particular (Project) Specifications

List of Specific Specifications for use on this project:

C3.4.1	PM:	MASONRY
C3.4.2	PE:	SMALL EARTH DAMS
C3.4.2	SPEC BVMECH01:	GENERAL MECHANICAL SPECIFICATION
C.3.4.3	SPEC BVMECH01/2	WATER PUMPS: MEDIUM PRESSURE
C.3.4.4	SPEC BVMECH01/6:	MEDIUM PRESSURE PIPEWORK AND VALVES
C.3.4.5	SPEC BVMECH01/7:	CHEMICAL DOSING EQUIPMENT AND STORAGE TANKS
C.3.4.6	SPEC BVMECH01/8:	REVERSE OSMOSIS PACKAGE TYPE WATER TREATMENT PLANT
C.3.4.7	SPEC BVMECH01/9:	ELECTRIC ACTUATORS
C.3.4.8	SPEC BVELEC01/0:	GENERAL TECHNICAL SPECIFICATIONS: ELECTRICAL
C.3.4.9	SPEC BVELEC01/1:	ELECTRICAL QUALITY SPECIFICATION
C.3.4.10	SPEC BVELEC01/2:	LAYING OF CABLES AND EXCAVATIONS
C.3.4.11	PG :	SUPPLY, INSTALLATION AND TESTING OF GEOSYNTHETIC MEMBRANES

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PM MASONRY

PM 1 Scope

Materials, construction method and workmanship desired for masonry are explained in this section. All activities in connection with masonry and plaster of structures are treated.

PM 2 Material

The building-sand for mortar must comply with specification for sand for concrete, on condition that all the sand can be screened through a 2,4mm screen.

The cement for mortar must comply with the same specification as for cement in concrete.

Quality bricks should be thoroughly burnt to be hard and durable. A hard ringing sound emitted when two bricks are struck together, indicates that bricks were well burnt. The bricks should be true to size and shape, with straight edges and even surfaces. Bricks must comply with the requirements as stipulated in the latest edition of SANS 227.

Platforms for mixing, wheel barrows and pans which come in contact with the mortar must be clean, watertight and none absorbed before any mortar is placed on or in it.

PM 3 Brickwork

All brickwork must be done in Stretcher Bond and no false headers may be used.

Bricks must be soaked in water before immediate use and the previous layer must also be well wet before the next layer is mortared. Bricks must be well embedded in the mortar and all the joints of each layer of bricks must be well cocked. Joints may under no circumstances be thicker than 10mm and all vertical joint and corners must be plumb.

PM 4 Mortar

Measurements for mixing of mortar must be done by volume units. Five units of sand to one unit of Portland cement for masonry and plaster of walls, and three units of sand to one unit of Portland cement for the plaster of concrete ceilings and beams, if not otherwise stipulated.

The ingredients must be dry mixed until the mixture is uniform in colour and appearance. There after water must be added with fine spray and the ingredients must be thoroughly mixed.

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PE SMALL EARTH DAMS

The normal requirements as stipulated in SANS 1200 D, DA and DE shall be applicable.

The following requirements and guidelines shall also be applicable:

- PE 1 Before any material is placed, all surfaces must be clean and free of any plant material after any in-situ operation was executed on the surface.
- PE 2 Excavations of materials must be done selectively so that boulders, rocks and other items can be separated from materials to be used for fill. The fill material shall not contain boulders, rock and other material larger than 100 mm diameter in size
- PE 3 Materials must be placed in layers not more than 300 mm thick and must be compacted to the prescribed densities. The material to be placed and compacted as fill material, as well as any in-situ material to be compacted, must compact to 95% Mod AASHTO density.
- PE 4 Density tests must be carried out on every layer under the supervision of the Engineers or the Engineer's representative. The required frequency shall be five (5) tests per 200 square meters of area on the compacted layer.
- PE 5 The side slopes of the dam walls must be finished to the specified slope after compaction is completed and required density is obtained. No loose material or material with sharp edges or extrusions must be left behind on the side slopes of the dam walls.
- PE 6 The surfaces of the base, the side slopes and top of embankments must be finished off, clean and neat, and material and objects with extruding and/or sharp edges must be removed before the inner lining can be placed and installed.
- PE 7 All structures must be constructed after completion of the earth works and backfilling alongside the structures must be recompacted to the prescribed original density.
- PE 8 Excess material must be spoiled and trimmed neatly and no stockpiles or heaps are allowed to remain on site after completion of the works.
- PE 9 The Sub-Contractor to supply and install the geo-membrane and HDPE lining, shall be appointed by the main Contractor, where after the main Contractor shall bear all responsibility with regard to deliverables, time lines, supervision, payments, etc. of his appointed sub-contractor.

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C3.2.3.2 SPEC BVMECH01: GENERAL

CONTENTS

1. SCOPE
 2. INTERPRETATIONS
 3. DESIGN, MATERIALS AND MANUFACTURE (SUPPLY AND DELIVERY)
 4. PLANT
 5. INSTALLATION AND COMMISSIONING
 6. TOLERANCES
 7. TESTING
 8. MEASUREMENT AND PAYMENT
- APPENDIX A : APPLICABLE STANDARDS

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SPEC BVMECH01: GENERAL

1. SCOPE

This specification covers the requirements for the supply, delivery, installation, testing and commissioning of mechanical and electrical equipment forming part of civil engineering construction works.

2. INTERPRETATIONS

Definitions

For the purposes of this specification the following definitions shall apply:

a) General

Acceptable/Approved (Approval) - Acceptable to/approved (approval) by the Engineer.

Authorized/ordered/rejected - Authorized/ordered/rejected by the Engineer.

Designated - Shown on a drawing, or otherwise specified by the Engineer or, in relation to an item scheduled in the tender document, descriptive of an item to be priced by a tenderer.

Instructed/ directed/ permitted - Instructed/directed/ permitted by the Engineer.

Satisfactory- Capable of fulfilling or having fulfilled the intended function.

Service - Any pipeline, duct, cable, or overhead wire for conveying, as appropriate, any liquid or gas, or electricity for lighting or power or telecommunication transmissions.

Submitted - Submitted with the tender or submitted to the Engineer, as appropriate.

b) Tolerances

Deviation. The difference between the actual (i.e. measured) size or position and the specified size or position.

Tolerance. The range between the limits within which a size or position shall lie.

NOTE: A tolerance is an absolute value without a sign but the dimension or axis to which it applies must be stated.

c) Measurement and payment

Schedule - The Schedule of Quantities.

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Schedule rate - The unit rate or price entered in the schedule at which the Contractor undertakes to execute the particular work or to provide the required material, article, or service, or to do any or all of these things, as set out in the item concerned.

Scheduled - Listed in the Schedule of Quantities.

No limitation by description

Nothing appearing in the specification or Schedule of Quantities shall limit the obligations and liabilities of the Contractor, the Engineer, or the Employer under the conditions of contract.

Approval

No approval or acceptance of any material or equipment and its operation, or of any installation procedure to be used, or of any Contractor's drawings or instructions, will imply any relaxation of the requirements governing the quality of the materials or of the finished work, or relieve the Contractor of his responsibilities under the Contract.

Specification drawings

Where reference to a drawing is used in place of a written requirement, the drawing shall be deemed to form part of the specification.

Items in Schedule of Quantities

The rate or price tendered by the Contractor for a scheduled item shall be deemed to cover the Contractor's profit plus the cost to him of all labour, materials, plant, equipment and facilities required by him to carry out the operations or activities required by the applicable standard specification or in the measurement and payment clause of the Project Specification.

The Contractor's charges for completing a preliminary and general item scheduled in the Schedule of Quantities, shall be interpreted to be his rate or price to cover his direct costs plus overheads, and to include his profit and all costs and expenses that he requires for the item specified and for all general risks, liabilities, and obligations set forth or implied in the documents on which the tender is based.

3. DESIGN, MATERIALS AND MANUFACTURE (SUPPLY AND DELIVERY)

Standards

The materials and workmanship throughout shall be of the highest quality generally accepted in the manufacturing and/or construction industry. All inferior work will be rejected.

Where available, all materials used and the standards of workmanship employed for the execution of the Works shall comply with the appropriate SABS, IEC, ISO or BS Standard and/or Code and if such material is available with an official standard mark, the material shall bear such mark.

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Occupational Health and Safety Act

All apparatus and material supplied and all work carried out shall comply in all respects with Act No. 85.

Electrical work

All electrical equipment, materials and the installation thereof shall comply with the relevant clauses of the following, as applicable:

- a) The South African Code of Practice for the Wiring of Premises - SANS 10142-1.
- b) The Post Office Act No. 44.
- c) The Standard Electricity Supply By-Laws of Local Authorities and appropriate additional By-Laws or Regulations.

Holding down bolts, pipes, etc. to be concreted in

The Contractor shall supply and deliver all holding down bolts, pipes and other metal work that are to be concreted in.

Defective items

Any parts or items found to be defective shall be replaced or repaired at the Contractor's expense, to the Engineer's approval.

Interim Storage

If the Engineer gives notice that physical delivery to the point stated in the Project Specification is temporarily inadvisable, delivery shall be delayed until authorized by the Engineer. The giving of such notice shall not relieve the Contractor of any obligations undertaken by him in regard to physical delivery at the point stated in the Project Specification but, as an interim measure, for the purpose of vesting ownership of such goods in the Employer, the Engineer will either

- a) order the Contractor to deliver the goods to the Employer at:
 - i) the Employer's main store, or
 - ii) a store provided in the vicinity of the Site by the Employer, in which event the Contractor shall so deliver the goods to be stored there at the Contractor's risk
or
- b) order the Contractor to store the goods for the Employer in suitable premises provided by the Contractor, in which event the Contractor shall store the goods for the Employer at the Contractor's risk.

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Insurance

When any goods are stored in accordance with orders given by the Engineer under, the Contractor shall insure the goods for the benefit of the Employer against all risks whilst they are in storage and shall produce evidence to the satisfaction of the Engineer that the goods are so insured, upon request.

Inspection and vesting of ownership

The Engineer or a person appointed by him will inspect the goods for provisional approval as soon as possible after they are stored in terms of the Engineer's order. Notwithstanding that any of the goods are stored, ownership therein shall pass to and vest in the Employer upon payment therefore.

Transport

Notwithstanding that payment may have been made in respect of transportation of goods to a place of storage, the Contractor shall remain liable for physical delivery of the goods stored to the point stated in the Project Specification.

Storage of goods on Site

In the event of the Engineer not being satisfied with the provisions for storage provided by the Contractor on Site, he may order all goods and erection equipment to be delivered to the Employer's stores and stored therein at the Contractor's risk and cost. Whether goods are stored at the Employer's stores on the order of the Engineer or on the request of the Contractor, the Contractor shall provide all handling and transport to move the goods and erection equipment to the Site of the Works when required.

Tools and spares

As part of the equipment supplied, the Contractor shall supply all special tools or keys required for adjustment to any parts of such equipment. Where ordered by the Engineer, the Contractor shall supply standard spanners and a cabinet to the size and details ordered. The Contractor shall supply such spares, if any, ordered by the Engineer from those listed in the Spares Schedule that forms part of the Detail Sheets.

4. PLANT

Silencing of plant

The Contractor's attention is drawn to Regulation B17 of Chapter III of the regulations framed under Act No. 85. When working in built-up areas, the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause an equivalent noise level exceeding 85 dB(A), measured in accordance with SANS 10083, during installation and other work. Alternatively he shall, by means of barriers, effectively isolate the source of any such noise in order to comply with the said regulations.

5. INSTALLATION AND COMMISSIONING

Penalties and stages of work

The Work is divided into the following stages:

- a) Submission of drawings

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- b) Manufacture and delivery of the equipment,
- c) Installation of equipment, and
- d) Testing and commissioning of equipment.

Stage (a) shall be completed within 6 weeks of award. Stages (b), (c) and (d) for each Section of the Schedule of Quantities shall be completed within the period stated in the Appendix to the Tender.

Penalties will be applied at the rate stated in the Appendix to the Tender.

Contractor's drawings and instructions

General

The Contractor shall provide drawings and instructions as applicable. These drawings and instructions shall be submitted to the Engineer and shall be to his satisfaction. In the event of there being no major departure from the layout in the Engineer's drawings, the Contractor's drawings may be prepared as supplementary to the Engineer's drawings.

All drawings and data submitted at tender stage and during the contract period shall be in SI units. All drawings shall be done on ISO 216 A Series finished. Sheet size A1 is preferred. The supply of the original printed or typed documents is preferred, but when copies are made and supplied from original forms these shall be clear and legible and suitable for further duplication. Each complete set of Drawings, instruction manuals, etc. shall be bound in a hard cover lever arch file.

Equipment requiring civil foundations and/or structures

Where the equipment supplied by the Contractor is to be installed on foundations or inside structures to be provided by others, the Contractor shall provide:

- a) Drawings showing the sizes and shapes of civil structures required to house the equipment; the loads imposed by the equipment, and fully dimensioned scale drawings of each item of equipment within 8 weeks of the award of the Contract.
- b) Fully dimensioned drawings showing foundation and fixing bolt positions and sizes and openings to be left in the civil structure to accommodate the equipment, and indicating the position of all water supply points required and the method of operation and control of the equipment, within 12 weeks of the award of the Contract.
- c) Drawings and instructions detailing any work or assistance required from the civil contractor in installing the equipment within 12 weeks of the award of the Contract.

Electrically controlled or operated equipment

Where the goods supplied by the Contractor are to be electrically controlled or operated by equipment provided by others, the Contractor shall provide within 12 weeks of the award of the Contract:

- a) Fully detailed drawings and documentation showing the position and power of all motors, motor characteristics and power points,

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- b) Full schematic diagrams indicating the interconnection of and the electrical operation of the equipment and details of the electrical motors, etc.

Permanent operating and maintenance instructions

The Contractor shall submit for the Engineer’s approval, drafts of the following for each section of equipment: -

- a) Drawings of the equipment detailing all part numbers and materials, and, if required by the Engineer, detailed drawings showing the complete installation.
- b) A complete spares list.
- c) A lubrication and maintenance schedule showing all maintenance and lubrication operations, their recommended frequency and the grades of lubricant required.
- d) A maintenance brochure describing all maintenance, adjustment and replacement procedures.
- e) Operating manual describing the operation of the equipment with performance curves where applicable.
- f) A manual detailing all dismantling and reassembly procedures.
- g) A manual detailing the maintenance procedure for the corrosion protection painting systems.

The instructions shall be written for application to the particular equipment installed and shall be submitted to the Engineer in draft form for approval before being issued to the Site. “Typical” or “Generalized” instructions may be rejected as inadequate. The Contractor shall amplify and amend such drafts until the Engineer is satisfied that they will provide adequate instructions for the Employer’s staff to operate and maintain the installation. The drawings shall be up-dated for record purposes to show the installation as built. Once the drafts of all manuals, drawings etc., have been approved by the Engineer, the Contractor shall prepare three suitably bound copies and one sepia of each drawing and deliver them to the Engineer.

Contractor’s programme

Draft programme

Within the time stated in the Appendix to the Tender, the Contractor shall submit to the Engineer for approval a draft proposed programme for the manufacture, installation, testing and commissioning of his equipment.

Final programme

The Contractor, in conjunction with the civil and other contractors, if any, and the Engineer, shall draw up a detailed installation and finishing programme showing the installation, testing and painting of the equipment and structures and the commissioning of the Works.

Should the Contractor deviate from the agreed programme he shall be liable for any costs arising from such deviation.

Water, light and power

Unless otherwise specified, the Contractor shall, at his own cost, make his own arrangements with the local authorities for adequate supplies of water, light and power as may be necessary for every part of the work and he

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shall bear all costs for openings, connections, meter hire, and any other work necessary for providing such supplies.

Installation of equipment

Safety

The Contractor shall at all times observe proper and adequate safety precautions on the Site in terms of the Contract and Act No. 85.

General

The Contractor shall commence installation within two weeks of notice being received by him from the Engineer. A skilled rigger shall be in charge of the work at all times and any instructions and explanations which the Engineer shall give to him shall be deemed to have been given to the Contractor. The work shall be neat and workmanlike true to line and level, plumb and in proper working order. Where any item of equipment is mounted on a frame or bedplate, packers/shims shall be provided and fitted by the Contractor to ensure accurate alignment.

Where required to correct alignment, all mounted units shall be shimmed with non- corrosive metal shims. Shims shall be the same shape and size as the contact area of the parts and slotted so that the shims can be removed without removing the mounting bolts.

All cut edges shall be without burrs. Shims with wrinkles in the material will not be permitted. Only small lugs shall protrude after completion.

All equipment shall be assembled avoid the development of initial stresses in the materials and to ensure free running of all moving parts.

Concrete pedestals and grouting of bolts, base plates, etc.

The construction/modification of the concrete pedestals and foundation blocks for all the equipment will form part of this contract but, unless otherwise specified, the Contractor shall supply the holding down bolts, nuts and washers, templates and/or all dimensions and other details necessary for the construction of the pedestals, foundation blocks, holding down bolt pockets, etc. The Contractor shall satisfy himself that all anchor bolts are firm and that baseplates are fully supported over their whole area and that no voids have been left on the underside of any parts of the base plates.

Pipes through walls

The building in of, or boxing out for, pipes will form part of the civil section of this contract and the Contractor shall provide all drawings and dimensions necessary for the accurate alignment and positioning of the pipes or boxed out holes.

- a) Where pipes are to be built in, the Contractor shall, in good time, provide the pipes and specials which are to be built in, as scheduled.
- b) Where holes have been boxed out for pipe work, the contractor will be responsible for the grouting in of the pipe work.

Before the positioning of the pipe work through the holes is commenced the Contractor shall:

- i) arrange to remove all formwork and boxing remaining in the holes.

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- ii) make any alterations required to the position and shape of the holes.
- ii) remove all coatings from the outer surfaces of the section of the pipes and specials that passes through the wall to within 25 mm on either side of the wall surfaces, and thoroughly scrape, clean and accurately position them in the respective walls.

The contractor will then grout in (or concrete in where appropriate) the pipes.

Testing and commissioning

General

The equipment shall be tested in accordance with Clause 7 of this specification and shall be commissioned as specified. Commissioning of the Works shall not commence until the Contractor has met the requirements with regards to operations and maintenance manuals as specified. The equipment will not be taken over by the Employer until it has been satisfactorily tested and commissioned.

Commissioning

The Contractor shall be responsible for commissioning the equipment which shall comprise putting it into operation, calibration, proper adjustment of the equipment, and thoroughly running in the whole of the installation after completion. The Contractor shall be responsible for training the Employer's staff with regards to operation and maintenance of the equipment. When all these operations have been carried out to the satisfaction of the Engineer and the installation is operating satisfactorily it will be considered to have been commissioned.

Servicing

Without limiting the liability of the Contractor for remedying defects, the Contractor shall make quarterly visits to the installation during the Defects Liability Period to service and supervise the operation and maintenance of the installed equipment. During these visits he shall make all adjustments and do everything necessary to ensure the proper running of the equipment.

After each servicing visit to the Site the Contractor shall submit to the Engineer a report on:

- a) the condition of the equipment and the servicing work carried out,
- b) the degree to which the operator has become familiar with the equipment.

The last servicing visit shall be carried out during the last week of the Defects Liability Period when the Contractor shall carry out full checks on the equipment to ensure that the alignment, clearances and settings are correct and he shall make any adjustments required to achieve this.

The Final Certificate will not be issued until the last service visit has been carried out to the satisfaction of the Engineer.

6. TOLERANCES

Method of specifying

Tolerances are specified by way of permissible deviations from the designated line or level or standards, as may be applicable.

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Degree of accuracy

The Contractor shall construct the various parts of the Works to the degree of accuracy specified in the Project Specification or as shown on the drawings.

7. TESTING

General

The Contractor shall be responsible for the completed installation passing any tests specified or required by the relevant Local Authority or Act No. 85. Where test certificates are required in terms of Specifications or Act No. 85 such certificates shall be submitted to the Engineer after the relevant tests have been completed and before the tested equipment is delivered, installed or commissioned.

Approved laboratories

The testing laboratories of the SABS, CSIR, relevant government departments, local authorities and the Engineer will be deemed to be approved laboratories.

Methods of testing

All testing shall be carried out in strict accordance with the methods specified in the relevant SABS, IEC, ISO or BS specification(s). The Engineer will be entitled to be present at all tests and the Contractor is to give the Engineer sufficient notice of the dates of testing.

Factory tests

The Contractor shall carry out tests in accordance with the requirements of the recognized SASS, SC, ISO or BS standards. Details of the standards used shall be supplied. Additional tests in the manufacturer's works, which the Engineer considers necessary, to determine that the equipment complies with the requirements of the specification, may be called for at no additional cost to the Employer.

Tests on site

All site tests shall be carried out in the presence of the Engineer and at such times as he may require. The Contractor shall satisfy himself by prior testing that the equipment conforms to the specifications. The Contractor shall provide all the relevant test equipment and bear the costs of all testing to be done. The cost of the Engineer's attendance at site tests will be for the Contractor's account if tests fail due to lack of care by the Contractor to ensuring that the equipment conforms to the specifications.

8. MEASUREMENT AND PAYMENT

General

Payment for items scheduled shall conform to the payment clauses of the Conditions of Contract as amended by the following:

- a) Unless scheduled separately, the tendered rates or sums shall cover the cost of drawings and instructions as required.
- b) The tendered rates or sums shall cover the costs of anything not specially mentioned but which an experienced contractor can reasonably foresee as being required to enable the equipment to be installed

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and function safely and correctly as specified. No claims for extras will be allowed on the grounds that a piece of equipment or a part thereof is not specifically mentioned in the Schedule of Quantities.

- c) The Contractor will not be entitled to any payment until three copies of the Progress Certificate have been submitted to the Engineer. The certificate shall be accompanied by an invoice of all items as scheduled in the Schedule of Quantities and reflect the progress made on each item.

Preliminary and general items

Unit.....**Sum**

Where provision is made in the Schedule of Quantities for Preliminary and General items, the sum(s) tendered shall cover the cost of all responsibilities specified in the Specifications together with all responsibilities in terms of the GCC. In interim certificates, payment for Preliminary and General Items will be made as a percentage of the tendered lump sum(s) pro rata to the value of work certified for payment.

Where no provision is made in the Schedule of Quantities for Preliminary and General Items the rates tendered for the scheduled items shall cover the cost of all responsibilities specified in the Specification together with all responsibilities in terms of the GCC.

Supply

Unit..... **No or Sum**

The tendered rate or sum shall cover the cost of supply of the goods, testing as required by Act No. 85, provision of test certificates certifying compliance of the goods with SABS, IEC, ISO or BS standards, corrosion protection and supply of all special tools and keys (if required).

Payment for supply of the relevant equipment will not be effected until the draft copies of relevant drawings and operations and maintenance manuals have been submitted.

Delivery

Unit..... **No or Sum**

The tendered rate or sum shall cover the cost of delivery of the goods and offloading at the delivery point stated in the Project Specification.

Where a rate or sum has been tendered for delivery of goods which are then stored as provided for in the specification, the Engineer may certify an amount for partial or full payment of the relevant item, if in the Engineer's opinion such a payment is justified by reason of the transportation of such goods to their place of storage.

Installation

Unit..... **No or Sum**

The tendered rate or sum shall cover the cost of all necessary site oriented activities such as handling, storing, sorting, erecting, all painting, testing and commissioning (unless scheduled separately), including all costs of transport of personnel and their erection gear to Site.

Testing

Unit..... **No or Sum**

The tendered rate or sum shall cover the cost of testing as specified including all costs of transport to and from Site, and Site accommodation of testing personnel and their equipment.

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Commissioning (where scheduled separately)

Unit No or Sum

The tendered rate or sum shall cover the cost of commissioning as specified including all costs of transport to and from the Site, and Site accommodation of personnel and their equipment.

Servicing visits

Unit Sum or No of Visits

The tendered rate or sum shall exclude the cost of providing lubricants but shall cover the cost of servicing visits and operations as specified. Payment of 95% of the tendered amount will become due after each visit. The remaining 5% will be regarded as Retention Money and paid at the end of the Defects Liability Period.

Tools and spares

Unit Prime Cost Sum

The cost of special tools and keys shall be covered by the tendered rate or price for the supply of the. Payment for standard spanners and tool cabinet(s) will be made out of the Prime Cost Sum allowed in the Schedule of Quantities for such items. The Contractor's profit, administration and delivery charges will be paid at the tendered percentage of the actual purchase price of the goods.

Payment for spares will be made at the price tendered in the Spares Schedule which price shall cover the cost of supply, crating and labeling where applicable, and delivery to the Site of the said items.

Interim storage

Unit Month

When interim storage is to be paid, the minimum period measured will be three months. The tendered rate shall cover the cost of providing storage in the approved store, protecting and maintaining the goods in storage, handling the goods in and out of the store, and labeling and packing. No separate payment for storage will be made where normal delivery is affected

Insurance for goods stored

Unit Month

When insurance for goods stored is to be paid, the minimum period measured will be three months. The tendered rate shall cover the cost of insuring the goods while in storage.

Additional visits to Site

Additional visits to Site ordered by the Engineer (other than visits required as a result of malfunctioning of, or defects in the Contractor's materials or workmanship, or as a result of circumstances for which the Contractor is responsible in terms of the Contract) will be scheduled as:

a) **Transport Unit No of Visits**

The tendered rate for transport shall cover the total cost of transporting personnel and equipment to and from Site.

b) **Site operations Unit Day**

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The tendered rate for site operations shall cover the full daily cost of the wages, equipment, accommodation and local transport.

APPENDIX A: APPLICABLE STANDARDS

SANS 10083 The measurement and assessment of noise exposure during work for hearing conservation purposes

SANS 10142-1 The wiring of premises Part 1: Low voltage installations

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C3.2.3.3 SPEC BVMECH01/2 WATER PUMPS: MEDIUM PRESSURE

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- 9. MAINTENANCE**
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SPEC BVMECH01/2 WATER PUMPS: MEDIUM PRESSURE

1. SCOPE

This specification covers the supply, installation, testing, commissioning and maintenance of pumping equipment, motor control devices and low-voltage cables. The function of water pump systems shall be the delivery of water at a specified flow rate and head to the required location.

This specification shall act as a guideline to the Particular Specification and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

1.2 INTERPRETATIONS

Physical:

- Coupling - any process of jointing (with the exception of welding) straight pipes to one another and to specials and valves.
- Special - Any pipe other than a straight pipe
- Straight Pipe - A straight pipe of uniform bore and of standard or variable length.

2. STANDARD SPECIFICATIONS

GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

- BS 5316, Part 1 - Acceptance tests for centrifugal, mixed flow and axial pumps
- SABS 948 - Three-phase induction motors
- SABS 1222 - Enclosures for electrical equipment (classified according to the degree of protection that the enclosure provides)
- BS 4999 - General requirements for rotating electrical machines
- BS 1486, Part 2 - Heavy duty lubrication nipples
- ISO 281/1 - Rolling bearings – dynamic load ratings and rating life

2.1 OCCUPATIONAL HEALTH AND SAFETY ACT OF 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act, 1993 (Act no 85 of 1993) shall be adhered to.

2.2 MANUFACTURERS' SPECIFICATIONS, CODES OF PRACTICE AND INSTALLATION INSTRUCTIONS

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All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

2.3 MUNICIPAL REGULATIONS, LAWS AND BY-LAWS

All municipal regulations laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

3. AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals.

4. PUMP DESIGN AND REQUIREMENTS

Pumps shall be of the End Suction centrifugal type with suction and discharge flanges being either horizontal or vertical upwards. Pumps of the back pull-out type are preferred. The operating speed of rotating elements shall be below the critical resonant speed of the pump. Operating vibration levels of all pumping equipment and motors shall be to the satisfaction of the Engineer.

- (a) Pump casings shall be manufactured from close-grained cast iron.
- (b) The pump shaft shall be manufactured from stainless steel and shall be sealed where it enters the casing with double mechanical face seals.
- (c) The impeller shall be suitable for pumping of clear water and manufactured from cast iron or zinc-free bronze.
- (d) The impeller shall be statically, dynamically and hydraulically balanced. No holes may be drilled in the impeller to balance it with regard to mass distribution.
- (e) Pump bearings shall be either grease- or oil-bath lubricated. A thrust bearing shall be provided to accommodate the end thrust of the impellers. The lubrication points of bearings shall be situated in such a position so that lubrication can be done without taking the pump out of operation.
- (f) Bearings shall have a B-10 life rating of 100 000 hours.
- (g) The pump shall be a currently catalogued product.
- (h) Performance curves shall be based on a reproducible and certified test carried out in an approved testing facility, such as the SABS.

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- (i) The flow rate at break-off point of the curve for the impeller selected shall be at least 1.5 times that of the maximum flow rate specified.
 - (j) The head at zero delivery of the curve of the impeller selected shall be at least 1.2 times the maximum head in the pump's operational range.
 - (k) Each pump shall be clearly labelled. The label shall be a 0.5 mm thick stainless steel plate of dimensions 100 mm x 50 mm. The label shall be fixed to the pump exterior with an approved adhesive or other method after the completion of corrosion protection on the pump. It may be bent to follow the shape of the pump exterior but shall not be bent to accommodate sharp folds. Under no circumstances shall the stainless steel plate of the label influence, damage or otherwise have a detrimental effect on the corrosion protection system. The label shall include the following information:
 - pump rates
 - pump head
 - power required
 - NPSH (r) rotational speed
 - impeller detail.
 - (l) All new pumps shall be fitted with a single self-aligning balanced flush mechanical seals manufactured from 304 stainless steel and fitted with ceramic or carbon seals, which shall be included in the cost of the pumps. The pump shafts shall be hardened and accurately ground where the seal bears on the shaft. The rotating seal face shall be mounted on a flexible member, sealing on the shaft as well. The flexible member shall be manufactured from rubber, PTFE or equivalent material suitable for the operating environment.
 - (m) Centrifugal pumps shall comply with relevant and applicable items under the clause on technical requirements regarding all pump types, as well as the following:
 - (i) Preference shall be given to pumps of the self-regulating type and where the power consumption characteristic is such that the power consumption decreases with an increase in delivery to beyond a certain limit, thus ensuring that the motor is not overloaded in the event of a large reduction in pumping head.
 - (ii) The casing for centrifugal pumps shall be horizontally or vertically split to allow removal of parts.
 - (iii) The efficiency of the pump shall not be less than 95 % of its maximum efficiency at the selected operating point, where the latter shall not be less than 80 %.
 - (n) Base plates – Pumps and motors shall be mounted on base plates of rigid design manufactured in fabricated steel, equipped with anchor bolt holes, anchor bolts, drain connections and unobstructed grout holes. Base plates shall be adequately protected against corrosion

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- (o) Anchor Bolts to be not less than M16. The Contractor will be responsible for the grouting in of the anchor bolts using an approved non-shrink grout.
- (p) Couplings – Pumps and motors shall be direct coupled with a suitable coupling that will take up minor misalignment or off-setting of the motor and pump shaft satisfactorily. Couplings shall be statically and dynamically balanced. Couplings to be robust, shall be readily dismantled and reassembled and shall have a service factor of at least 1.5.
- (q) Guards – Contractor to supply a strong removable all-metal guard over the coupling and drive shafts as protection against accidents in case of bodily contact.

5. MOTOR DESIGN AND REQUIREMENTS

- (a) Electric motors shall comply with the requirements of SABS 948
- (b) Imported motors forming an integral part of the pump shall be submitted to the South African Bureau of Standards to be tested in accordance with the requirements of SABS 948.
- (c) Motors for pumps shall be of the TEFC type.
- (d) All motors shall be standard catalogue models and shall be readily available.
- (e) All motors shall, where possible, be from the same manufacturer and shall have the same interchangeable frames. Variations in type and size shall, where possible, be limited to make stocking a variety of special spares unnecessary.
- (f) All motors shall have dynamically balanced rotors supported by maintenance-free, sealed-for-life ball bearings.
- (g) All motors shall be suitably coated to ensure the satisfactory operation of the motor under the specified class of service.
- (h) All terminal boxes shall be waterproof and suited for submersion up to the depth as specified for the pumps.

6. WORKING VOLTAGE AND SUPPLY SYSTEMS

The motors shall be capable of operating within $\pm 10 \%$ of the nominal supply voltage without risk of damage. All motors shall be suitable for operating continuously at the specified three-phase voltage system under actual service conditions, including the $\pm 10 \%$ voltage tolerance, without exceeding the specified temperature rise determined by the resistance on a basic full load heat run.

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All motors shall be capable of operating continuously under actual service conditions at any supply frequency between 48 and 51 Hz together with any voltage between $\pm 5\%$ of the nominal supply voltage.

The slip-in speed of any motor at 80 % of the nominal voltage at 50 Hz shall not exceed a percentage agreed on by the Engineer, and the motors shall be capable of operating at this voltage for a period of five minutes without deleterious heating.

7. PLANT

The Contractor shall provide all plant that is necessary to install, test and commission all items covered in this specification.

The Contractor shall use suitable rigging and lifting equipment for handling and placing the pumps, motors and valves so that no installed equipment is over-stressed during operation.

The Contractor may use any acceptable device to control the installation and alignment of pump sets.

8. TESTING AND COMMISSIONING

During the day of commissioning tests the pump operating point shall be determined by observing the following:

- (a) pump delivery and suction pressures, and
- (b) electric motor power consumption.
- (c) All anchor bolts to be retightened after one day of continuous operation.

The Contractor shall supply the necessary adaptors, fittings and pressures gauges to measure the suction and delivery pressures. If the characteristics with regard to discharge "duty point" head falls short of that specified, the Contractor shall, at his own cost, immediately remedy the defects to ensure that the installation complies with the requirement of the specified duty within the time period laid down by the Engineer. After having remedied the defects, a second test shall be carried out. Should the second test also fail to meet the requirements, the equipment may be rejected in which case the Contractor shall take immediate steps to replace the installed equipment with equipment that meet the requirements. Any payments made by the Employer in respect of rejected equipment shall be repaid by or recovered from the Contractor within 30 days of said rejection.

8.1 TEST CONDITIONS

- (a) All tests shall be performed in situ.
- (b) The pumped medium or liquid shall be water.
- (c) The Contractor shall supply reasonable proof to the Engineer that all gauges and meters supplied for testing are accurately calibrated within 3 months of conducting the tests on the pumping equipment.

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- (d) The fact that the Employer will take pumping units into service after testing in no way relieves the Contractor of his responsibility to ensure that the pumps perform as specified unless any improper performance is due to negligence on the part of the Employer or his staff.

9. MAINTENANCE

9.1 GENERAL

All pumping equipment and systems shall be completely serviced, following practical completion of the installation of which it forms part, to maintain it in perfect functional condition.

Maintenance shall be carried out and shall include routine preventative maintenance according to the manufacturer's specification to be set out in the operating and maintenance manual, as well as unforeseen repair work or replacement for the duration of the Defects Liability period.

10. MEASUREMENT AND PAYMENT

10.1 SUPPLY AND DELIVERY OF PUMPING EQUIPMENT

Unit number

The unit of measurement shall be the number of pumping equipment units supplied and delivered. The tendered rates shall include full compensation for the design, manufacture, corrosion protection, patent rights, pre-delivery testing and test certificates, transport for delivery to site and off-loading, including all handling of the equipment. The equipment shall include the following:

- (a) The pump and motor.

The tendered rates shall include full compensation for the site handling and positioning of the pumping equipment, including the fastening of the equipment in its designated position. The following shall also be included in the tendered rates:

- (a) Coupling of all required pipes flanges, including all required gaskets, nuts, bolts and washers;
- (b) Routing and fastening of the power cable up to the isolator box;
- (c) All required installation materials, labour and consumables to render a complete and working installation.

The tendered rates shall also include full compensation for all preliminary tests, delivery and efficiency tests if required and commissioning tests. Commissioning tests shall comply with the section dealing with testing and commissioning.

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SPEC BVMECH01/6: MEDIUM PRESSURE PIPEWORK AND VALVES

1. SCOPE

This specification covers the supply and installation of pipe work up to DN 1000 mm, for transporting water and sewage under working pressures of up to 2,5 MPa inside pump stations, treatment works and the like.

Definitions

The following definitions shall apply:

Bell hole - An enlarged excavation around a joint on the pipe to give room for workmen to reach the sides and bottom of the pipe.

Bending shoes - Devices used when bending a pipe to prevent crushing and flattening the pipe and to obtain a smooth curve.

Dolly - A device having rollers on which lengths of pipe can be placed, permitting the pipe to be rotated easily to facilitate welding.

Fitting -

- a) A special or valve.
- b) Any process of jointing (except welding) straight pipes to one another and to specials and valves.

Flexible pipe - A pipe of which the diameter is reduced by more than 1% under an external radial force before the appearance of cracks.

Manual shielded electric arc process welding. (MSEAP) -

Electric arc welding done by hand using a filler electrode coated with a material which gasifies at the point of arc and excludes oxygen from the weld, thus improving the metallurgical quality of the completed weld.

Mitre welds - Welds which join two lengths of pipe at an angle point in such a manner that the axis of both lengths of pipe proceed in a straight line to the point of intersection.

Pig, Swab, Scraper -

These terms are loosely used interchangeably. Swab, however, is more commonly confined to mean a device passed through the pipeline during construction solely to remove obstacles and foreign matter which are hazards peculiar to construction.

Pig and scraper mean devices for cleaning the pipeline after operations are in progress, for the removal of materials which may accumulate on the inside of the pipe walls during service.

Pinhole - A very small hole indicating a flaw in a weld or coating.

Pipe end bevel - A bevel cut made on the end of a pipe to afford a groove between abutting joints in order to receive weld metal.

Position weld - A weld made under such conditions that the pipe cannot be rotated to keep the welder always working in the same position, as a consequence of which the welder must change positions as his work proceeds around the weld (Stove pipe weld).

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Rolling weld - A weld made from one position as the pipe is rotated.

Root or stringer bead - The first weld bead applied to the joint between two sections of pipe.

Special - Any pipe other than a straight pipe.

NOTE: Under this definition shall be included all sizes of specials of shapes such as bends, tees, crosses, angle branches, reducers, tapers and flexible couplings with or without centre registers.

Stove pipe welds - A weld made without rotating the pipe, requiring the welder to shift his working position to all quadrants.

Straight pipe - A straight pipe of uniform bore and of standard or non-standard length.

Pipe work - Shall include all pipes, joints, specials, fittings and valves.

Welding icicles - Congested droplets of metal which extend through the weld to the interior of the pipe, caused by excessive heat or improper welding technique.

Additional abbreviations

CI:	Cast iron
CID :	Constant internal diameter
COD :	Constant outside diameter
FC :	Fiber cement
IRHD :	International rubber hardness degrees
DN :	Nominal diameter, which shall mean minimum inside diameter of the pipe as scheduled for all pipes over DN 150.
PN:	Nominal working pressure
OD :	Outside diameter, which shall mean $DN + 2 \times \text{lining thickness} + \text{pipe wall thickness}$
p.e :	Plain-ended
PTFE :	Polytetrafluoro ethylene
PVC :	Polyvinyl chloride
PVC-U :	Polyvinyl chloride - unplasticized
Sa :	Followed by a number refers to the relevant part of Swedish Standards SIS 05 59 00.
SS :	Stainless steel

2. DESIGN, MATERIALS AND MANUFACTURE

General

Pipes and fittings shall be of the types shown on drawings or scheduled and, unless otherwise required in terms of the Project Specification. All pipes and fittings shall be supplied complete with couplings and jointing material.

Pipeline materials shall be so transported, stored and handled that pipes are not overstressed at any time and fittings are not damaged in any way. All thin-walled, flexible, and soft-coated pipes shall be handled with particular care and shall be so stored that they are not subject to concentrated pressure from stones or other obstructions. Pipes damaged or cracked in any way shall be removed from the Site at no cost to the Employer.

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All pipe work shall be supported and anchored by civil structures only where it passes through the walls of the building. All other supports and anchors shall be by means of steelwork designed, supplied and erected by the Contractor.

The orientation of pump suction and delivery pipe work shall be such as to facilitate maintenance, and designed for minimum head losses, no air traps and to ensure that no stress is placed on the pump flanges.

Under no circumstances shall the suction or discharge manifolds be of a smaller diameter than those shown on the drawings. The flow velocity shall not exceed 1.5 m/s and 2.5 m/s respectively.

Steel pipes, fittings and specials

Unless otherwise scheduled or shown on the drawings, pipes etc., shall be manufactured from grade A steel plate complying with SANS 719.

Welding shall be in accordance with API Std. 1104. (See 5.2.2) or SANS 10044 Part 5 as applicable.

Pipes of nominal diameter up to DN 150

Unless otherwise scheduled or shown on the drawings, steel pipes and fittings up to DN 150 shall be of medium class and screwed, and shall comply with the applicable requirements of SANS 62.

Pipes of DN over 150

Unless otherwise specified, straight piping and specials shall be manufactured to the following dimensions:

Nominal Diameter	Minimum Plate Thickness		Minimum outside diam. Of Steel pipes and specials	
	Pipes (mm)	Specials (mm)	Epoxy Paint lined (mm)	Concrete Lined (mm)
200	4.0	5.0	219.1	219.1
250	4.0	5.0	273.0	273.0
300	4.0	5.0	323.9	323.9
350	4.5	6.0	355.6	375.0
400	4.5	6.0	406.4	430.0
450	4.5	6.0	457.2	480.0
500	5.0	8.0	508.0	530.0
600	6.0	8.0	609.6	640.0
700	6.0	8.0	711.2	740.0
800	8.0	10.0	812.8	845.0
900	8.0	10.0	914.4	945.0
1000	10.0	12.0	1016.0	1050.0
1200	10.0	12.0	1220.0	1255.0
1400	12.0	12.0	1420.0	1460.0
1600	14.0	14.0	1620.0	1665.0

Helically welded pipes will not be permitted inside pump stations or treatment works.

The pipe OD, length and type of joint shall be as specified in the Project Specification and/or as shown on the drawings.

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Specials

Specials DN 150 and smaller shall comply with BS 1387.

Specials larger DN 150 shall be manufactured from pipes complying with the sizes stated in the table above.

Specials shall be fabricated in accordance with BS 534.

All specials (except flanges) shall be suitable for a working pressure of not less than 2,5 MPa.

CI pipes, fittings and specials

CI pipes and flanged fittings shall comply with the applicable requirements of BS 2035.

PVC-u pipes

PVC-U pipes and fittings shall be fitted with spigot and socket rubber ring joints and shall comply with the relevant requirements of SANS 966-1.

Jointing

Flexible couplings

Except where otherwise specified or scheduled, flexible couplings for plain-ended steel pipes shall be of the slip-on type. A coupling shall be able to withstand a hydrostatic test pressure of twice the working pressure specified for the pipe for which the coupling is required, and coupling flanges shall be capable of withstanding all stresses caused by tightening of the bolts. Rubber rings shall comply with the relevant requirements of SANS 974: Part I and shall have a hardness of 66-75 IRHD.

Flexible couplings shall be supplied complete with all necessary bolts, nuts and rubber jointing rings.

Flanges

The drilling of steel and CI flanges shall conform to the requirements of SANS 1123 appropriate to the class of pipe specified.

Any item of pipe work, special or valve that has flanges which are incorrectly drilled will be rejected. Reaming of bolt holes to oversize dimension in order to make a particular piece fit will not be permitted.

All flanges shall be machined overall with gramophone finish in accordance with SANS 1123.

Flanges for nominal pipe diameters greater than DN 1000 shall have raised faces.

Where the working pressure exceeds 1,6 MPa, and for all diameters of DN 400 and over, flange faces shall be machined in accordance with DIN 2514 specification. Valve faces shall be machined female to receive the rubber 'O' ring.

Loose flanges

Loose flanges for welding onto steel pipes on Site shall be manufactured from the same steel as is specified for the pipes, and shall be in accordance with SANS 1123. Any item of pipe work that is found to have flanges that are incorrectly drilled will be rejected.

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All loose flanges shall be suitable for field welding to pipes and specials, and shall conform to API 1104 in respect of attachment.

Gasketing

Each flanged pipe and fitting shall be supplied complete with one insertion piece, of the appropriate diameter, and made of a material that is suitable for the maximum working pressure, such as rubber for small diameter low pressure pipelines or compressed asbestos or other approved material for medium to large diameter and medium to high (2,5 MPa and higher) pressure pipelines, and one set of bolts and nuts.

Unless otherwise specified in the Project Specification, asbestos gaskets, in accordance with BS 2815 Grade B and having a minimum thickness of 2 mm, shall be supplied for working pressures not exceeding 1,6 MPa. Where working pressures exceed 1,6 MPa, rubber "O" rings dimensioned in accordance with DIN 2514 Specification shall be supplied to suit suitably machined flanges.

Bolts and nuts

Bolts and nuts shall comply with the relevant requirements of SANS 1700, or where high strength friction grips are specified in the Project Specification the bolts shall comply with the requirements of BS 3139, and their use and design shall be as specified in BS 3294, Part 1 and BS 4604. Locking devices for nuts shall be provided wherever there is a possibility of the nuts becoming loose during service.

All bolts, nuts and washers shall be hot dip galvanized.

Screw-ended pipes

Screw-ended pipes shall comply with the relevant requirements of SANS 1109. Male ends shall be taper-screwed and female ends shall have parallel threads.

Spigot specials

Each spigotted special shall be supplied with one sleeve coupling (or such other type of coupling as is shown in the drawings) to suit the particular pipe with which the special is to mate. The coupling shall fit the larger end of the barrel in the case of a reducer.

Spigot and socket pipes

Spigot and socket pipes shall be provided with rubber or neoprene sealing rings for forming flexible couplings.

Welding electrodes

The Contractor shall supply all the necessary welding electrodes, which shall be of the shielded type.

Valves

All valves shall be hydraulically tested. Unless otherwise scheduled or shown on the drawings, valves shall comply with the following requirements.

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Gate valves

Gate valves shall comply with the following as applicable:

- a) for working pressures up to 1,6 MPa and over DN 50 but not exceeding 600 mm shall be of cast iron and shall comply with the relevant requirements of SANS 664;
- b) for working pressures over 1,0 MPa and of diameter exceeding DN 600 shall be of cast steel and shall comply with the material and construction requirements of SANS 191 and with dimensional requirements of the approved manufacturer.
- c) the outlet connections shall be flanged or spigot plain ended as scheduled;
- d) the spindles shall be non-rising and made from either zinc-free bronze, 304 stainless steel or as approved;
- e) the spindles shall be fitted with hand wheels;
- f) the direction of closing shall be clockwise;
- g) the valve design shall be such that it may be opened or closed against the differential pressure specified in the Project Specification or schedule, with an effort applied by one man of 200 N exerted simultaneously with each hand on the rim of a standard hand wheel, or on the cross bar of a tee key with hands spaced 900 mm apart (total effort 400 N).

In order to achieve this, gate valves shall be fitted as required with either plain or ball thrust bearing, spur gearing and close-machined channel guides and shoes;

- h) for working pressures above 1,0 MPa and valves of DN 250 and under, and all valves of DN 300 and over, valves shall be fitted with a spur reduction gear having an advantage of not less than 2:1;
- i) for working pressures above 1,0 MPa valves shall be fitted with ball-bearing spindle thrust collars;
- j) the seat rings shall be pinned, and manufactured from either phosphor bronze, 304 stainless steel or as approved;
- k) alternatively resilient seal valves (RSV) may be offered unless excluded in the Project Specification.
 - (i) The gate of the RSV shall be completely covered by natural or an approved neoprene rubber to a minimum thickness of 1 mm and pinhole free;
 - (ii) the gland packing shall be lubricated and graphited cotton packing ;
 - (iii) Two rubber "O" seal rings of an approved design shall be provided;
- l) the design of all valves shall be such that they may be mounted vertically;
- m) flanged valves shall be drilled off-centre, and
- n) electrically operated actuators, where specified in the Project Specification, shall comply with (e).

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Butterfly valves

Butterfly valves for working pressures exceeding 2,5 MPa shall comply with the requirements of the Project Specification. Valves for working pressures up to 2,5 MPa shall comply with the relevant requirements of BS 5155 and the following:

- a) The valve shall:
 - i) be manufactured from materials as specified in Table 3 of BS 5155;
 - ii) be suitable for connecting to pipe flanges by individual bolting;
 - iii) have a replaceable stainless steel or zinc-free, phosphor bronze seat mechanically fixed to the body and a resilient rubber or neoprene seal, replaceable and adjustable on site, mechanically fixed to the edge of the disc;
 - iv) be suitable for flow in either direction, capable of use as a regulating valve and shall shut off drop tight, and have a maximum working pressure as stated in the Project Specification;
 - v) be clockwise closing;
 - vi) be designed for installation with the main shaft horizontal and the operating shafts vertical;
 - vii) be designed such that it may be opened or closed against the differential pressure specified in the Project Specification or scheduled, with an effort not exceeding 250 N on the handwheel in the case of valves up to 300 mm in diameter, and not exceeding 400 N on the hand wheel in the case of larger valves;
- b) the seal retaining rings and screws shall be of an approved stainless steel or zinc-free, phosphor bronze;
- c) the main shaft shall be offset from the centre line of the disc so as not to pass through the seal;
- d) the body ends shall be flanged and drilled in accordance with the flange specification and off-centerline;
- e) the valves shall be fitted with actuators which shall:
 - i) not be an integral part of the main body but shall be a separate unit bolted to the main body in such a manner that water leaking past the main shaft seal is prevented from entering the actuator;
 - ii) be fitted with a horizontally mounted hand wheel at a height that provides for reasonable operation under the conditions shown on the drawings;
 - iii) comply with Section 11 of AWWA C 504, and shall be capable of opening and closing torques at least 30% in excess of the necessary under the working conditions stated in the Project Specification, and
- f) the valve assembly shall be protected against corrosion.

Each valve shall be supplied with a certificate certifying that it complies with the requirements of this specification and that it has been tested and inspected in terms of BS 5155.

Check valves

Check valves shall be so designed that they perform in the manner, and fulfill the requirements set out in the Project Specification. The valve shall be suitable for horizontal or vertical mounting, of robust construction, and shall close drop tight at the required operating head. Access to the moving parts shall be possible without removing the valve from the line. In addition, the following shall apply:

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- a) For flanged check valves:
 - i) the valve shall be double flanged;
 - ii) the body, cover and door shall be of close-grained cast iron;
 - iii) the door shall be fitted with a zinc-free phosphor-bronze face closing on a corresponding bronze face in the body, and
 - iv) the door suspension lugs shall be hinged on a long zinc-free, phosphor-bronze spindle supported in trunnion bearings on both sides of the body;
- b) For wafer type spring check valves:
 - i) the discs shall be either stainless steel or carbon steel with resilient seats, and
 - ii) the valve bodies shall be manufactured of the materials specified.

Air valves for water

Air valves for water shall be Vent-O-Mat type RBX or similar approved.

- a) The body for all types of air valves shall be:
 - i) for working pressures up to 2,5 MPa, cast iron or stainless steel cylindrical body with ends that conform with the relevant clauses of BS 1452 for Grade 220, and
 - ii) for working pressures exceeding 2,5 MPa, cast steel.
- b) Each air valve shall be supplied with:
 - i) a bronze isolation cock, (for DN 25 valves only), and
 - ii) flanged isolating RSV gate valve, and with or without bevel gears and spindle cap or hand wheel as specified, or for operation in the manner specified in the Project Specification.
- c) Each double or multiple orifice air valve (flanged) shall be fitted with a suitable drain cock to release the pressure inside the valve when the isolating valve is closed at a time when the float is sealing the large orifice.
- d) Unless otherwise specified in the Project Specification, single, small orifice air valves shall be capable of releasing automatically under normal operating pressure and conditions any air entrapped in the pipeline, and shall be of the lever type with a 316 stainless steel ball.
- e) Triple orifice air valves shall be provided with cast iron shield plates so designed as to prevent the entry of dirt when the large orifice is open.

Air Valves for sewer rising main

Air valves for sewers shall be Vent-O-Mat type RGX or equal approved.

- a) All materials used in the manufacture of the valve shall be so compatible as to reduce corrosion and electrolytic action to a minimum. The end covers shall be FBE painted.
- b) The valve shall be constructed of close-grained cast iron;

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- c) The valve body shall be contoured to ensure that there are no corners or rough surfaces to which solids may adhere;
- d) Two wash-down sludge plugs for cleaning and inspection shall be provided.
- e) All mechanisms shall be totally enclosed;
- f) The seat profiles of the three orifices shall be such that the valves are gas-tight at pressure not exceeding 50 kPa.
- g) The valve seats shall be readily accessible for cleaning and inspection on removal of the cover bolts;
- h) The head casting shall be specially strengthened and dimensioned to receive a vertical vent pipe, if required subsequently;
- i) The operation of the valve shall be such that the sewage never comes into contact with the plastic cylindrical floats or valve seats.

Pressure gauges

Pressure gauges shall be fitted to the pipe work as shown on the drawings or as specified in the Project Specification.

These gauges shall be as specified in the Project Specification.

Corrosion protection

Pipe work, specials, valves and pumps

Corrosion protection shall be in accordance with the requirements of the Project Specification and shall generally be protected as detailed in the clauses of SPEC BVMECH01/4

Protection against electrolytic corrosion

External protection against electrolytic corrosion, consisting of an extruded sheath of polyvinyl chloride or polyethylene, an impervious adhesive plastic tape or petroleum- based impregnated tape or other approved insulating material, shall be applied where required in terms of the Project Specification.

Flexible couplings

Flexible couplings for steel pipes shall be thoroughly cleaned and then treated as specified in the Project Specification.

Bolts, etc.

Mild steel bolts, nuts and washers for joints shall be thoroughly cleaned and hot dip galvanized unless another means of corrosion protection is specified in the Project Specification.

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Corrosive soil

Where scheduled or ordered, steel or cast iron fittings and joints that is to be subjected to corrosive soil conditions shall be wrapped with an approved plastic tape or protected with other scheduled or approved materials.

3. PLANT

Setting out

The Contractor may use any acceptable device to control the alignment and installation of pipe work and valves.

Temporary supports

The Contractor shall provide such temporary supports as are necessary, in the vicinity of the position of permanent supports, to ensure that pipework and valves are installed true to level and alignment.

Handling and rigging

The plant and rigging equipment used by the Contractor for the handling and placing of pipes and valves shall be such that no pipe shell or valve casing is over-stressed during any operation covered by the specification.

Testing

The Contractor shall provide the pump, pressure gauges, etc., as well as the necessary tools and fittings required for the performance of the tests required.

Welding equipment

The Contractor shall supply all welding equipment, generators, clamps, dollies, swabs and other equipment and labour required.

Welding machines shall be operated within the amperage and voltage recommended for each size and type of electrode, Any equipment which does not meet the requirements shall not be used until it has been repaired or alternatively replaced.

4. INSTALLATION AND OPERATING REQUIREMENTS

Installation and laying

Inside structures

All pipe work shall be installed and supported to even grades and to the levels and alignments shown on the drawings or as directed. Both the suction and discharge piping shall be supported over the pumps with rigid supports and/or anchors to prevent strain from the pipe work acting directly on the pumps.

Outside structures

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General

Pipes outside structures shall be laid to even grades and with a cover of 800mm or such other cover as is directed or shown on the drawings. Where so required, slight misalignment may be taken up by deflection at pipe joints, but the deflection shall not be greater than the deflection recommended by the manufacturer of the pipe.

Where site welding of joints is approved bell holes shall be provided at each joint.

Pipe trenches shall be kept free of water from the time that laying commences until backfilling has been completed.

Should it be necessary to cold bend steel pipes on site, the Contractor shall employ bending shoes. The minimum radius allowed will be 20 times the pipe O.D.

Minimum clearance between pipes

The minimum clearance between the outside of a pipeline being laid and the outside of any other pipe that it crosses shall be 150 mm. Where this requirement conflicts with other requirements, the Contractor shall ask the Engineer for written instructions and shall carry out the work in accordance with those instructions.

Damage

Each pipe and each fitting shall be thoroughly cleaned and carefully examined for damage and defects immediately before laying. Should any damaged or defective pipe or fitting be laid, it shall be removed and replaced at the Contractor's expense and to the satisfaction of the Engineer.

Keeping pipelines clean

Every reasonable precaution shall be taken to prevent the entry of foreign matter and water into the pipe(s). At any time when work is suspended for a significant period, the last laid section of each pipe shall be plugged, capped, or otherwise tightly closed until laying is recommenced. All pipes shall be swabbed as work proceeds.

Jointing

Flanges (steel pipelines)

In the jointing of steel pipes with flanges, special care shall be taken to align, grade, and level the pipes, specials, and valves to avoid straining of the flanges. All bitumen shall be removed from the face of each flange immediately prior to jointing (epoxy paint need not be removed). Insertion pieces shall comply with the applicable requirements and form a continuous ring(s) between the flanges. In the case of small diameter flanges, accurately cut holes shall be provided for the bolts. All threads shall be oiled with an approved lubricant during erection to ensure ease of removal during maintenance.

Bolts shall be tightened up evenly in opposite pairs to ensure uniform bearing on the insertion. Care shall be taken to avoid damage to the internal and external surfaces of the pipes during assembly of the pipeline.

Wherever loose flanges are welded onto pipelines, the Contractor shall ensure that internal and external coatings are restored so that they comply in all respects with the specification for such coating and are

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soundly bonded to the existing coatings. All pipes and specials, whether flanged or not, shall be supplied complete with all jointing materials, bolts and nuts necessary to make and complete all joints.

Welding (steel pipelines)

Unless otherwise approved, all welding done by hand shall be MSEAP welding, and done in accordance with API Std. 1104.

Pipes shall be manufactured by an approved automatic submerged-arc welding process or shall be electric resistance welded. Where automatic submerged-arc welding is employed, at least one pass shall be made on the inside and at least one pass on the outside.

The number of longitudinal weld seams shall not exceed one seam for pipes up to DN 1000. Field welding will not be permitted without the Engineer's prior approval, which will be granted only where the Contractor describes fully the method to be employed in making good the lining and coating at each weld. The Contractor shall guarantee that the quality of the repairs to the protective coating and linings is equal to the original protective system.

Field welding of steel pipelines shall comply with the relevant requirements of API Std. 1104. Each welder shall have a unique number with which he shall mark each joint welded by him, so that it can be identified. Before welding, all foreign matter shall be removed from the pipe ends. If any of the pipe ends are damaged to the extent that satisfactory welding contact cannot be obtained, the damaged pipe ends shall be cut and beveled with an approved beveling machine to the Engineer's approval. Should laminations, split ends, or other defects in the pipe be discovered, the joint containing such defects shall be cropped, repaired or removed from the pipeline as ordered by the Engineer. All repairs shall be done at the Contractor's expense.

The space between abutting pipe-ends, when aligned for welding, shall be such as to ensure complete penetration without burn-through. For pipes having the same dimensions, the spacing shall be approximately 1.5 mm. The alignment of the abutting pipe-ends shall be such as to minimize the offset between pipe surfaces. Internal lineup clamps shall be used whenever practicable. External line-up clamps shall be used where it is impracticable to use internal line-up clamps.

At the discretion of the Engineer, roll welding will be permitted provided proper arrangements are made to maintain the alignment between adjacent pipes being welded.

Where spigot and socket joints are approved, field welding will be permitted. An approved epoxy mortar shall be applied to the inside of the socket in such a manner that the whole space between the spigot and socket is filled to prevent the ingress of water. The filler and finish weld beads shall be deposited by an acceptable method and each filler bead shall be approximately 3 mm in thickness. Completed welds shall have a reinforcing of 1,2 mm \pm 0,3 mm above the pipe surface around the entire perimeter of the weld, and the width of the finish bead shall not be more than 3 mm greater than the original groove. Each weld shall consist of at least three (3) beads. No two beads shall be started at the same point. In the case of spirally welded pipe the reinforcing may be increased to 2.5 mm \pm 0.5 mm.

No mitre welds will be permitted on site (only at the manufacturer's works), and all welds shall be at ninety degrees (90°) to the axis of the pipe. All slag and scale shall be removed from each bead for visual inspection immediately after each bead has been run.

Welding will not be permitted when in the opinion of the Engineer the quality of the completed weld may be impaired by the prevailing weather conditions, including, but not limited to, air-borne moisture, blowing

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sand, or high winds. Where practicable, the Contractor will be permitted to erect approved screens to protect the welding operations.

Where ordered by the Engineer or specified in the Project Specification, welds shall be examined by radiographic inspection as stated in API Std. 1104.

All field welds shall be tested by a qualified inspector using the dye-penetrant test method.

Detachable couplings (FC, PVC-U and steel pipelines)

Each end of all pipes shall be thoroughly cleaned by brushing and wiping immediately prior to being jointed. All rubber rings and seals shall be carefully inspected after being placed in position, and before the joint is closed, to ensure that they have not suffered any cuts, tears, or other damage, and are not in any other way defective. Only the lubricant recommended by the manufacturer shall be used for sleeve-type couplings and rubber seal rings of FC pipes.

Polyurethane joints for PVC-U pipes shall be lubricated with soft soap or similar material approved by the manufacturer. Grease derived from petroleum products shall not be used in PVC-U pipe joints. PVC-U and FC pipelines with CI detachable couplings shall have a gap, after laying and jointing, of approximately 10 mm between the ends of the pipes and central to the collar, to allow for expansion when the pipes are filled and have absorbed moisture.

Design of specials

The Contractor shall be responsible for the design of all specials. He shall submit his design calculations to the Engineer for approval before manufacture commences. The Contractor shall ensure that all the necessary collars, Triforms and/or other forms of reinforcing required to prevent distortion or local over-stressing are an integral part of each special. Lifting eyes (lugs) shall be welded to all specials of DN 450 and larger to facilitate handling and minimize damage to the pipe coating.

All fabricated specials shall as far as practicable be constructed such that bends are formed to a radius three times the OD of the pipe (either by mitres of a maximum of 22,5° or hot bent) and all reducers (or expanders) shall have a maximum angle of divergence of 10°.

All specials and fittings shall be manufactured exclusively at the works of an approved manufacturer, and at one works only. No Site fabrication of specials will be permitted.

Setting of valves, specials and fittings

Unless otherwise shown on drawings or directed, gate and control valves shall be set upright, and butterfly valves shall be set with the main shafts horizontal. All valves, specials, and fittings shall be correctly set, supported, and placed in position as the work proceeds, and shall be properly jointed to their respective pipes.

5. TOLERANCES

General

No deviation that is visible to the naked eye will be permitted.

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Control points

For the purposes of this clause, valves set on the centre line of the pipe work and designated changes in gradient or direction shall be regarded as control points, and shall be located with a permissible vertical deviation of ± 5 mm on the centre line. The same deviation will be permissible laterally. The maximum distance between control points shall be 100 m.

Alignment (plan and level)

Unless otherwise directed, the permissible deviation in alignment between control points from a straight line joining the control points, when measured on the top centre of the pipeline, shall be ± 5 mm.

The permissible deviation from the designated level at any point on the invert of the pipeline shall be ± 5 mm.

6. TESTING AND COMMISSIONING

General

The pipe work valves and specials shall be tested by means of test equipment supplied by the Contractor.

In the case of steel pipelines butt-welded or fillet-welded in the field, joints shall be tested immediately after being made.

Each test shall be carried out in the presence of the Engineer or his representative. The Contractor shall be responsible for carrying out all tests and for all expenses incurred. When carrying out the hydraulic test, the Contractor shall ensure that all valves, tees, and bends are properly secured and shored to prevent movement of pipes and fittings and, should any such movement occur, the Contractor shall, at his own expense, reposition and, if necessary, repair the pipes and fittings and the securing means.

Until the pipe work has been subjected to the pressure test, and has complied with the applicable requirement for the allowable leakage rate given, the pipe work will not be accepted. The test shall be repeated until the Engineer is satisfied that the pipe work under test complies with these requirements.

Initial tests on welded steel pipes

Dye-penetrant test

The inside and outside of every weld in steel pipes and specials shall be subjected to a dye-penetrant test carried out as specified below:

- a) The Contractor shall obtain the approval of the Engineer for the group of the dye-penetrant and the developer he proposes to use for the test.
- b) the clean and dry surface to be tested shall be thoroughly and uniformly coated with approved penetrant by immersion, flooding, brushing or spraying. The surface shall remain wetted for the period recommended by the penetrant manufacturer but in any case this period shall not be less than 15 minutes, unless otherwise authorized by the Engineer. The excess penetrant shall be removed by wiping the surface with a suitable absorbent material dampened with penetrant remover or other approved methods.

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After removal of excess penetrant the test surface shall be dried by normal evaporation or forced air circulation as approved, at a temperature not exceeding 50°C and for a period not exceeding 10 minutes.

- c) After drying of the test surface, the approved developer shall be uniformly applied in a thin coating by spraying or brushing. Thick coatings and pools of wet developer shall be avoided.
- d) The test shall be applied to shop welding prior to dispatch of pipes to the Site. Field welds shall be subjected to the test shortly after each weld is completed as pipe laying progresses.
- e) In order to obtain a surface that is dry, clean, and free from scale, dirt, and grease, the Contractor may grind, but he shall not grit blast the surface.
- f) The temperature of the surface to which the developer and the penetrant are applied shall not be below 16°C or above 52°C.
- g) Observations for indications of penetrant on the opposite side of the metal to which the penetrant has been applied shall be made not less than 15 minutes and not more than 60 minutes after application of the penetrant.
- h) Any surfaces on which non-relevant indications are observed shall be explored by visual methods and, if considered necessary by the Engineer, such surfaces shall be cleaned and retested.
- i) Welds that show no relevant trace of dye on the developer will be accepted.

Radiographic examination

Joints shall be examined radiographically as and to the extent set out in the Project Specification when required.

Standard hydraulic pipe test

Test pressure and time of test

Unless otherwise ordered, hydraulic field testing shall be commenced only after permanent anchor blocks have attained their specified strength or after 28 days, whichever is the earlier.

The pipe work shall be tested in sections between isolating valves and/or end caps, blank flanges, or other isolating devices, at the pressure given appropriate to the type and, when relevant, class of pipe in the pipeline under test.

The test pressure for field testing shall be 1,5 (or such other factor as is stated in the Project Specification) times the maximum working pressure laid down in the Project Specification.

The test pressure applied to the pipe work under test shall be such that the pressure at any point is not greater than 1,5 times the maximum working pressure at these points.

The field test pressure shall not exceed the appropriate of the following values:

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Type of pipe	Specification	Test pressure expressed as a percentage of the specified hydraulic test pressure
Mild steel	SANS 719	50% (3,5 MPa max.)
Cast iron	BS 2035	67% (or works test pressure)
Fibre-cement (COD) & (CID)	SANS 1223	75% of the test pressure for permeability test.
Black polyethylene	SANS 533	100%
uPVC	SANS 966	75%

Where circumstances permit, in the case of fiber cement pipes and cement mortar lined steel pipes, the pipe work shall be filled at least 24 hours before the test pressure is applied, to ensure saturation of the pipe work.

Care shall be taken to ensure that all air is expelled from the line to be tested after it has been filled and before the test commences.

All valves shall be successfully hydraulically tested in the manufacturer's works to at least twice their guaranteed working pressure.

Visible leaks

Except as allowed, the test pressure specified shall be maintained for a period of at least 3 hours (or such longer period as is necessary for inspection of the pipeline) by means of a suitable pump, during which period all pipes, specials, joints, and fittings shall be carefully inspected for leaks. All visible leaks shall be made good and any pipe, special, or fitting found to be defective shall be removed and replaced, at the expense of the Contractor, and such replacement material shall, after installation, be tested at the expense of the Contractor.

In the case of pipes of nominal diameter under 400 mm, the test period may be reduced proportionally to the nominal diameter of the pipe, provided that in no case shall the test period be less than 1 hour.

Permissible leakage rates

The test pressure shall be maintained for a further period of 1 hour after the completion of the procedure above, during which time the volume of water required to be pumped into the pipeline for maintenance of the pressure shall be measured. No additional water shall be required in the case of continuously welded steel pipes, and in other cases the volume shall not exceed the value, in liters, calculated from the applicable of the following formulae:

- a) Jointed pipes in steel, cast iron, black polythene, and PVC-U:

$$0,01 \quad \begin{matrix} \times \text{diameter of pipe in millimeters} \\ \times \text{length of test section in kilometres} \\ \times \text{square root of the test pressure in megapascals} \end{matrix}$$

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b) Fiber cement pipes and concrete-lined steel pipes:

0,075 x diameter of pipe in millimetres
x length of test section in kilometres
x square root of the test pressure in megapascals

7. MEASUREMENT AND PAYMENT

Scheduled items

Supply and install complete suction and delivery pipe work, valves, etc.

Unit..... Sum

Pipe work will be measured by sum or as scheduled.

The sum shall cover the cost of the provision of the pipes, specials, valves, fittings and pressure gauges complete with couplings, and the costs of the handling, inspecting, transporting, jointing, cutting, installing, testing and anchoring.

No extra payment over and above the rates will be made in respect of any additional cutting, turning, and jointing of pipes required for the location of valves exactly in the positions given on the drawings.

Unless specific provision is made in the schedule, no separate payment will be made for the supply and fitting of any additional joints and jointing materials which may be required for the connection of shortened pipe lengths.

Extra-over for excavation for bell-holes in rock

Unit..... m³

No additional payment will be made for bell-holes, except where hard rock is encountered in the trench, in which case an extra over payment on trench excavation will be made for rock.

Extra-over for encasing joints

Unit..... No.

Where wrapping or protection of joints, etc., is ordered, payment will be made as an extra-over per joint.

The rate shall cover the cost of the material, plant, and labour necessary for the completion of the joint.

Temporary valves, etc.

Unit No. or Sum

Payment for the supply or loan of temporary valves, end caps, blank flanges, or other isolating devices ordered by the Engineer will be made at daywork rates or at a price to be agreed by the Engineer, unless

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the method of payment for the work has been dealt with in the Project Specification and a suitable item included in the schedule.

Special wrapping in corrosive soil (diameter and location stated)

Unit..... **m**

The rate shall cover the cost of the provision and fixing of the wrapping and the cost of any delay and inconvenience caused by the requirement to wrap.

Cold bending of pipes

An extra over payment on the sum tendered for cold bending of steel pipes will be made only where such bends are ordered by the Engineer in addition to those shown on the drawings.

Payment will be made at day work rates or at a price agreed by the Engineer.

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C3.2.3.7 SPEC BVMECH01/7: CHEMICAL DOSING EQUIPMENT AND STORAGE TANKS

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SPEC BVMECH01/7: CHEMICAL DOSING EQUIPMENT AND STORAGE TANKS

1. SCOPE

This specification covers the requirements for the supply, delivery, installation and testing of equipment for the solution feeding of chemicals for the treatment of water for household use.

2. DESIGN, MATERIALS AND MANUFACTURE

General

All chemical feeding and storage equipment shall be provided complete with all piping, valves, brackets, fixings and all equipment necessary for the chemicals specified.

All materials used in the construction of the equipment shall in themselves be resistant to the chemicals to be used or shall be suitably protected from the action of these chemicals. Details of materials proposed shall be stated in the relevant Detail Sheet.

Electric motors forming part of the dosing apparatus shall be securely sealed against penetration by the chemicals in use. They should be readily accessible for repair and maintenance.

Equipment required

The equipment required is for the bulk storage and the solution dosing of the chemicals specified in the Project Specification.

The equipment shall comprise:

- (i) Chemical bulk storage tanks to the sizes and number stated in the Project Specification.
- (ii) Pipe work to convey the chemical from the bulk storage tank to the chemical metering pumps.
- (iii) Chemical metering pumps to dose the chemicals specified at the rates specified in the Project Specification.

Solution feeding equipment and bulk storage tanks

- (iv) Delivery pipe work and fittings to convey the chemical to the point of application, including dosing point connection.
- (v) In-line mixer and fittings to dilute the dosed chemical prior to application to the raw water.

Bulk storage tanks

Bulk storage tanks shall be manufactured from a non-corrodible material suitable for the stored chemical.

They shall be provided with the following:

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- i) Access hatch of 480 mm minimum diameter in the top of the tank.
 - ii) Flanged hatch of 250 mm diameter in the top of the tank to allow for the fitting of a level metering device
 - iii) Level indication by means of sight glass or similar. The sight glass shall be graduated in m³ to the first decimal place.
 - iv) Drain outlet and ball valve.
 - v) Outlet and ball valve to allow for connection to the pump suction manifold.
 - vi) 100 mm Stortz coupling and pipe work to allow for filling.
 - vii) Air vent in the top of the tank, fitted with suitable insect / vermin proof mesh.
 - viii) Bulk storage tanks shall be founded on concrete slabs or foundations.

Dosing pumps

The dosing pumps shall be piston operated diaphragm pumps capable of operating over the range specified in the Project Specification.

The pump shall be driven by a variable speed electric motor and a speed controller capable of accepting a 4 - 20 mA analogue control signal to allow dosing to be done in proportion to the flow.

Pipe work and fittings

General

Chemical pipes and hoses shall be of non-flame propagating materials suitable for the chemicals in use. They shall be arranged for easy dismantling for cleaning, and, if screwed joints or joints formed by solvent welding are proposed, enough flanged or flexible joints shall be provided to enable the pipe work to be removed in sections without working from one end to the other of a particular run. Tees and cocks shall also be provided at convenient points for the connection of a pressure water supply to flush pipe work through as required.

All necessary chemical delivery piping, fittings, support racks or trays and brackets to serve the plant supplied shall be provided.

Valves shall be of the ball or diaphragm type, with bodies or linings suitable for the chemicals to be handled.

Suction pipe work. (Bulk tanks to day tanks / make-up tanks)

The pipe work shall include either calibration pots or a 200ℓ tank and load cell for measuring the pump rate of delivery.

Delivery pipe work

The delivery pipe work shall include:

- (i) Pulsation dampers.

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- (ii) Loading or back pressure valves.
 - (iii) Dilution water connections and in-line mixers.
 - (iv) Pressure relief valves as shown on the drawings.

Dosing connection

Mixing of the chemical solution into the raw water shall be by means of an in-line mixer in the raw water pipeline as shown on the drawings.

The in-line mixer and flanged connection in the raw water pipe will be provided by others.

The Contractor shall provide all piping and fittings, including the dosing probe to connect to the raw water line as shown on the drawings.

3. PLANT

General

The Contractor shall provide all plant that is necessary to install, test and commission all items of equipment covered by this specification.

4. INSTALLATION AND OPERATING REQUIREMENTS

Installation

Chemical pipes shall be fully supported without sags, and secured to racks or trays to be fixed to ducts, walls of tanks and buildings as necessary. The method of securing the pipes to the racks shall be by clips, or similar, facilitating easy removal in such a way that individual runs can be changed without dismantling adjacent pipes.

All chemical pipes shall be colour banded to identify the chemical carried.

5. TOLERANCES

The metering pump shall be capable of feeding in the range specified in the Project Specification and shall have a repeatable accuracy not worse than $\pm 3.0\%$.

6. TESTING/COMMISSIONING

Tests shall be conducted on the equipment, as specified hereunder.

Acceptance test

After installation of the equipment, and before commissioning, each metering pump shall be tested throughout its operating range and calibration curves shall be produced. The calibration curves shall be incorporated into the operating and maintenance instructions.

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7. MEASUREMENT AND PAYMENT

Testing

Measurement and payment for testing will be by the sum for each portion of equipment as scheduled. The tendered sum shall cover the cost of all plant and personnel for conducting the test and in the case of the preliminary test shall include the cost of the chemicals. For the acceptance test the chemicals will be provided by the Employer.

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Contract number: **CI-KH-0028/1**

Kgalagadi Transfrontier Park:

Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camps



SPEC BVMECH01/8: REVERSE OSMOSIS PACKAGE TYPE WATER TREATMENT PLANT

- 1. PROCESS DESCRIPTION**

- 2. DESIGN, MATERIALS AND MANUFACTURE**

- 3. PLANT**

- 4. TESTING AND COMMISSIONING**

- 5. MEASUREMENT AND PAYMENT**

- 6. ALTERNATIVES**

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SPEC BVMECH01/8: REVERSE OSMOSIS PACKAGE TYPE WATER TREATMENT PLANT

This specification covers the requirements for the design, manufacture, supply, installation and commissioning of equipment for a package type potable water treatment plant utilizing reverse osmosis as primary treatment process.

SA National Parks operates the Kgalagadi Transfronteir Park in the Northern Cape province. They are desirous to provide their permanent personnel residing in the various rest camps of the park with fresh potable drinking water. The detailed specification for the envisaged works to achieve this goal are as follows:

1. PROCESS DESCRIPTION

Raw water supply

Tweeriviern Rest Camp

This camp utilizes 3 number boreholes as water source. The water is abstracted from the wellfield by means of electrical submersible pumps, and is then pumped to a precast concrete storage reservoir located behind a dune, approximatley 350m from the personnel housing quarters. The storage volume at Twee Rivieren is approximately 100 000 liters.

Flow to the storage reservoir is controlled by means of a level control, which switches the pumps off when the reservoir is full. Water for domestic use is then abstracted from the storage reservoir, and lifted into a set of 4 x 2500 liter tanks on an elevated stand, from where water is gravity fed to the rest camp reticulation system.

Nossob Rest Camp

This camp utilizes 3 number boreholes at the Kwang Pan Wellfield, and another 2 boreholes at the Kortpad Wellfield. The water is abstracted by means of solar-powered submersible pumps, and then pumped through pipelines to a common storage reservoir facility near Nossob Rest camp. The Storage Facility consists of 10 number 10 000 liter groundlevel tanks. From the storage facility, water is pumped by either an electrical or a diesel-powered pump into a single 10 000 liter elevated tank. Water is then fed into the rest camp's reticulation system under gravity.

Mata-Mata Rest Camp

This camp is supplied by water from a single borehole located near the camp. Water is abstracted from the borehole with a submersible pump, and then pumped to the storage facility consisting of 10 number 10 000 liter storage tanks. The tanks are located at a high point, and water is fed under gravity into the Mata-mata Rest Camp's reticulation network.

It is envisaged that the raw water supply for each of the proposed RO water treatment plants will be abstracted directly from the local storage facility at each rest camp.

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Media Filter Feed Pump (PC 1001)

Each package plant will be equipped with a vertical multi-stage inline centrifugal pump to transfer raw water from the local Storage Tanks to the Media Filter. This pump shall have a nominal capacity of 1 m³/h at a Total Head of 40m. The pump shall be powered by a 3-phase electrical motor. Pump body to be constructed from Grade 316 Stainless Steel.

Media Filtration (FT 1001)

The Media Filter will be close coupled to the Reverse Osmosis membrane vessel. The Media Filter consists of a pressure vessel manufactured from GRP and rated for a maximum pressure of 6 bar. This vessel shall be fitted with an access hatch as well as an inlet and outlet connection. The filter media will be Silica Sand with grading of 0.6mm to 1.2mm grain size and a bed depth of 800mm. Filtration Rate shall not be less than 8m/h, while the backwash rate shall not be less than 35m/h. This filter's valves shall all be electrically actuated valves to enable fully automatic operation, including the backwash cycle, with a facility to operate manually by hand if needed. Backwash wastewater to be discharged to the evaporation pond.

Low-Pressure Feed Pump (PC 2001)

The filtrate from the Media Filter is fed directly into the suction end of the Low-Pressure Feed Pump. This pump is utilized to feed water at low pressure through dual Cartridge Filters, and then directly to the suction inlet of the High-Pressure Feed Pump. The Low-Pressure Pump is also utilized for flushing and for the Clean-In-Place function. It will be an inline vertical multistage centrifugal pump with a capacity of 2 m³/h at a Total head of 30m. Pump to be powered by a 3-phase electrical motor. Pump body to be constructed from Grade 316 Stainless Steel.

Cartridge Filters (CF 2001 & CF 2002)

The plant will be fitted with 2 number (10 inch) 250mm dia x 500mm (L) x 5-micron cartridge sediment filters. The purpose of these filters being to protect the downstream Reverse osmosis membranes. The cartridge filters are installed as a safety precaution against suspended solids loading onto the RO membranes.

Low Pressure Connector Piping

All piping between process units from the Raw Water Tanks up to the inlet of the High-Pressure Feed Pump will be uPVC Class 9 pipes with either glue joints, flanged joints or BSPT threaded screw in joints.

High-Pressure Pump (PC 2002)

The high-pressure pump after the cartridge filters delivers the feed water to the Reverse Osmosis membranes at a high pressure required to force the water through the semi-permeable membrane. This pump is typically an inline vertical multistage centrifugal pump with a capacity of 1 m³/h at a Total head of 70m. Pump to be powered by a 3-phase electrical motor. Pump body to be constructed from Grade 316 Stainless Steel.

High Pressure Piping

All piping downstream of the High-Pressure Pump will be Grade 316 Stainless Steel piping up to the Flow Control Valve on the Brine Reject pipeline. Similarly, the Permeate delivery line will revert back to uPVC Class 9 piping directly downstream of the RO membrane Permeate outlet. All Stainless-Steel piping to have a wall thickness of no less than 1.5mm. All stainless-steel piping joints to be either welded, BSP threaded or flanged.

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Reverse Osmosis Membrane (PV 2001)

The filtered raw water will be pumped into the reverse osmosis membrane under pressure and the water molecules will be forced through the membrane, while the soluble salts and other constituents will be retained on the membrane surface. As clean water/permeate is extracted from the system, salts are concentrated in the brine waste stream. The Clean Water / permeate will be stored on site in a 5000 liter tank. For this application, a low (10%) recovery rate is required with a high cross flow velocity. This will avoid scale forming on the membrane and therefore not require the dosing of an anti-scalant. The RO will be controlled to operate at a constant recovery. The operation of the RO is automated and controlled at a constant flow rate. The flow rate is controlled by a variable speed drive on the high-pressure feed pump (PC-2002). The water recovery is controlled by means of a flow control valve (FCV-2001). The brine is routed back to the raw water reservoirs, where it will be diluted by the incoming raw water supply on a continuous basis.

Clean In Place (CIP)

Membrane fouling is a normal occurrence in all membrane systems. This can be reversed by periodic cleaning of the membranes using a suitable cleaning solution. Cleaning in Place or CIP is initiated automatically and used to wash the membranes in-situ when the plant performance deteriorates (for constant flow and constant recovery systems this is usually a 15-20% increase in normalised differential pressure or a 15-20% increase in normalised salt passage) due to membrane fouling or scaling.

A CIP tank (TK-2001) is provided to facilitate cleaning of the RO membranes in the event of significant membrane fouling. The CIP cycle is to be a fully automated procedure. The chemical solution will be circulated through the membrane unit to clean the membranes for a set amount of time. Once the timer expires, the spent cleaning solution will be transferred to an evaporation pond. The CIP sequence is to be followed by a long flush in order to rinse the membranes with clean water.

1.1. Disinfection

Dosing of the disinfectant is to be done by means of a chemical dosing pump injecting liquid chlorine solution directly into the permeate/Clean Water delivery piping. A maximum dosing rate of approximately 3mg/l will be dosed at a fixed rate to maintain a Free Chlorine concentration of at least 0.6mg/l in the Clean Water Storage Tank.

1.2. Evaporation Pond

An evaporation pond with approximate dimensions of 10m x 10m x 0.500m will be provided in close proximity of the RO Water Treatment Plant. The evaporation pond will be used for discharging the spent CIP chemicals as well as the backwash waste from the Media Filter Backwash cycle. Due to the aggressive nature of the CIP chemicals, it will be required that the evaporation ponds be fully lined with a HDPE membrane of at least 1.5mm thickness to avoid any contamination of the surrounding soil and subsurface water. The evaporation ponds will be equipped with a leak detection system and will be fully fenced off to avoid any animals from drinking the contaminated water.

1.3. Plant automation

This modular treatment plant, once started and the flow rate set, shall function fully automatically. All plant processes are to be graphically displayed on a 19" HMI (Human Machine Interface) mimic on which ready equipment icons will be displayed in GREY, active equipment in GREEN and defective or malfunctioning equipment in RED. All piping graphics to be in GREY and change colour to BLUE when the plant is started.

The HMI mimics for the Treatment Plant shall continuously display the operational status of:

- Media Filter Feed Pump



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- Feed Water flow and totalizer
- Feed Water pressure
- Media Filter
- Filtrate Pressure after Media Filter
- Low Pressure Feed Pump
- Cartridge Filters
- Cartridge Filter Feed Pressure
- Cartridge Filter Delivery Pressure
- High Pressure Feed Pump
- High Pressure Feed Pump Delivery Pressure
- Feed Water Conductivity
- Feed Water pH
- RO Membrane Vessel
- Permeate Conductivity
- Permeate Flow Rate and Totalizer
- Clean Water Tank
- Clean Water Tank Level
- Dosing Pump 1 (CIP Low pH)
- Dosing Pump 2 (CIP High pH)
- Citric Acid Make-up Tank
- High pH Cleaning Soltion Tank

The following parameters will be controlled from the HMI:

- RO Plant Start up
- Automatic operation of all pumps
- Automatic Media Filter operation including backwash cycle
- Interval between backwashes and duration of wash cycle to be adjustable.
- Automatic CIP process
- Interval between CIP cycles, as well as duration of Low pH and High pH cycles to be adjustable.
- Dosing rate of CIP Dosing Pumps to be adjustable
- Dosing Rate of Chlorine Dosing Pump to be adjustable
- All pumps to have an AUTO / MANUAL setting to enable override of automatic operation by the Operator.

This specification implies that the contractor will provide all necessary instrumentation, radio, hard-wired or fibre optic cables and outstations and any related equipment needed to meet the specification.

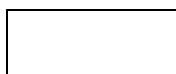
Control Overview

Media Filter (FT-1001)

Sequences

The normal operational cycle entails:

- Filtration
- Backwash
- Rinse



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These are fully automated and executed in accordance with pre-determined sequences controlled by the PLC. The main equipment relating to these cycles is

- Transfer pump (PC-1001)
- Actuated valves (XV-1001/2/3/4/5)

Filtration

During filtration the feed water is passed through the media bed by means of the MF feed pump (PC-1001). All the feed water is converted to filtrate. The build-up of solids in the media bed results in an increase in differential pressure (DP) over the bed as determined by the feed and filtrate pressure transmitters (PT-1001/1002). The duration of the filtration cycle is set by adjustable timer (PLC function).

Backwashing

A filter cleaning should be initiated when the differential pressure over the vessels has increase by 15%, or when the filtration timer has expired.

To clean the filter, the filter media needs a backwash and a rinse cycle.

A backwash cycle removes dirt particles from the media. During the backwash cycle, feed water is pushed in the opposite direction of normal flow by means of the MF feed pump (PC-1001). The Backwash waste is discharged to the evaporation pond.

The backwash duration is based on a timer.

Rinsing

The rinse cycle settles the media before normal operation. The rinse is performed with MF feed water. During the rinse cycle, MF feed is pushed in the direction of normal flow by means of the MF Feed pump (PC-1001). During rinsing, the close-coupled RO is bypassed and the rinse water is discharged to the evaporation pond.

The rinse duration is based on a timer. Following the rinse, the valves are configured to filtration mode.

1.4. Reverse Osmosis

1.4.1. RO Feed Flow Control Loop

A pre-determined feed flow rate set-point has to be entered into the PID flow control loop (FIC-2001) which acts on the variable speed drive (VSD) of the RO high pressure pump (PC-2002). The VSD will then control the pump flowrate measured on magnetic flowmeter (FIT-2001) to the entered set-point.

1.4.2. RO Start-up Sequence

The RO start-up sequence entails

Flush sequence:

- The RO flush valve will be open during start-up.
- MF feed pump (PC-1001) and the low-pressure RO feed pump (PC-2001) will start up and run for 60 seconds with the flush valve open.

Filtration sequence:

- The RO flush valve will be closed during operation.
- The RO high pressure feed pump (PC-2002) starts up. The pump ramps up slowly on a variable speed drive (VSD).
- A feed flow rate set point is given to the flow controller (FIC-2001) which acts on the high-pressure pump (PC-2002).

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- The brine flow control valve (FCV-2001) must be opened until the desired flow rate is observed on magnetic flow meter (FIT-2003).

1.4.3. RO Shutdown Sequence

The RO (controlled) shutdown sequence entails:

- Ramping down of the RO high-pressure pump (PC-2002) and opening of the RO flush valve.
- Once the high-pressure pump (PC-2002) is stopped and the flush is open, the MF and the low-pressure pump will then stop on a timer.

1.4.4. CIP Cycle

The CIP cycle is an automated procedure involving the following steps:

- Take the system off-line.
- Isolate CF-2001 by closing XV-2001.
- If LSH-2001 is not activated, XV-2010 will be opened and the CIP tank will be filled with MF filtrate via PC-1001.
- Once LSH-2001 is activated, the RO unit is isolated from the close-coupled MF-unit by closing XV-1008.
- Open XV-2002 and XV-2003 in order to implement CF-2002.
- Close XV-2005/6/8/9.
- Open XV-2011/12/13/14.
- Once open feedback is received, PC-2001 will start followed by the relevant chemical dosing pump.
- Dosing pump speed will be controlled by the pH (AE-2005).
- The chemical solution will be circulated through the membrane unit to clean the membranes for a set amount of time.
- Once the timer expires, PC-2001 stops, close XV-2011/12/14 and open XV-2009, transferring the spent cleaning solution to an evaporation pond via PC-2001.
- The CIP sequence is followed by a long flush in order to rinse the membranes with clean water.
- The membrane unit is then returned to service.

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2. DESIGN, MATERIALS AND MANUFACTURE

General Design

This plant will treat brackish raw water abstracted from groundwater sources at the various rest camps. The quality of the raw water is indicative of the quality that can be expected at each rest camp.

Samples represented below are a blend of the water to be found at the Raw Water Storage facility of each of the rest camps mentioned.

Contractors are required to study these results carefully, and if needed, take additional samples for their own use if required for the design of an effective reverse osmosis desalination water treatment plant. This water can be described as brackish groundwater.

Raw Water Quality

In general, the following parameters have the following average values:

Twee Rivieren Rest Camp Water Quality analysis:

Chloride (mg/l as Cl)	579
Conductivity (mS/m) (at 25 °C)	395
Iron (µg/l as Fe)	<20
Manganese (µg/l as Mn)	<20
Magnesium (mg/l as Mg)	3.2
pH (at 25 °C)	9.27
Sulphate (mg/l as SO ₄)	335
Total Hardness (mg/l as CaCO ₃)	21.4
Turbidity (NTU)	0.37
Total Dissolved Solids (mg/l)	2600
CaCO ₃ Precipitation Potential (mg/l)	6.7
Silicon (µg/l as Si)	6581
Sodium (mg/l as Na)	1015
Total Alkalinity (mg/l as CaCO ₃)	924
Total Phosphate (mg/l as P)	<0.20
Total Suspended Solids (mg/l)	<4
Langelier Saturation Index (at 25 °C)	1.1
Calcium (mg/l as Ca)	3.3
Silica (µg/l as SiO ₂)	14083
Aluminium (µg/l as Al)	<40
Ammonia Nitrogen (mg/l as N)	<0.10

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Arsenic (µg/l as As)	59
Colour (mg/l as Pt)	<4
Copper (µg/l as Cu)	<20
Fluoride (mg/l as F)	6.6
Lead (µg/l as Pb)	<10
Nitrate & Nitrite Nitrogen (mg/l as N)	36.9
Nitrate Nitrogen (mg/l as N)	36.7
Nitrite Nitrogen (mg/l as N)	<0.20
Potassium (mg/l as K)	16.3
Total Chromium (µg/l as Cr)	70
Total Organic Carbon (mg/l as C)	<0.10
Zinc (mg/l as Zn)	<0.01

Nossob Rest Camp Water Quality analysis:

Chloride (mg/l as Cl)	706
Conductivity (mS/m) (at 25 °C)	480
Iron (µg/l as Fe)	<20
Manganese (µg/l as Mn)	<20
Magnesium (mg/l as Mg)	9.1
pH (at 25 °C)	8.49
Sulphate (mg/l as SO4)	570
Total Hardness (mg/l as CaCO3)	65.6
Turbidity (NTU)	0.28
Total Dissolved Solids (mg/l)	3100
CaCO3 Precipitation Potential (mg/l)	20.8
Silicon (µg/l as Si)	13930
Sodium (mg/l as Na)	1217
Total Alkalinity (mg/l as CaCO3)	1014
Total Phosphate (mg/l as P)	<0.20
Total Suspended Solids (mg/l)	<4
Langelier Saturation Index (at 25 °C)	0.94
Calcium (mg/l as Ca)	11.3
Silica (µg/l as SiO2)	29810
Aluminium (µg/l as Al)	<40
Ammonia Nitrogen (mg/l as N)	<0.10

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Arsenic (µg/l as As)	<10
Colour (mg/l as Pt)	<4
Copper (µg/l as Cu)	<20
Fluoride (mg/l as F)	6.2
Lead (µg/l as Pb)	<10
Nitrate & Nitrite Nitrogen (mg/l as N)	16.3
Nitrate Nitrogen (mg/l as N)	16.1
Nitrite Nitrogen (mg/l as N)	<0.20
Potassium (mg/l as K)	33.7
Total Chromium (µg/l as Cr)	50
Total Organic Carbon (mg/l as C)	<0.10
Zinc (mg/l as Zn)	0.02

Mata-Mata Rest Camp Water Quality analysis

Chloride (mg/l as Cl)	356
Conductivity (mS/m) (at 25 °C)	280
Iron (µg/l as Fe)	<20
Manganese (µg/l as Mn)	<20
Magnesium (mg/l as Mg)	2.0
pH (at 25 °C)	8.48
Sulphate (mg/l as SO4)	278
Total Hardness (mg/l as CaCO3)	11.7
Turbidity (NTU)	0.22
Total Dissolved Solids (mg/l)	1800
CaCO3 Precipitation Potential (mg/l)	-2.7
Silicon (µg/l as Si)	11510
Sodium (mg/l as Na)	730
Total Alkalinity (mg/l as CaCO3)	697
Total Phosphate (mg/l as P)	<0.20
Total Suspended Solids (mg/l)	<4
Langelier Saturation Index (at 25 °C)	-0.09
Calcium (mg/l as Ca)	1.4
Silica (µg/l as SiO2)	24631
Aluminium (µg/l as Al)	<40
Ammonia Nitrogen (mg/l as N)	<0.10

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Arsenic (µg/l as As)	<10
Colour (mg/l as Pt)	<4
Copper (µg/l as Cu)	<20
Fluoride (mg/l as F)	3.0
Lead (µg/l as Pb)	<10
Nitrate & Nitrite Nitrogen (mg/l as N)	18.5
Nitrate Nitrogen (mg/l as N)	18.3
Nitrite Nitrogen (mg/l as N)	<0.20
Potassium (mg/l as K)	16.6
Total Chromium (µg/l as Cr)	228
Total Organic Carbon (mg/l as C)	<0.10
Zinc (mg/l as Zn)	0.08

Flow Rate to be treated:

These plants are to be capable of delivering a flow rate of **not less than 1.0 m³/day** or 83.3 liters per hour per plant over a 12-hour operational period.

Quality of Treated Water

The quality of the treated water shall comply with a Class 1 water as described in SANS 241: 2015 *Standard for Drinking Water*.

If, in the opinion of the Contractor, remineralization of the Final treated Water is required, Contractors should then make provision for the equipment needed to do this treatment step.

Chemicals to be dosed

This plant shall will be equipped with 3 (three) dosing points as follows:

- i) CIP Dosing Point 1 for Citric Acid for low pH cleaning cycle
- ii) CIP Dosing Point 2 for Avista ROClean L211 for high pH cleaning cycle
- iii) Sodium Hypochlorite for disinfection of Final Treated Water

Unit Processes to be utilized

The treatment process will include the following unit processes:

- i) Media Filtration
- ii) Cartridge micro filtration
- iii) Reverse Osmosis
- iv) Disinfection

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Design Parameters

Media Filtration

General Description

Filters must be of the pressurized sand filter type. A single clean filter must have a nominal filtration capacity of **3.5 m³/h** at a rate not exceeding 8m/h. Each filter to have a minimum diameter of 940mm with a surface area not less than 0.7m².

Filterbed depth shall be a minimum of 800mm. Inlet and outlet ports shall be 80mm diameter with flanged connections. The filter is to be fitted with a bottom support flange and sand draining port not smaller than 50mm diameter. Each filter must have a side/top access port for inspection of the media and servicing of the underdrain. This port must be provided with a lid which is easily removable yet water tight during operation.

Underdrain system

The preferred underdrain system shall comprise a 75mm diameter central manifold with perpendicular slotted collectors of which the length shall decrease from the center outwards. The under-drain nozzles shall be arranged in a manner to ensure an even flow of filtrate as well as a uniform distribution of backwash water. Slot openings on collectors shall not exceed 0.35mm. Contractors are to provide complete details with regards to the under drains that they propose.

Filter Media

Filter media shall be sand from a quartzitic origin and have an effective size between 0.6mm and 0.9mm with a uniformity coefficient not exceeding 1.4. Contractors will provide proof of the effective size and uniformity coefficient from his sand supplier which is to be included in the tender documents. The preferred sand supplier is Silica Quartz (Pty) Ltd PO Box 157 Delmas.

Filter Body and coatings

Filters body shall be manufactured from mild steel covered with an epoxy coating or FRP. Internal coating is to have a thickness of 450 – 500 microns. Epoxy shall be similar to a heat cured anti corrosive pipe coating. External coating will have a minimum thickness of 200 – 250 micron and shall comprise a polyester UV resistant coating.

Manifolds and pipe work

Filters are to be supplied complete with inlet, outlet and backwash water outlet. Contractors will supply all valves (isolating as well as hydraulic control), gauges, fittings and connectors necessary to operate and backwash the filter banks as per the process description.

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PROCESS UNIT	DESIGN	UOM/COMMENTS
<u>Media Filter</u>		
- Feed pump/Backwash Pump	1 - 9	m ³ /h @ 2.5 bar
- Feed pump MOC	SS316	Local representation for aftersales service
- Feed pump VFD	Included	
- Media	Silica Sand	0.6 to 1.2 mm
- Vessel Pressure	> 5	bar
- Filter bed depth	> 800	mm
- Filtration rate	< 8	m/h
- Backwash rate	> 35	m/h
- Valves	Motorised	Electrically driven (Kaytar, EMV Africa)
- Operation	Automatic	

Cartridge Micro Filtration

The plant will be fitted with 2 number (10 inch) 250mm dia x 500mm (L) x 5-micron cartridge sediment filters. The purpose of these filters being to protect the downstream Reverse osmosis membranes. The cartridge filters are installed as a safety precaution against suspended solids loading onto the RO membranes.

Each cartridge to be housed in a Gr 304 Stainless Steel filter housing with a quick release clamp to secure the cover. Minimum operating pressure to be not less than 750kPa and a throughput of minimum 1m³/h.

Filter cartridges should use the latest gradient density micro fiber media technology, polypropylene media with specially combined variation in the fiber diameter to create a gradient density matrix that ranges from open on the outside to finer on the inside. All components used in the manufacture must be biologically safe and chemically inert. The micron rating is the smallest size of pore in the filter that prevents particle from passing through.

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Reverse Osmosis

Each treatment plant will be equipped with **a single (one) 4” (100mm dia.) RO pressure vessel approximately 40” (1.016m) in length**, fitted with a Low Fouling spiral wound membrane in a Single Stage configuration.

Pressure vessel to be of the End Port configuration and manufactured from FRP with a maximum test pressure of 20 bar.

Membranes to be manufactured from Composite Polyamide with an active area of at least 7.5m². All membrane elements are supplied complete with a brine seal, interconnector, and O-rings. Permeate Capacity will be **1 m³/day** or 84liter/h over a 12-hour operational period.

<u>Reverse Osmosis</u>		
- Permeate capacity	1	m ³ /d average over maximum 12 hours operation; minimum instantaneous flow rate of 84 L/h.
- Membrane Flux	<15	LMH
- Concentrate/brine flow rate	0.85	m ³ /h minimum
- Daily operational hours	<12	hours
- Low pressure feed pump/CIP Pump	1-2	m ³ /h @ 3 bar
- Feed pump MOC	SS316	Local representation for aftersales service
RO recovery	10-15%	
- Low pressure feed pump VFD	Included	
- RO CIP station	Included	Automated
- Low pH CIP chemical	Citric Acid	
- High pH CIP chemical	L211	
- RO CIP heater	Excluded	
- RO CIP mixer	Excluded	
- SMBS dosing / Chlorine removal	Excluded	
- Antiscalant dosing	Excluded	High cross-flow velocity, low recovery
- Cartridge filter	Included	
- High pressure RO pump	1	m ³ /h @ 7 bar
- High pressure RO pump MOC	SS316	
- RO pressure vessels number	1	1 stage configuration
- RO membranes number	1	Hydranautics ESPA2-LD-4040, DuPont XLE-4040, BW30-4040
- Brine flow control valve	Motorised	Globe
- Permeate off spec valve	Motorised	
- Permeate isolation valve	Motorised	
- High pressure piping	SS 316	
- Auxiliaries	Included	All sampling connections
- Steel frame & configuration	Included	All equipment to be installed on steel frame
<u>Remineralisation</u>		
- Remin system	Excluded	

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Disinfection

Disinfection will be done by utilizing a sodium hypochlorite solution in a 100 liter daytank. The chlorine solution will be added by means of a dosing pump dosing at a fixed rate. Dosing is to take place after water leaves the RO membranes, but before discharge into the Clean Water Storage Tank. Dosing pumps to have a maximum flow of 30 liters per hour.

The preferred manufacturer of dosing pumps is messrs Milton Roy. Each dosing pump to be equipped with a VSD to allow infinite and accurate adjustment.

Contractors will supply complete with the dosing pump a dosing panel manufactured from either HDPE sheeting or polyethylene sheeting which is to be mounted to a vertical wall and include the following:

- Pulsation damper for each pump
- Pressure relief valve for each dosing line
- Pressure sustaining valve for each dosing pump
- Calibration pot
- Rotameter for visual flow indication
- Isolating valves
- Non-return valves
- Facility to flush all pipe work
- 1 x 100 liter day tank complete with a water supply to each and hand mixer
- All required small bore uPVC pipe work, valves, holder bats, etc to complete a neat and functional installation.

CIP Dosing

When the RO membranes become clogged, it is required to conduct a **Clean-In- Place process**. During this process, low pH liquid and high pH liquid are alternately recycled through the membrane pressure vessel in order to remove any fouling or materials causing clogging. In order to do this, either Citric Acid (low pH), or Avista ROClean L211 (high pH) liquid are dosed into the recycle stream. The dosing rate of each chemical is controlled by an inline pH meter, which regulates the dosing pump dosing rate to maintain a pre-set pH level. Subsequently two dosing pumps are required for this purpose, as well as two 100 liter make-up tanks. Dosing pumps to have a maximum flow of 50 liters per hour.

The preferred manufacturer of dosing pumps is messrs Milton Roy. Each dosing pump to be equipped with a VSD to allow infinite and accurate adjustment.

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Additional Equipment required

Contractors will supply complete with the dosing pumps a dosing panel manufactured from either HDPE sheeting or polyethylene sheeting which is to be mounted to a vertical wall and include the following:

- Pulsation damper for each pump
- Pressure relief valve for each dosing line
- Pressure sustaining valve for each dosing pump
- Calibration pot
- Rotameters
- Isolating valves
- Non-return valves
- Facility to flush all pipe work
- 2 x 100 liter day tanks complete with a water supply to each and hand mixer
- All required small bore uPVC pipe work, valves, holder bats, etc to complete a neat and functional installation.

Instrumentation Required

Flow meters

- Raw Water Flow meter (FIT 1001)**
The contractor shall provide an electromagnetic flow meter suitable for the measurement of raw water downstream of the Transfer Pump as indicated on the P&ID diagram. Said flow meter is to have an instantaneous flow display in liters/second as well as an integrating totalizer which displays the total volume of water passing through the meter. This meter should have an IP68 rating. In addition, the meter should provide a 4-20mA analogue signal for driving flow proportionate dosing as well as relaying a flow signal to the HMI screen. A pulsed output of 1 pulse per cubic meter is also required.
- RO Membrane Feed Water Flow meter (FIT 2001)**
The contractor shall also provide an electromagnetic flow meter for the measurement of water flow before the water enters the RO membrane vessel. Said flow meter to have an instantaneous flow display in liters/second as well as an integrating totalizer which displays the total volume of water passing through the meter. In addition, the meter should provide a 4-20mA analogue signal for relaying a flow signal to the HMI. A pulsed output of 1 pulse per cubic meter is also required.
- Permeate Flow Meter (FIT 2003)**
A third electromagnetic flow meter shall be installed downstream of the RO membrane vessel to measure the permeate flow. Said flow meter to have an instantaneous flow display in liters/second as well as an integrating totalizer which displays the total volume of water passing through the meter. In addition, the meter should provide a 4-20mA analogue signal for relaying a flow signal to the HMI, as well as for controlling the actuated flow control valve on the brine reject line. A control loop must be established to ensure that the permeate flow remains constant. This is controlled by increasing or decreasing the brine flow by means of the flow control valve. A pulsed output of 1 pulse per cubic meter is also required.

The preferred supplier of flow meters is Messrs Endress+Hauser.

Pressure Transducers

The following pressure transducers are required:

- Raw Water Pressure before Media Filter (0 – 6bar range) (PIT 1001)**
- Filtered Water Pressure after Media Filter (0 – 6bar range) (PIT 1002)**
- Cartridge Filter Inlet pressure (0 - 6bar range) (PIT 2002)**
- Cartridge Filter Outlet pressure (0 – 6bar range) (PIT 2003)**
- PV-2001 Feed Pressure (PIT-2004);**

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Analytical Instrumentation

The following analytical instruments are required for online measurement and control:

- i) Raw Water Feed conductivity & temperature (**AE-2002, AIT-2002**);
- ii) Raw Water Feed pH (**AE-2005**);
- iii) Permeate Conductivity & temperature (**AE-2004, AIT-2002**);

Level Sensors

The following level sensors will be required for system control:

- i) Loop powered ultrasonic level sensor in Raw Water Tanks
- ii) Loop powered ultrasonic level sensor in Permeate/Clean Water Tank
- iii) Hi Level float switch in CIP tank
- iv) Lo Level float switch in CIP tank
- v) Lo Level float switch in Citric Acid Make-up Tank
- vi) Lo Level float switch in High pH Make-up Tank

Pumps and electric motors

All centrifugal pumps for this plant shall be equipped with suitable mechanical seals. Pumps with gland packing seal arrangements will not be accepted. Pumps shall comply with the specification for medium pressure pumps as found elsewhere in this document. All electric motors shall be of the TEFC type as specified. Pumps preferably to be of the vertical multi-stage configuration. The preferred supplier is Grundfos.

The Permeate pressure pump delivering treated water to the personnel quarters shall be a self-contained booster pump that delivers sufficient water pressure to all Clean Water taps. It must feature a pump, motor, tank, sensor, drive and non-return valve in one compact unit that is able to be installed quickly and easily. The preferred unit is the Grundfoc SCALA II pressure pump.

Electrical Installation

Building reticulation and lighting

Building reticulation and internal and external lighting are specified elsewhere in this document.

General Installation guidelines for treatment plant equipment

All electrical works will comply with the minimum specification as attached in Portion 2 of the general specifications. No cables or conductors may be fixed directly to the plant floor. All cable work to motors and equipment will be fixed to horizontal or vertically installed galvanized cable trays. Said cable trays may be fixed to walls, roof trusses, inside pipe/cable channels or on specially manufactured support brackets.

All domestic fittings such as light switches, contact sockets, light fittings etc will be surface mounted. All supply conductors to domestic fittings shall be surface mounted inside galvanized electrical conduits. All surface work shall be horizontal and plumb and unnecessary conduit crossings should be avoided.

Motor Control Centres

Motor control centres will comply with the specifications as described in the Project Specifications. Contractors are advised to read these with care as the type and manufacturers of equipment are specifically mentioned.

Level Control

The Level Sensor in the Raw Water Tanks will be used to ensure that the RO Treatment Plant does not start up if there is not at least 50% of water available. If the Raw Water Storage Tanks are below 50% there must be a lock out enabled to avoid the RO Treatment Plant from starting up.

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The Level Sensor in the Permeate Tank will be the primary automated control for starting up the RO Treatment Plant. Once the water level in the Permeate Tank drops below 70%, the RO Treatment Plant will commence its start-up sequence, and continuously produce clean water until the Permeate Tank level reaches 90%.

The CIP tank is to be equipped with a High-Level Float switch, and a Low-Level Float switch only. This is a small 250 liter tank used for recirculating either a low pH (ph 3) liquid, or a high pH (pH 12) liquid. Float switches must be selected to ensure that they can operate in these conditions.

As a rule, Float switches will not be acceptable as primary control. Primary control will be conducted by an ultrasonic level sensor which uses a non-contact measurement principle to continuously monitor the tank level. Such an instrument will be equipped with switching relays to control pumps, provide a low water level alarm/cut-out to prevent pumps running dry and provide a high-water level alarm should the level rise above normal operating parameters. The preferred supplier of this equipment is Messrs Endress+ Hauser.

Miscellaneous Equipment

The idea with this RO Treatment Plant is that all the major equipment such as:

- i) Pumps
- ii) Media Filter
- iii) Cartridge Filters
- iv) RO Membrane Pressure Vessels
- v) Valves
- vi) Instrumentation
- vii) uPVC and Stainless-steel piping
- viii) MCC and HMI
- ix) Electrical wiring and cabling

Are to be manufactured and **pre-assembled** at the Contractors premises as a complete unit mounted on a galvanized mild steel skid frame. The concept is to have a “plug & play” configuration with only 4 connections:

- i) Raw Water Supply Inlet connection
- ii) 400V 3-Phase Electrical Supply connection
- iii) Permeate Outlet connection
- iv) Brine / CIP / Waste Outlet connection

The following equipment will be accepted as loose standing units:

- i) Raw Water Tanks – already on site
- ii) Citric Acid Make-up Tank
- iii) High pH liquid Make-up Tank
- iv) Dosing Bench for dosing pumps
- v) CIP Tank
- vi) Permeate Tank (5000 liter)
- vii) Pressure Pump for delivery of Treated Water to personnel quarters Tap.

Water testing instruments and tools

The contractor will supply the following equipment, tools and consumables as part of this contract for use during the operation of the plant:

- 1 year’s supply of Citric Acid for CIP
- 1 year’s supply of Avista ROClean L211 for CIP (or similar)
- 1 year’s supply of Sodium Hypochlorite

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- 1 x portable grease pump
- 1 x complete set of combination spanners, Allen keys, screw drivers, socket set complete with power bar and ratchet, hammer, heavy duty pliers all enclosed in a lockable wall mounted steel cabinet.
- 20 liters of replacement oil suitable for the pumps
- 5 liters of suitable grease for the lubrication of bearings, etc
- 1 x LOVIBOND PC Checkit portable turbidity meter complete with standards
- 1 x LOVIBOND PC Checkit IR Free Chlorine meter complete with 1000 DPD No.1 reagent tablets
- 1 x Portable pH meter (Complete with calibration standard solutions)
- 1 x Portable Electrical Conductivity meter (Complete with calibration standard solutions)
- 6 x 600ml Pyrex glass beakers for sampling.

Sampling Points

The contractor will supply sampling points throughout the plant by fitting a 15mm bibcock tap to the pipe work in order to enable sampling of the following:

- Raw water sample valve (HV 1004)
- Media Filter Water sample valve (HV 1020)
- Cartridge Filter Water sample valve (HV 2012)
- Final permeate water sample valve (HV 2025)
- Brine sample valve (HV 2028)

Materials

All equipment is to be manufactured from materials that have been adequately protected against corrosion. Equipment, where indicated, shall be manufactured from Gr.316 Stainless-Steel, GRP, PVC or any other material that has sufficient resistance to corrosion.

Where special materials such as stainless steel or polyethylene are required, they have been specified. It is the contractor's responsibility to select and offer equipment manufactured from materials that have sufficient resistance to corrosion with respect for the liquids or chemicals that need to be handled.

The skid frame is to be manufactured from Galvanized Mild Steel, and there is a mechanical specification included.

Manufacture

This specification is for a modular water treatment plant. All modules such as filters, pressure vessels, pumps, manifolds and RO membranes are to be manufactured in controlled conditions to ensure accurate measurements and manufacture to exact specifications.

All equipment offered by contractors will be preceded by detail shop drawings which are to be submitted to the Engineer for approval BEFORE manufacturing or ordering commences.

Only connector uPVC piping and uPVC dosing piping will be allowed to be developed on site. Manifolds for filters and all galvanized piping and Stainless-Steel piping will be manufactured in controlled conditions within the specifications given elsewhere in this document.

3. Plant

The Contractor will supply all equipment and tools needed to install, test and commission the items in this specification.

The contractor will ensure that all tools and rigging equipment used for the handling, placing and installation of items in this specification will be of such a nature that no items will be placed under undue stresses and strains during any installation procedure.

All equipment supplied by the contractor shall comply with the regulations and rules of the OHS act and be erected, operated and maintained during the contract to ensure a safe environment.

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Installation and operating requirements

The complete water treatment plant, inclusive of switchgear and instrumentation is to be housed inside a **refurbished 2.40m x 6m shipping container**. Container to be manufactured from standard CORTEN steel and painted. Said shipping container to be refurbished to be devoid of holes and dents, shall have no corrosion present, the plywood floor is to be in good condition to allow fixing and mounting of equipment, and container doors shall be fully functional and lockable. Container is to be repainted in two coats of Brilliant White alkyd type paint for neat and functional appearance.

Before any equipment is positioned or fixed, the contractor will ensure that floor surfaces are free of foreign objects, grease, oil and dust. All equipment will be placed level and true to line. The contractor will ensure that all base plates are fully supported and that no gaps occur below baseplates.

All supplied equipment will be fixed to the timber floor of the plant by means of galvanized bolts, nuts and washers of suitable size and strength. **Rawl bolts will not be allowed on site**. No items of equipment may under any circumstances be free standing.

Defective materials and equipment

All supplied items will be thoroughly inspected for damage or defects BEFORE installation. Should any damaged or defective equipment be installed, it will be removed and replaced at the contractors cost to the satisfaction of the Engineer. All equipment which has an epoxy paint or painted finish will be suitable packed to prevent chips and scratches or any damage to the protective coating. Serious paintwork or protective coating damage will lead to such an item being rejected by the Engineer. Minor repair work may be conducted on site with the Engineers' permission.

Cleanliness and foreign objects

All reasonable measures must be put in place to prevent the ingress of foreign objects or materials in pipes and equipment during installation. Any damage caused to pumps and other equipment due to foreign objects in pipes or sumps will be rectified at the contractor's cost.

Tolerances

The complete water treatment plant installation will be guaranteed in writing to deliver potable water at the required flow rates and quality as specified and to operate satisfactorily on all accounts for the specified conditions. Such letter of guarantee is to be included with the tender documents.

4. Testing and Commissioning

Testing and commissioning of the water treatment plant will take place in the presence of the Engineer or his authorized representative. The Contractor is responsible for the execution of all tests as well as for the costs incurred to conduct such tests.

Tests

Chemical dosing equipment will be operated and tested at their minimum and maximum capacities. The contractor will compile a calibration curve for the full extent of this equipments performance and include such curves in the Operation and Maintenance manual for the plant.

Pipe work and all vessels that will contain liquids, will be filled and pressurized to the specified working pressure, and b left to stand for at least 12 hours. After this period. All visible and known leaks will be repaired at the contractor's cost.

Commissioning

On completion of construction, the contractor will commission the plant in the presence of the Engineer. The contractor will then demonstrate that the plant is able to produce potable water of the correct quality and at the maximum specified flow rate **for a continuous period of 14 days**.

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Sufficient log sheets are to be kept of all recorded parameters for this test period inclusive of minimum water quality parameters such as raw water flow, clear water flow, all pressures on pumps and filters, pH, turbidity, conductivity and free chlorine content.

Operation and Maintenance Manuals

On completion of construction, the contractor will compile a complete operations and maintenance manual for the treatment plant inclusive of the following:

- Description of installation
- Specifications of plant and equipment
- Brochures of all installed equipment
- Complete drawings and diagrams (process and electrical)
- Operational procedures
- Maintenance schedules and procedures
- List of spare parts to be kept in stock
- Contact details of equipment suppliers
- Full equipment warranty details

Extended Operation and Training

It is a requirement of the Client that the Contractor shall, as a part of his contract, be responsible for the complete operation of the water treatment plant **for a period of 6 months after commissioning.**

This entails that the contractor will provide at least two (2) number operators of sufficient skill level to operate the entire plant for the period as stated above.

During this period of operation, the Client will provide his own dedicated personnel to work with the contractors' operators on a full-time basis in order to familiarize themselves with the plant and equipment under supervision of the contractor's personnel.

The price for this item should include salaries, accommodation and transport for the contractors' personnel for the full period.

5. Measurement and Payment

General

Payment for specific items scheduled shall conform to the payment clauses of the Conditions of Contract as amended by the following:

- a. Unless scheduled separately, the tendered rates or sums shall cover the cost of drawings and instructions as specified.
- b. The tendered rates or sums shall cover the costs of anything not specifically mentioned but which an experienced contractor can reasonably foresee as being required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and any work or material or equipment required for the proper execution and installation of such apparatus and equipment, piping, valves, gauges, instruments, either severally or collectively in complete working order), to enable the apparatus and equipment to be installed and/or function safely and correctly as specified.
- c. No claims whatsoever will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned in the Schedule of Quantities.
- d. The contractor will not be entitled to any payment until an original copy of the Progress Certificate has been provided by him to the Engineer. The Progress Certificate shall contain an invoice of all items as scheduled, and reflect the progress made on each item. The form of the Progress Certificate used by the contractor will be subject to the approval of the Engineer.

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Payment

Payment for the items scheduled under this specification will be as follows:

- a. On approval of the contractors proposed equipment and submitted shop drawings, the contractor may **claim 40% of the value** of the applicable items to commence placing orders on his suppliers.
- b. On delivery of said equipment to site, a further 20% of the value of the applicable items may be claimed.
- c. On completion of installation of said equipment to the satisfaction of the Engineer, a further 15% of the value of the applicable items may be claimed
- d. On completion of the commissioning and testing of the entire plant to the satisfaction of the Engineer, a further 15% of the value of the applicable items may be claimed.
- e. A further 5% of the value of the applicable items may be claimed when the Certificate of Practical Completion is issued for the entire contract.
- f. The final 5% of the value of the applicable items may be claimed when the Final Certificate for the entire contract has been issued.
- g. Payment for the **Extended Operation and Training** will be a on a monthly basis as per the rates tendered by the contractor.

Contractors making use of specialist subcontractors to carry out the works in this specification are free to make alternative arrangements with their subcontractors. The payment procedure as described above will be applicable to the contractor to whom the complete contract has been awarded.

6. Alternatives

The Engineer is willing to consider any alternative proposals which meet the following requirements:

- Are guaranteed to provide the same quantity and quality of water as specified.
- Are able to be accommodated inside the standard shipping container as specified with no more than minor adjustments
- If alternatives are presented, it must be as a complete presentation, inclusive of drawings, calculations and brochures of equipment proposed
- If alternatives can provide a substantial saving on expenditure
- If alternatives are maintenance friendly and require similar or less operational input in terms of operational costs.
- If alternatives offer similar degrees of redundancy.
- Alternatives will be subject to the same conditions of payment as stated in Clause 6 of this specification.

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SPEC BVMECH01/9: ELECTRIC ACTUATORS

1. SCOPE

This specification covers the requirements for electric actuators for the automatic opening and closing of valves, penstocks, weirs, etc.

2. DESIGN, MATERIALS AND MANUFACTURE

Design parameters

Power supply

The actuator shall be suitable for use on nominal 230 volt single phase 50 Hz or 400 volt 3-phase 50 Hz power supply and shall incorporate motor, integral reversing starter, local control facilities and terminals for remote control and indication connections.

Ambient temperature

The actuator shall be capable of functioning in an ambient temperature ranging from 0°C to 55°C.

Actuator sizing

The actuator shall be sized to guarantee valve closure at the differential pressure specified in the project specification. The safety margin of motor power available for seating and unseating the valve shall be sufficient to ensure torque switch trip at maximum valve torque with the supply voltage 10% below nominal, unless otherwise specified in the Project Specification. The operating speed shall be such as to give valve closing and opening times as specified in the Project Specification.

Automatic and manual drive

Motor

The electric motor shall be 3-phase squirrel cage Class F, insulated with a time rating of 15 minutes at 40°C or twice the valve stroking time, whichever is the longer, at an average load of at least 33% of maximum valve torque.

The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence or the 3-phase power supply connected to the actuator.

It shall be possible to carry out the setting of the torque and turns and configuration of the indication contacts without the necessity to remove any electrical compartment covers.

Setting of the torque or turns by using the local controls is not acceptable. Infra-red or wireless settings shall be used.

Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gearcase.

Motor protection

Protection shall be provided for the motor as follows:

Overload protection shall be provided by direct sensing of motor temperature by a thermostat embedded in the motor winding. The motor shall be de-energised in the event of a stall when attempting to unseat a jammed valve. Motor temperature shall be sensed by a thermostat to protect against overheating.

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Gearing

The actuator gearing shall be a single-stage wormgear totally enclosed in an oil-filled gearcase fitted with filling and drain plugs, suitable for operation at any angle. All main drive gearing shall be of metal construction. Where the actuator operates gate valves or large diameter butterfly, ball or plug valves the drive shall incorporate a lost-motion hammerblow feature. The output shaft shall be hollow to accept a rising stem, and incorporate thrust bearings of the ball or roller type at the base of the actuator. The design shall be such as to permit the gearcase to be opened for inspection or disassembled without releasing the stem thrust or taking the valve out of service.

Drive bushing

The actuator shall have a drive bushing which is easily detachable for machining, to suit the valve stem or gearbox input shaft. The drive bush shall be positioned in the base of the actuator to facilitate the use of standard length valve stems. Thrust bearings, when housed in a separate thrust base shall be of the sealed for life type.

Hand operation

A handwheel shall be provided for emergency operation, engaged when the motor is declutched by a lever or similar means, the drive being restored to power automatically by starting the motor. The manual/auto selection lever should be padlockable in both manual and auto positions. It should be possible to select manual operation while the actuator is running or start the actuator motor while the manual/auto selection lever is locked in manual without damage to the drive train. The handwheel drive shall be mechanically independent of the motor drive and any gearing shall be such as to permit emergency manual operation in a reasonable time. Unless otherwise specified in the Project Specification, clockwise operation of the handwheel shall give closing movement of the valve.

Time of opening/closing

The valve shall be opened and closed in the times specified in the Project Specification. This may be achieved by either selection of suitable gear ratio or by intermittent operation of the actuator.

Starter switches and indicators

Torque and position limit switches

Each actuator shall be provided with both open and close torque and/or position limit switches as required by the type of valve, plus two additional position limit switches at each end of travel for remote indication and interlocking. Means shall be provided to prevent the open torque switch tripping during initial unseating hammerblow effect.

The electrical circuit diagram of the actuator shall not vary with valve type, and shall be identical regardless of whether the valve is to open or close on torque or position limit.

Torque and turns limitation

Torque and turns limitation shall be adjustable as follows:

Position setting range: 2.5 to 100 000 turns, with resolution to 15 deg. of actuator output.

Torque setting: 40% to 100% rated torque.

Latching shall be provided for the torque sensing system to inhibit torque off during unseating or during starting in mid-travel against high inertia loads.

The electrical circuit diagram of the actuator shall not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit.

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Remote valve position/actuator status indication

Four contacts shall be provided which can be selected to indicate any position of the valve, with each contact selectable as normally-open or normally-closed. The contacts shall be rated at 5A, 250 V AC and 30V DC.

As an alternative to providing valve position any of the four above contacts shall be selectable to signal one of the following:

- Valve opening or closing.
- Valve moving (continuous or pulsing).
- Motor tripped on torque in mid travel.
- Motor stalled.
- Actuator being operated by handwheel

The status contacts should changeover and give correct remote indication or interlock even with all power supplies isolated and the actuator moved by hand.

Additional or intermediate position switches

Provision shall be made in the design for two extra sets of limit switches to be available to order, comprising at least two switches per set, each set independently adjustable to any valve position. Switch contact rating on inductive circuits shall be 5 Amp AC up to 400 V, 50 watts DC up to 250 V.

Local position indication

The actuator shall incorporate a digital position indicator with a display from fully open to fully closed in 1 % increments. Red, green and yellow lights corresponding to Open, Closed and Intermediate position shall be included on the actuator. The digital display shall be maintained without any external supply being connected.

Provision shall be made in the design for the addition of a contactless transmitter to give a 4 — 20 mA analogue signal corresponding to valve travel for remote indication when required.

Provision shall be made in the design for the addition of a contactless transmitter to give a 4 — 20 mA analogue signal corresponding to actuator output torque for remote indication when required.

Starter, transformer and controls

Integral starter and transformer

The reversing contactor starter, control transformer and local controls shall be integral with the valve actuator, suitably housed to prevent breathing and condensation build-up.

The starter shall be suitable for 60 starts per hour, and shall comprise mechanically and electrically interlocked reversing contactors of ratings appropriate to motor size, with coils fed from a 120 volt control transformer of 40 VA minimum rating.

The common connection of the contactor coils at the transformer shall be grounded so that the contactors drop out in the event of a leakage to ground.

The primary winding shall be separated from the second by a grounded screen.

The secondary output shall be protected by a fuse of an easily replaceable cartridge type.

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The controls supply transformer shall be fed from two of the incoming three phases. It shall have the necessary tappings and be adequately rated to provide power for the following functions:

- 120V AC energisation of the contactor coils.
- 24V DC output where required for remote controls.
- Supply for all the internal electrical circuits.

The primary and secondary winding shall be protected by easily replaceable fuses.

Red/White/Green illumination of the actuator indicator dial for Open/Intermediate/Closed shall be provided internally by a lamp fed from a 6 volt tapping on the control transformer.

Integral pushbuttons and selector

Integral to the actuator shall be local controls for Open, Closed and Stop and a Local/Remote selector switch padlockable in any one of the following three positions:

- local control only,
- off (no electrical operation),
- remote control plus local stop only.

It shall be possible to select maintained or non-maintained local control.

The local controls shall be arranged so that the direction of valve travel be reversed without the necessity of stopping the actuator.

Relays

Provision shall be made to incorporate any or all of the following when required:

- (a) Phase discriminator, to prevent starting with incorrect phase rotation or one phase dead.
- (b) Two interposing relays, to provide DC powered remotely operated Open, Stop and Close control. These interposing relays shall be suitable for operating from a nominal volt DC power supply (min. 24 volts) and shall be suitable for satisfactory operation anywhere within the range 80-110% nominal voltage.
- (c) Monitor (availability) relay, having one (change over) normally open contact, the relay being energised from the control transformer only when the Local/Off/Remote selector switch is in the Remote position, to indicate that the actuator is available for remote (control room) operation.

Control facilities

The necessary wiring and terminals shall be provided in the actuator for the following functions:

Removable links for substitution by external interlocks to inhibit valve opening and/or closing.

Connections for external remote controls fed from an internal 24V DC supply and/or from an external supply of (min. 12V, max. 120V) to be suitable for any one or more of the following methods of control:

- (a) Open, Close and Stop.
- (b) Open and Close.
- (c) Overriding Emergency Shut-down to Close (or Open) valve from a make" contact.
- (d) Two-wire control, energize to close (or open), de-energize to open (or close).

Selection of maintained or push-to-run control for modes (a) and (b) above shall be provided and it shall be possible to reverse valve travel without the necessity of stopping the actuator. The starter contactor shall be

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protected from excessive current surges during travel by an automatic time delay on energization of approximately 300ms.

The internal circuits associated with the remote control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 1,1 kV.

Wiring and terminals

For actuators with integral contactors and control gear, suitable terminals with removable links shall be provided to permit connection of external interlocks to inhibit any one of the following operations:

- (a) Valve opening
- (b) Valve closing
- (c) Valve opening and closing for all actuators:

Internal wiring shall be of tropical grade PVC insulated stranded cable of 5 amp minimum rating for control circuits and of appropriate size for the motor 3-phase power. Each wire shall be clearly identified at each end.

The terminals shall be of the stud type embedded in a terminal block of high tracking-resistance compound. The 3-phase power terminals shall be shrouded from the control terminals by means of an insulating cover. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal.

The terminal compartment of the actuator shall be provided with 3 threaded cable entries.

A durable terminal identification card showing plan of terminals shall be provided attached to the inside of the terminal box cover indicating:

- (a) Serial number
- (b) External voltage values
- (c) Wiring diagram number
- (d) Terminal layout

This shall be suitable for the Contractor to inscribe cable core identification alongside terminal numbers.

Enclosure

All actuators, whether for explosion-hazardous locations or not, shall be 0-ring sealed, watertight and dustproof to NEMA 6/IP68 and shall at the same time have an inner watertight and dustproof 0-ring seal between the terminal compartment and the internal electrical elements of the actuator, fully protecting the switch mechanism, motor and all other internal electrical elements of the actuator from ingress of moisture and dust when the terminal cover is removed on site for cabling.

Enclosure shall allow for temporary site storage without the need for electrical supply connection. All external fasteners should be of stainless steel.

Actuators for explosion-hazardous application shall in addition be certified explosion proof Class 1, Groups A, 8, C and D, Division 1 and 2.

Start-up kit

Each actuator shall be supplied with a start-up kit comprising:

- installation instructions,
- electrical wiring diagram and
- sufficient spare cover screws and seals to make good any site losses during the commissioning period.

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3. TESTING AND COMMISSIONING

Performance test certificate

Each actuator shall be performance tested, and individual test certificates shall be supplied free of charge. The test equipment should simulate a typical valve load, and the following parameters shall be recorded:

- No load current
- Current at maximum torque setting
- Stall current
- Torque at maximum torque setting
- Stall torque
- Test voltage and frequency
- Flash test voltage
- Actuator output speed

In addition, the test certificate shall record details of specification such as:

- gear ratios for both manual and automatic drive,
- closing direction,
- wiring diagram code number, and, when applicable,
- remote position transmitter resistance and
- interposing relay voltage, etc.

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C3.2.3.10 SPEC BVELEC01/0 GENERAL TECHNICAL SPECIFICATIONS

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SPEC BVELEC 00/1 : GENERAL TECHNICAL SPECIFICATION

1. GENERAL

This part of the specifications gives the general requirements for MV & LV electrical installation work. These requirements are based on the relevant quality specifications given and are augmented by the specific requirements for this Contract given in the project specifications.

The following documentation must be provided with tender off Electrical contractor/sub-contractor responsible for specific specialist installations:

1. Tenderer to submit written proof that he owns sufficient plant and equipment to complete the project timeously or alternatively list the plant he intends on renting,
2. Tender to submit written of his labor force he intends to utilize,
3. Company organogram,
4. Company profile,
5. CV's & certificates of key personnel members he intends to utilize,
6. Reference letters or completion certificates of similar installations completed.

2. SUMMARY OF CONTRACT

The contract will provide for the supply of some or all of the materials required and the provision of labour and expertise for the installation of some or all of the materials in accordance with the requirements of the Project Specifications.

3. DRAWINGS

The electrical drawings form an integral part of the Project Specification. Tenderers are advised to visit the site and thoroughly acquaint themselves with the nature and extent of the work to be done.

4. SUPPLY OF MATERIALS

The onus is on the Contractor to order material well in advance to ensure timely delivery. No extension of time shall be allowed for late delivery of material due to orders not placed on time.

5. STANDARDS

In view of the fact that this installation is to be operated and maintained by others it is a condition of this Contract that the standard of workmanship and quality of materials will be subject to the approval of the Engineer and the party finally responsible for the operation and maintenance of the system. All correspondence in this regard shall however be directed to the Engineer and the final approval will only be granted by him.

6. DAMAGE TO OTHER SERVICES

The Contractor shall be held liable for all damage to other services and if such damage is not replaced to the satisfaction of the Engineer within a reasonable period the Engineer shall be entitled to appoint another Contractor to repair such damage and debit the account of the Electrical Contract. It is essential that the Contractor should liaise with the Engineer and other Contractors on site in order to minimize such damage.

7. OUTAGES

Power outages will be required to perform some of the tasks involved on this project. Outages are to be planned allowing sufficient notice to the Employer and in compliance with any reasonable stipulations required. Liaison with the Engineer, Employer, other Contractors and the Supply Authority is compulsory.

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8. P.C. AMOUNTS

Where P.C. Amounts are specified, no part of these amounts will be used without the written approval of the Engineer. Unused amounts will be omitted from the Contract.

9. VARIATION ORDERS

Where variation orders are necessary, instructions will be issued by the Engineer and all variations will be calculated according to the priced Schedule of Quantities. All the items in the bill must be priced by the Tenderer or the tender might be declared null and void.

10. ITEMS FOR APPROVAL

Where the specification refers to a specific brand name “or similar and equivalent” or “Other approved type” and alternative equipment is offered in lieu of that specified, then written approval must be obtained from the Engineer before such equipment is installed.

In certain cases the Contractor may be required to submit samples and where necessary, tests will be performed to establish the quality of the material offered.

11. QUALITY OF MATERIALS

Only new, good quality materials may be used and where applicable materials must comply with the specifications of the South African Bureau of Standards or the British Standards Specifications.

Wherever possible, S.A. manufactured material must be used.

12. STANDARD OF WORKMANSHIP

All installation work in this Contract is to be executed by qualified Electricians and Cable Jointers in accordance with modern techniques.

The Engineer shall have the right to reject any work, which does not meet with his approval.

13. PLANT SUPPLIED BY EMPLOYER FOR INCORPORATING INTO THE WORKS

The Contractor must supply all Plant required for the erection and completion of the Works.

14. LIMITATIONS ON THE CONTRACTOR’S PERFORMANCE OF THE WORK

The Contractor shall control his activities and processes in such a way as to ensure compliance with the specifications. He shall carry out, as a minimum requirement; all the tests laid down in the specifications and shall submit all the test results to the Engineer.

The Contractor shall be responsible for the relevant Quality Assurance Requirements to be imposed on his Sub-Contractors and suppliers of materials.

The Employer’s personnel as well as other Contractors will be active on site during the execution of this Contract. The inherent problems associated with this type of interaction must be taken into account and should be allowed fully for in tender prices and the Tenderer should take note of the fact that his program will be altered from time to time to accommodate the needs of the other Contractors and site conditions, everything to ensure the best co-ordination of the works in total, however not necessarily to the advantage of this Electrical Contract.

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15. SITE FACILITIES TO BE PROVIDED BY THE CONTRACTOR

15.1 OFFICE, WORKSHOPS AND STORES

The Contractor shall erect and maintain at his own cost all covered storage and offices that he may require. The yard shall be fenced by the Contractor and maintenance of the yard will be his responsibility. The yard shall at all times be kept in a clean and tidy condition, to the satisfaction of the Engineer.

On completion of the project, all structures and installations shall be removed from site, to the satisfaction for the Engineer.

15.2 TELEPHONE AND TELECOMMUNICATIONS

The Contractor shall be responsible for the supply on site of his own telephone or cellular phone.

15.3 SETTING OUT

The Contractor is responsible for setting out the works to the dimensions shown on the drawings, and he will do all surveying of any supply lines. Contractor shall allow for a qualified surveyor in his pricing.

15.4 PROVISION OF STANDARD SPECIFICATIONS

Where any specification is listed and makes reference to other published standards, or specifications of a similar nature, the Contractor shall arrange at the request of the Engineers, to make available at least one complete set of the latest edition of all documents so referenced.

The documents shall be kept in the Contractor's site office where they shall be available for reference at all times by the Contractor's personnel or the Engineer until completion of the Works.

16. CONTRACT ADMINISTRATION, COMPLETION, TESTING AND COMMISSIONING

16.1 QUALITY CONTROL DURING THE EXECUTION OF THE CONTRACT

Daily inspection of the works by the Contractor is expected to ensure that all work is executed in accordance with the drawings and specifications by **an accredited 3 phase 22kV authorized installation technician/contractors manager.**

These inspections will be monitored by the Engineer or his duly authorized Representative.

The onus is on the Contractor to clarify any uncertainties with the Engineer to ensure that the work is executed as intended by the Engineer and to the required standards.

Failure to comply might result in the Contractor redoing unsatisfactory work for his own account.

16.2 MAINTENANCE OF AS-BUILT DRAWINGS

During execution of the Contract, the Contractor shall update the drawings daily with all the relevant information regarding cable routes, joints, sleeves, etc.

At the end of the Contract, the Contractor shall provide the necessary information to enable the Engineer to prepare "As-Built Drawings" of the installation, together with 3 sets of any other drawings, wiring diagrams, services and instruction manuals for equipment supplied

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16.3 SETTING OF PROTECTIVE DEVICES AND CONTROLS

16.3.1 All protective devices installed throughout shall be correctly adjusted by the Contractor to the approval of the Engineer before any circuit is energized. The Contractor is required to obtain all data necessary to establish the correctness of the settings. Where doubts exist the Engineer's confirmation is to be sought. Data with regard to all commissioning documentation and diagrams of all control, alarm and indication circuits are to be provided for approval prior to their installation.

16.3.2 These diagrams shall include:

- 16.3.2.1 Wiring diagram.
- 16.3.2.2 Schematic wiring diagram.
- 16.3.2.3 Device operating sequence diagram.
- 16.3.2.4 Operational narrative of the control and protective devices.

16.4 PRELIMINARY TESTING OF MAJOR EQUIPMENT

All items of major equipment are where feasible, to be factory tested prior to delivery to site, and results of such tests, in a format to be agreed in advance, are to be produced before the equipment is delivered.

All such tests are to be in accordance with the relevant Codes of Practice, and with any other requirements as set out in this documentation.

16.5 COMPLETION OF INSTALLATION

Before the commencement of any test or commissioning procedures, the Contractor is to ensure that all nuts and bolts are securely fastened, and that paintwork on all items supplied has been touched up where damage has occurred.

16.6 INSPECTION AND TESTING

On completion of the entire installation or any particular section thereof, as may be decided by the Engineer, the following minimum tests shall be carried out in the presence of the Engineer or his authorized Representative.

16.6.1 Transformer Testing

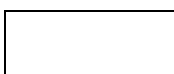
- 16.6.1.1 Factory test results and certificates as required by SABS 780 shall be furnished.
- 16.6.1.2 Megger testing (5000 V) of insulation (MV/LV and LV/E).
- 16.6.1.3 The recording and marking of phase rotation and voltage on the secondary side.
- 16.6.1.4 MV and LV transformer earth resistance.

16.6.2 Cable Testing. MV and LV cables shall be tested by the Contractor for:

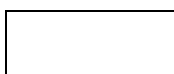
- 16.6.2.1 Continuity.
- 16.6.2.2 Insulation.
- 16.6.2.3 Phase rotation.

16.6.3 LV Testing. The tests on the LV system to be conducted are as follows:

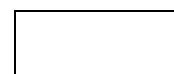
- 16.6.3.1 Operation tests of all circuit breakers.



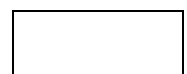
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- 16.6.3.2 Continuity tests.
- 16.6.3.3 Megger tests (not less than 1 000 Volt).
- 16.6.3.4 Measuring and recording of clearances.

16.6.4 Documentation

All instrumentation necessary for testing shall be provided by the Contractor.

The results of all the tests must be clearly recorded, signed and handed to the Engineer or his authorised Representative. Where available standard or specifically designed forms should be used. In this regard, Tenderers are referred to any forms included in this document.

16.6.5 Commissioning, Testing And Documentation

16.6.5.1 On completion of the entire installation or any particular section thereof, as may be decided by the Engineer, test shall be carried out before commissioning, in full accordance with the current edition of the "Code of Practice for the Wiring of Premises", the manufacturers and/or the SABS specifications, in the presence of the Engineers or his authorized Representative.

The Contractor should note that where applicable, at least the following test must be carried out:

- 16.6.5.1.1 Phase Rotation Tests
- 16.6.5.1.2 Insulation Test
- 16.6.5.1.3 Continuity Test
- 16.6.5.1.4 Loop Line Earth Impedance Test
- 16.6.5.1.5 Polarity Test
- 16.6.5.1.6 Earth Leakage Circuit Breaker
- 16.6.5.1.7 Earth Termination Test.

16.6.5.2 Any further tests to meet the Supply Authorities requirements, or as deemed necessary by the Engineer.

16.6.5.3 All instrumentation necessary for testing shall be provided by the Contractor.

16.6.5.4 The results of the above tests must be clearly recorded, signed and handed to the Engineer or his authorized Representative, together with the Certificate of Compliance, or any such form or forms required by the Local Supply Authority or Engineer.

16.6.5.5 The Engineer requires at least the following:

- 16.6.5.5.1 Certificate of Compliance.
- 16.6.5.5.2 Schedule of protection and control settings.
- 16.6.5.5.3 Set of schematic wiring and function diagrams.
- 16.6.5.5.4 Sequence diagram and control functional narrative for each control panel.
- 16.6.5.5.5 Drawings of the installation marked "As Built" and signed.
- 16.6.5.5.6 File of distribution legends.
- 16.6.5.5.7 Operating and maintenance instructions on equipment.
- 16.6.5.5.8 List and description of clearance measurements at road crossings, Telkom crossings, between other

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services etc. all as per the OHS act, to determine compliance.

16.6.5.5.9 Guarantees ceded to the Employer.

16.6.6 Once the Engineer has inspected the complete installation and satisfied himself that all testing has been completed, and that the Contract is complete in all aspects, can the Employer be approached in writing, with the above documentation, with a view to arrange a hand-over date.

16.7 UNACCEPTABLE TESTS AND ABORTIVE HAND OVERS

Should the Employer or Engineer find at the time of hand over that work is defective to the extent that they have to return for further inspections and the handover aborted, then the Employer reserves the right to claim expenses in whole or part from the Contractor.

LABELLING

All new Switchgear, LV cubicles and attendant circuits, circuit breakers, transformers, cables, poles etc. shall be clearly labelled. The inscriptions to be used will be provided in the Project Specifications or after the award of tender.

17. PROGRAM OF WORK

A program shall be finalised by the successful Contractor during a meeting within 2 weeks after a Tender has been awarded. The Contractor shall only deviate from this program if the Engineer approves. However, the Engineer reserves the right to alter the program if necessary. This program shall be regarded as a binding document and the handover date shall be the date stipulated on the program. The penalty clause will be applied from the "Handover date".

Where applicable, the program will not be drawn up in isolation, but the Contractor must take cognisance of the program of the Civil and or any other Contractors on site, and should make provision to accommodate their requirements.

18. OFF-LOADING, STACKING AND LIABILITY FOR BREAKAGES

The Contractor will be required, at his own expense, to make all arrangements for off-loading and carefully stacking all plant and materials delivered under this Contract on the Site of the Works. The off-loading and stacking shall be carried out strictly in accordance with the requirements of the Engineer so as to permit a thorough and careful examination and testing of all items for breakages, fractures, etc.

Plant and materials shall be stored on site at the cost of the Contractor, who shall be fully responsible for its protection against theft or damage by water, weather, fire and any interference until such time as it is erected and installed, put into satisfactory operation and accepted by the Engineer and the Employer as complete.

19. INSPECTION AT SITE

All plant and materials will be carefully examined upon delivery at the site and all items showing defects or damage of any description shall be laid aside as not being in accordance with the requirements of the Contract, and these shall be removed and replaced by the Contractor at his own cost.

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20. ERECTION, INSTALLATION, ADJUSTMENT AND OPERATION

The erection and installation of the plant is to be carried out by skilled artisans, experienced in this type of work and under the personal supervision of the Contractor's Site Foreman, whose qualifications and experience to supervise this work must be acceptable to the Engineer. The plant, when erected and installed, shall be of neat and workmanlike appearance, solidly and evenly supported, true to line and level, plumb and in proper working order. The drilling and grouting of all structural bolts, channels, etc. will be the responsibility of the Contractor under this Contract.

Before handing over the Plant, the Contractor is to ensure that every component is operating satisfactorily. The Contract will not be deemed to have been completed until the Engineer is fully satisfied in this regard.

BRAND NAMES

Brand names and references to catalogues are made to determine a standard for material to be delivered and are not prescriptive as the exact type to be used. Alternatives may be presented for approval.

21. FIBRE OPTICS

Fibre Optic

1 General

The installation will comply with the SAIEE Code of Practice on overhead lines for conditions prevailing in Southern Africa and with Machinery and Occupational Safety Act.

The material and installation will comply with the relevant NRS specifications and specifications of the manufacturer.

The new fibre optic ADSS cable system will provide communication infrastructure between the booster pump station and the water purifying plant.

The fibre optic cable will be made of a minimum of 8 cores.

Any further requirements laid down by various statutory bodies such as the Department of Posts and Telecommunications, the S.A. Transport Services, etc., will also be observed when applicable.

2 Ancillary Equipment and Required Labour for Installation

All plant, labour, materials and equipment required in adhering to the various standards, acts and regulations mentioned above, although not necessarily detailed in the specification will nevertheless be provided for under this contract and will be to the approval of the Engineer.

3 NRS Specification

(a) ADSS Cable

The product specification is detailed in NRS 078-1:2004 of which copies can be obtained from the South African Bureau of Standards.

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The installation guidelines are detailed in NRS 078-2:2005 of which copies can be obtained from the South African Bureau of Standards.

The installation guidelines are detailed in NRS 061-2:2004 of which copies can be obtained from the South African Bureau of Standards.

(a) Line Schedule

The line schedule/ spanning sheet, listing all structure detail, is attached in the Drawings Book.

All Tenderers should submit a preliminary design report with their respective tenders, compiled by their proposed sub-contractor for the fibre optic cable system, which covers the following items in detail:

- i) Any assumptions
- ii) Structure capabilities, loading and safety factors
- iii) Tables and graphs indicating actual calculated loading of structures and the additional fibre optic cable load and the degrading of structures.
- iv) Positioning of ADSS on structures and electrical field plots.
- v) Calculate the position of ADSS in midspan for different variations in sag conditions.
- vi) Midspan field strength calculations and comparative sag for different temperatures and span lengths.
- vii) Optimal attachment heights.
- viii) Hardware designs.
- ix) Recommendations.

5 Fiber Optic Cable System Acceptance Testing

The Eskom document, TPC41-5 will be used for fiber optic cable acceptance testing.

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C.3.3.3.11 BVELEC01/1 ELECTRICAL QUALITY SPECIFICATION

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- 1. INTRODUCTION**
- 2. TABLE 1 : QUALITY STANDARDS**
- 3. TABLE 2 : GUIDELINES AND RECOMMENDED PRACTICES**

QUALITY SPEC BVELEC 01/1: QUALITY SPECIFICATIONS

1. INTRODUCTION

The following specifications form the base quality guidelines of this document and serve to set standards to which individual components as well as the complete installation must adhere. If any deviations from or additions to these specifications should occur, it is detailed in the general and project specifications. In all cases the latest available update of the specifications mentioned applies to this contract. All material supplied must be new and undamaged and shall, where applicable, bear the SABS mark.

2. TABLE 1: QUALITY STANDARDS

ITEM	DOCUMENT
Aerial Bundled Conductor	SABS 1418, Part 1 to 3 DTS 0105 (NRS 018)
Bolts and Nuts	SABS 135
Bolts, Eye	SABS 178
Bushbars	SABS 1195
CNE	SABS 1268: 1979
	NRS 016: 1991
Cables, installation of electric	SABS: 0198: 1988
Cables, low voltage	NRS 012: 1991
Cables, medium voltage	NRS 013: 1991
Cables (house service split concentric)	DTS 0084 (NRS 017)
Cable Glands	
Cable Ties	SABS 080
Clamps (strain for split concentric)	DTS 0086 (NRS 020)

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Clamps (suspension for split concentric)	
Clamps Strain	SABS 178
Clevis Tongue Adapter (twisted)	SABS 178
Clips for Wiring	
Compression Fittings	BS 3288 Part 1 (Tests)
Concrete Poles	SANS 470 DTS 0106
Conductor ACSR/AAC and AAAC	SABS 182
Conductor, Covered	DTS 0087 (NRS 021)
Conduit Saddles	
Conduit	
Connectors, lug/termination	NRS 028 EDF 6737/HN 33 E60 (Main cable 350mm ² to 70mm ² take off 6mm ² to 35mm ²)
Connectors, mid-span/no tension	BS 3288 (Tests)
Connectors	SABS 0162
Cross Arm Braces	SABS 1200 H/HA
Cross Arms	SABS 0162 SABS 1200 H/HA
D-Fuses	DTS 0048 Rev 0
Distribution Transformers	NRS 005
Earthing Rods	SABS 1063 SABS 0199
Electricity Dispenser	SABS 1524 -1 NRS 009 -1
Fittings (strain and suspension) ABC	DTS 0105 (NRS 018)
Fuse Holder	SABS 172 & BS 88
Fuses	SABS 172 & BS 88
Galvanising	SABS 763: 1988 SABS 935
Insulator Hardware	IEC/NWS 1536, SABS 177,
Insulator Spindle	DTS 0092
Isolators	SABS 0162
	SABS 1200 H/HA
Line Construction	NWS 1512

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Links Trilinks	IEC/NWS 1536
Links, ganged 3 phase (isolators)	IEC/NWS 1536
Links, pull Stick (Knife links)	IEC/NEW 1563
Links, single Pole "Huncklinks"	IEC/NWS 1536
Long Rod Insulators	DTS 0092
Miniature Circuit Breakers	SABS 156
Reticulation LV	DTS 0090 (NRS 023)
Road crossing standard	DTS 0060
Pole Top Service Box	DTS 0104 (NRS 032)
Post Insulators	DTS 0092
Performed Tension Wraps	SABS 178
Performed Ties	SABS 178
Ready Boards	DTS 0085 (NRS 019)
Switchgear, Metal incl. ring main units (1-24kV)	NRS 006
Service Box	DTS 0104 (NRS 023)
Stay Assemblies	BS 16, SABS 0162
Stay Assemblies	BS 16, SABS 0162
Stay Insulators	BS 16, SABS 0162
Stay Wires	SABS 182, Part 5
Surfix Wiring	SABS 1507
Surge Arresters	NWS 1108, BS 2914 (NRS 039)
Symbolic Safety Signs	SABS 1186 : 1978
Thimbles	BS 464
Transformer	SABS 780
Transmission line hardware	NWS 1827
Washers	SABS 135
Wire, PVC Covered	SABS 182
Wire Rope Grips	BS 462
Wire, Stranded Copper, bare	SABS 753
Wood, Poles, pine gum	SABS 754
Zinc coatings, hot dipped galvanized	SABS 763

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3. TABLE 2: GUIDELINES AND RECOMMENDED PRACTICES

ITEM	DOCUMENT
Overhead Reticulation: Recommended Practice for Low Cost Urban Reticulation	NRS 023: 1991 (DTS 0090)
Code of Practice for the Application of CNE on Low Voltage Distribution Systems	NRS 016: 1991 (DTS 0103)
Power Line Crossings of Proclaimed Roads, Railway Lines, Tramways and Important Communication Lines	DTS 0060
OHS Act (Act No 85 of 1993) and Amendments	
Construction Regulations and Amendments	
Eskom Standards	DT-Web

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C.3.3.12 SPEC BVELEC01/2 LAYING OF CABLES AND EXCAVATIONS

CONTENTS

- 1. HANDLING**
- 2. EXCAVATIONS**
- 3. BEDDING**
- 4. CABLE WARNING TAPE**
- 5. BACKFILLING**
- 6. RECORDING OF JOINT AND CABLE MARKERS**
- 7. CABLES**
- 8. TESTING OF CABLE TERMINATIONS**
- 9. HANDLING**
- 10. INSTALLATION**
- 11. DEPTH OF CABLES**
- 12. MARKING OF CABLES**
- 13. MEASUREMENT OF CABLES**
- 14. THERMAL RESISTIVITY**
- 15. POSITION OF CABLES**
- 16. TESTING ON COMPLETION**
- 17. INSTALLED ROUTE PLAN AND CABLE SCHEDULE**

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SPEC BVELEC 01/2: LAYING OF CABLES AND EXCAVATIONS

1.1 HANDLING

The storage, transportation, handling and laying of cables shall be according to first class practice, and the Contractor shall have adequate and suitable equipment and labour to ensure that no damage is done to cables during such operations.

Twisted, kinked or cables damaged in any way will not be allowed, and must be rejected.

Cable shall be removed from the drum in such a way that no twisting, tension or mechanical damage is caused, and must be adequately supported at short intervals during the whole operation.

Particular care must be exercised where it is necessary to draw cables through pipes and ducts, to avoid abrasion, elongation or distortion of any kind.

The ends of such pipes and ducts shall be sealed to approval of the Engineer after drawing in of the cables. The manufacturer’s recommended bending radius for cables are to be adhered to at all times. Failure to these will result in the Contractor to replace the cable at his own costs, and to the satisfaction of the Engineer.

1.2 EXCAVATIONS

The excavations of cable trenches shall be carried out by the Contractor, along the routes and in the servitudes as shown on the drawings or as indicated on site.

The bottom of the trench shall be level and clear and the bottom and sides shall be free from rocks, stones, or other objects liable to cause damage to the cable.

All MV cables, unless otherwise specified, shall be laid at a depth of at least 1 000mm and LV cables at 800mm below FINAL FINISHED GROUND LEVEL OR NATURAL GROUND LEVEL.

Trenches shall not be less than 400mm wide for one or two cables, and the width shall be increased where more than two cables are to be laid together, so that the cables may be placed at least 150mm apart throughout the run.

Where the nature of the ground does not permit the excavation of cable trenches to the specified depth without excessive blasting, the matter shall be referred back to the Engineer, whose decision shall be final.

The Contractor must take all necessary precautions to prevent trenching work being in any way a hazard to the public or hampering the progress of other Contractors on site and to safeguard all structures, roads, railways, sewers, works or other property from any risk of subsidence and damage.

Volumetric measurements for normal excavations will not be done and trenches will be measured on a cost per meter basis.

The Contractor shall be responsible to remove all excess ground left over after trenches have been back filled. He will ensure that the surface is left in the same condition in which it was handed to him.

No guarantee can be given that blasting will not be necessary. This item shall be the full responsibility of the Contractor and he shall be required to adhere to all laws, regulations and by laws regarding this type of work. The onus is on the Contractor to visit the site before submitting his Tender, to make an assessment of the soil type and to allow for blasting if deemed necessary as no extra claims shall be considered.

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BEDDING

In all trenches a layer of at least 100mm of clean sand shall be laid below the cable/sleeve, followed by a layer of at least 100mm clean approved bedding laid above the cable/sleeve.

1.3 CABLE WARNING TAPE

A yellow PVC cable warning tape of 300mm wide shall be installed at least 300mm above all cables in trenches.

1.4 BACKFILLING

Backfilling after bedding and laying of concrete slabs and warning tape, where applicable, is to be carried out with a proper grading of material to ensure settling without voids, and the material is to be properly compacted after the addition of every 150mm.

The surface is to be made good as previously described.

Backfilling may not commence until the entire trench has been inspected by the Engineer and where necessary, the route was recorded onto the "As Built" drawing.

1.5 RECORDING AND INSTALLATION OF JOINT AND CABLE MARKERS

Each length of power cable shall be numbered with the drum number and its exact position entered on a route drawing, and after site testing these numbers shall appear on the test sheet covering the respective length of cable and the test result.

Full details of all joints are to be submitted and each joint is to be numbered and the position, type and number recorded on the route drawing.

The Jointer's name and date of jointing, as well as the weather conditions, are to be recorded on the drawing.

At the completion of each cable section the Contractor shall install a concrete, pyramid type cable joint marker at every joint position. Also at every deviation and branch-off and where indicated on the drawing, cable markers shall be placed. The position of each joint or cable marker must be exactly indicated on the "As-Built" cable route drawing.

CABLES

1.6 MV CABLES

1.6.1 General

Medium Voltage cables of the oil impregnated paper insulated type shall be manufactured according to SABS 97 as amended, and shall bear the SABS mark.

The following designation code shall be used when identifying cables specified.

NOTE: All cables shall have stranded copper conductors and shall have a dielectric voltage grading for "unearthed" systems, unless otherwise stated.

1.6.2 Identification

<u>Component</u>	<u>Code Letters</u>
Impregnated paper dielectric	P
Lead sheath	L

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Lead-alloy B Sheath	B
Lead-alloy E sheath	E
Fibrous helical bedding or serving	S
Fibrous braided serving	X
Double steel tape armor (DSTA)	T
Single wire armor (SWA)	W
Double wire armor (DWA)	D
Anti-corrosion bedding or over sheath	C

When there is any doubt about identifying a type of cable required for a particular project, the Contractor shall immediately contact the Engineer for clarification of the code.

1.6.3 Joints and Terminations of MV Cables

General. Designs of cable joints, indoor and outdoor terminations, as well as all materials to be used for the jointing or terminating of the cable shall be approved by the Engineer prior to ordering of such materials.

The joints and terminations shall comply with the following:

Voltage withstand level	36 kV
Impulse withstand level	95 kV

The Contractor shall forward to the Engineer for his approval, full particulars of the instructions issued to the Cable Jointer prior to jointing of terminating of cables.

1.6.4 Tests before making Cable off. Before paper cables are made off, the following tests will be applied:-

- i) A crackle test shall be carried out on a sample of paper from both ends of the cables. If moisture is present, the cables shall be cut back.
- ii) A 5000V megger shall be used to assure continuity and earth resistance.

1.6.5 Terminations. The best practice shall be employed when making off the MV cable ends in the end boxes. Colours or numbers must be followed through and the phase rotation must be maintained.

The cable end boxes for all the transformers, outdoor or indoor, shall be wall or pole mounted and shall be complete with insulators with through connector rods, adapted for the aluminum cores on the inside when requested. The boxes shall be either C>I> or fabricated steel, compound filled with the filler and riser holes being the highest points in the box. Moisture gaps shall be provided in all joint boxes. The compound filling shall be done in one operation with topping up following at intervals as the compound settles.

Where the cables terminate on the transformers, the bushings shall be puttied and taped, together with the cable core.

The three screens for screened cables around each core shall be bonded to the lead and armoring by means of plumbing and connected to the earth bar by means of copper conductor of at least 70 mm². For belted cables the armoring and lead shall be bounded by means of plumbing and connected to the earth bar via a 70 mm² conductor.

The connection shall be executed carefully avoiding any heat generation at the termination under earth fault conditions.

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If specified heat shrink terminations shall be used. It shall be noted that the Manufacturer's instructions shall be adhered to.

The termination shall be complete and the cable supported by means of a wooden block prior to the connection of the cable to the switch gear bushings.

The wooden block shall be installed around the cable in such a manner that the sleeves or tapes used for the termination are free from the wooden block.

Spare cables of at least 1,5 m length shall be left in the cable trench at each termination.

1.6.6 Jointing of Paper Insulated Cables

All cable jointing shall be done in a first class workmanlike manner with particular attention paid to cleanliness, insulation and undue bending of the cable cores.

No cable end shall be made off ready for jointing and left open for any length of time, but shall be completely jointed and the sleeve filled with black compound immediately thereafter.

After stripping of the armor and lead sheath, the lead of the cable shall be slightly bell-mounted after which boiled linen tape 25 mm wide and of good quality shall be wrapped round the crutch of the cable, ensuring that the tape is partly under the bell-mouth. The belting shall now be stripped back and torn off against the boiled linen tape.

Each cable core shall be taped with four layers, half lap, of boiled linen tape after which a spreader shall be inserted between the cores of each cable end.

The jointing of all paper insulated cables shall be made either by means of crimping ferrules or sweating of the jointing ferrules onto the cable cores. If crimping is used, the ferrules shall be crimped on by means of a hexagon crimping tool.

Before the jointing ferrules are taped, care shall be taken that they are free of any sharp points or rough edges.

All joints on paper insulated cables shall be encased in a lead sleeve of sufficient diameter for the size of cable being jointed and this lead sleeve shall be "plumbed" on to the lead sheath of each cable.

The lead sleeve shall then be filled with a good quality black compound and topped up as the compound contracts on cooling. The black compound shall be of sufficiently high dielectric strength to withstand the voltage of the cable.

The armor and lead sheath of each cable shall be bonded together by means of plumbing on a flexible cable of adequate size in accordance with the size of the cable being jointed.

When jointing in earth trenches, a cast iron cable box shall be placed over the lead sleeve. The cable box shall also be filled with black compound.

The cable trench shall be widened where the joint will be done and at least 1,5 m of spare cable shall be provided on either side of the joint.

Prior to the jointing a plastic sheet shall be installed underneath the joint covering the sides and bottom of the trench to avoid dust or soil contaminating the joint.

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1.6.7 LV PVC INSULATED CABLES

General

All low voltage cables shall be manufactured according to SABS 15- - 1970 and shall bear the SABS mark.

The voltage gradient of the PVC dielectric shall be for 600/1000 Volts and for general purpose use unless otherwise stated.

All low voltage PVC insulated cables shall have stranded copper annealed conductors, unless otherwise called for.

The following code shall be used for identifying cables:-

1.6.7.1 Identification

<u>Component</u>	<u>Code Letters</u>
PVC di-electric	PVC
PVC sheath or extruded bedding	PVC
PVC tape bedding	PVCT
Single wire armor	SWA
Earth continuity conductor in armor	ECC/SWA
Double wire armor	DWA
Concentric neutral or earth conductor	N, NE or ECC as relevant
PVC outer sheath	PVC
Where a supplementary earth core is included	G/Y

1.6.7.2 Joints and Terminations of PVC PVC SWA PVC Cables

The ends of these cables shall be made off in the conventional way with an earth bond between the armor, and the cores jointed through by means of crimping ferrules, colour to colour (no taping required).

PVC jointing kits shall be used and these shall consist of a celluloid jointing mould which shall be placed around the joint. Into this mould shall be poured a clear plastic compound which shall be allowed to set after which the jointing mould shall be removed.

No joint will be permitted in any run of cable unless specifically specified or specifically approved by the Engineer.

Terminating PVC cable shall be by means of glands and shrouds or K-Clamps. Connecting of cable cores to bolted type terminals shall be affected by means of suitably sized lugs which shall either be sweated or crimped onto the relevant conductor ends.

1.7 TESTING OF CABLE TERMINATIONS

The following tests are required:

1.7.1 Before Terminations. Prior to jointing or termination the insulation and continuity tests by means of resistance shall be done:

MV cable	:	5000V
LV cable	:	1000V

1.7.2 After Terminations. The following tests shall be carried out on completed cable sections of laid and jointed cable.

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The Contractor shall be responsible for all necessary test equipment and instruments and the necessary electricity supply to carry out the test.

- 1.7.3 Paper Insulated MV Cables. A test voltage (either A.C. or D.C.) shall be applied between conductors and between each conductor and the metal sheath, which should be held at earth potential. The voltage should be increased to the full appropriate value, and maintained at this value for 15 minutes.

Test Voltage, V (rms)					
<u>Belted cables</u>			<u>Single core, and screened cables</u>		
Between conductors		Between any conductor and sheath		Between any conductor and sheath or screen (as relevant)	
<u>Cables for earthed systems</u>					
A.C.	D.C.	A.C.	D.C.	A.C.	D.C.
20 000	30 000	11 500	17 500	12 000	18 000
<u>Cables for unearthed systems</u>					
20 000	30 000	20 000	30 000	20 000	30 000

NOTE: Direct current tests should NOT be applied on cross-linked polyethylene cables (XLPE). All cables shall be discharged fully, immediately after each and every test.

- 1.7.4 PVC Insulated Cables. A 2000V megger shall be used and the insulation between phases and phases to earth shall be measured.
- 1.7.5 Rejected Cables. If breakdown of any cable occurs during testing it shall be replaced and/or the cable end shall be re-done. This shall be to the Engineers satisfaction and for the Contractor’s account.

1.8 HANDLING

During loading and off-loading the cable drums must be handled carefully to avoid damage to the inner layers of the cable. Drums must not be dropped onto or off the delivery vehicle. If no winch, hoist or other mechanical means is available, then drums must be gently rolled down a suitable ramp or rails.

When rolling a drum of cable on the ground, it must always be rolled in the direction of the arrow stenciled by the Manufacturer on the drum flange.

Periodic rotation of wooden drums is essential to avoid drum timbers from rotting through rising damp.

Incorrect handling of drums could result in rejection of the cable by the Engineer, without additional time to the Contract, or any other compensation being granted.

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1.9 INSTALLATION

The following points must be adhered to for the correct installation of cables:

- Robust cable jacks with a spindle strong enough to carry total load, shall be securely mounted and operated with the spindle level.
- The securing ropes must be cut so as to leave the inner end free to move, during unrolling operations.
- Correct wire mesh pulling stockings must be used for the drawing in of cables.
- The use of adequate, (approximately every 2 metres) well-oiled cable rollers, of the correct size or larger, shall be used.
- All pipe ducts must be cleared of all foreign matter before cables are pulled in.
Adequate protection and attention at the entrance and exit to pipe ducts is essential. Maximum pulling forces specified by the Manufacturers must not be exceeded.
- No cables must be laid when temperature is 10°C or lower, unless the special conditions as required by the Engineer have been fully met.
- The following bending radius is the absolute minimum and under no circumstances must the radius be less than these dimensions for the size of cable specified:
 - PVC insulated cable = 10 x D
 - Paper insulated lead covered = 12 x D
 - XLPE insulated cables = 15 x D

Where D = overall sheath diameter

The Engineer reserves the right to reject any cables which have been twisted, kinked or damaged in any other way, without additional time being granted for completion of the Contract.

When laying the cable, a certain “snaking” must be permitted so that contraction during cold weather will not detrimentally affect joints, etc. Due allowance for this has been made in this specification.

1.10 DEPTH OF CABLES

Unless authorized otherwise in writing, cable depths to underside of cable shall be as follows:

	Single or 3 per trench (max)	When tiered
i.) MV Cables	1000 mm	1 050/900 mm
ii.) Pipes/ducts under roads for cables	900 mm	900 mm
iii.) LV Kiosk supply cables only	800 mm	900/750 mm
iv.) Street-lighting, high mast or service connection cables only in street reserves	750 mm	900/750 mm

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v.) Cables in common trench with MV cables	800 mm	900/750 mm
vi.) MV Cables, across domestic public open spaces, Church, schools, etc. sites	1 200 mm	1 200/1050 mm
vii.) LV Cables across domestic, public open spaces, Church, school, etc. sites	900 mm	900/750 mm

Where the above conditions cannot be met, the Engineer may approve one of the following:

- i) Cement slabs over the cables or
- ii) Cable duct pipe encased in 300 mm square concrete.

Reference must be made to detailed specifications relative to road crossings and trenching.

1.11 MARKING OF CABLES

All cable joint and route markers shall be approximately 250 mm long and 160 x 140 mm at the base and 100 x 80 mm at the top.

Cast into the top of the cable marker shall be a 80 x 60 mm x 1,6 mm stainless steel insert on which the details of the cable shall be clearly stamped. Insert to be noticed to assist holding.

Letter sizes on route markers shall be approximately 10 mm minimum.

Joints shall be marked showing size of the cable, as well as the voltage, i.e.

- i) 150 LV Joint
- ii) 35mm² 22kV Joint

Route markers shall show the direction of the cable run, the size of the cable and the number of cores.

- i) 150 LV Cable
- ii) 35mm² 22kV Joint

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Cable route markers shall be placed at

- i) Approximately every 30 metres along a straight run and
- ii) Above every change of direction of the cable.

Where cables terminate at a substation or a kiosk, the cable shall be marked by means of 10 mm wide copper or stainless steel strap fixed approximately 500 mm above ground level showing the circuit designation with reference to the drawing. PVC or plastic markers will not be permitted.

1.12 MEASUREMENT OF CABLES

Quantities as shown on the Schedule of Quantities are approximate and the successful tenderer shall physically measure the route on site before ordering his cable.

All surplus cable at the end of the contract must be removed by the Contractor and the quantities for payment will be adjusted accordingly.

Cables shall be measured by the clerk of works by means of a measuring wheel once the trenches have been closed.

In addition to the cable lengths measured in the trenches, THE FOLLOWING SLACK WILL BE ALLOWED:

- i) Slack in cable trenches **+0.5%**
- ii) 11/22 kV at mini-substations **+ 3 m**
- iii) 11/22 kV at brick substations (actual measurement)
- iv) 11/22 kV at overhead poles **+ 10 m**

1.13 THERMAL RESISTIVITY

Cable current carrying capacity is affected by the thermal resistivity of the substances encountered.

The following table of values shall be used:

(g) Thermal Res. °Cm/W

Water logged ground	0,50		
Concrete		0,90	
Gravel			1,00
Sandy soil	1,20		
Clay		1,60	
Chalky soil	1,80		

Impurities such as slag, ash and intense vegetation in the cable trench cause an increase of “g” and must be avoided, particularly close to the cable.

1.14 POSITIONS OF CABLES

The centre line of the trench for a single cable shall be 1 000 mm from the official property boundary line pegs (fences may not be correct) unless written instructions to the contrary, are issued.

Where two or more cables are placed in a single trench and the cable are spaced at 150 mm

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centers, then the trench centre line shall be 1 000 mm from the official property boundary line pegs.

1.15 TESTING ON COMPLETION

Tests on completion shall be carried out on site in the presence of the Engineer, and the test results properly recorded and submitted in triplicate.

On each completed section of laid and jointed cable, the insulated resistance shall be tested on approval, with an approved “Megger” type instrument of not less than 5 000 Volts for MV and 1 000 Volts for LV. LV Low voltage has reference to 1 000 Volts and less while MV medium voltage has reference to more than 1 000 Volts.

On each completed section of laid and jointed MV cable a high voltage test shall be carried out. The test shall be performed in the same manner as that described in clause 8.3 of SABS 97 : 1959 (as amended) but alternating or direct current may be used at the following voltage values:

Cable Voltage Rating (volts)	Test Voltage (volts)			
	Between conductors		Conductors to Sheath	
	AC (rms)	DC	AC (rms)	DC
11 000	20 000	30 000	11 500	17 500

All MV and LV switchboards shall be “Megger” tested to approval after erection and installation on site, using the applicable test voltages.

1.16 INSTALLED ROUTE PLAN AND CABLE SCHEDULES

The Contractor is responsible to submit a final cable route plan (as installed) to the satisfaction of the Engineer.

Failure to comply with this requirement will result in the delay of the issuing of the acceptance certificate. No completion certificate will be issued if these requirements are not met.

The following shall be indicated on this route plan in a satisfactory manner for all installed cables:

- a) The route length for each cable as well as distances between joints.
- b) Cable route with references to fixed points.
- c) Cable joints with references to fixed points.
- d) The cable drum number for each length.
- e) Positions of cable route markers with reference to fixed points. The route markers shall be numbered and a separate drawing showing the face plates of all route markers (numbered), with North reference shall be submitted.

A site plan shall be provided to the Contractor for this work, who shall submit a plastic film and our (4) paper prints of the route plan.

Any uncertainty in this respect shall be cleared before submission of the Tender.

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PG SUPPLY, INSTALLATION AND TESTING OF GEOSYNTHETIC MEMBRANES

PG1 INTRODUCTION AND SCOPE

This specification details the technical requirements of High Density Polyetherelene (HDPE) may be used in the pollution control for the sewerage treatment works Nossob Rest Camp, Kgalagadi Transfrontier Park. It also addresses the Construction Quality Assurance (CQA) monitoring during the installation of the geomembranes.

The material supplied shall be in accordance with SANS 1526:2003. The installation procedures shall be strictly in accordance with the requirements of this specification which reflects industry accepted installation procedures and current quality control test protocols.

PG2 DEFINITIONS

PG2.1 Definitions relating to Construction Quality Assurance

PG2.1.1 Construction Quality Assurance and Construction Quality Control

This CQA Plan is devoted to Construction Quality Assurance. In the context of this document, Construction Quality Assurance and Construction Quality Control are defined as follows (in ISO 9000):

Construction Quality Assurance (CQA): A planned and systematic pattern of all means and actions designed to provide adequate confidence that items or services meet contractual and regulatory requirements and that the facility will be constructed on compliance with the specifications.

Construction Quality Control (CQC): Those actions which provide a means to measure and regulate the characteristics of an item or service to contractual and regulatory requirements.

See PG3 for the description of the parties to the CQA Plan.

PG2.1.2 Use of the Terms in this Plan

In the context of this document:

CQA refers to means and actions employed by the Engineer to assure conformity (to this CQA Plan, the Specifications and the Drawings) of the geomembrane, manufacturing, installation, testing procedures and results, and to assure at least a state-of-practice quality workmanship, CQA is provided by a party independent from the manufacturer, installer, and owner.

CQC refers to those actions taken by manufacturers, fabricators, installers and contractors to ensure that the materials provided to them, the materials they produce, and their own workmanship, meet the requirements of their own specifications, their quality control programme, the specifications and drawings. In the case of the geomembranes, CQC is provided by the manufacturer and installer of the geomembrane.

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PG2.2 Definitions relating to Geosynthetic Membranes

For the purpose of this specification the definitions and abbreviations given in SANS 1200 A and the following definitions shall apply:

Geosynthetic Membrane (GSM): A geosynthetic barrier to prevent migration of liquids which includes Geomembranes and GCL's.

Geomembrane: A planar, relatively impermeable, polymeric (synthetic or natural) sheet used in contact with soil/rock and/or any other geotechnical material in civil engineering applications.

Geotextile: A planer, permeable, polymeric (synthetic or natural) textile material, which may be nonwoven, knitted or woven, used in contact with soil/rock and/or any other geotechnical material in civil engineering applications.

PG3 PARTIES TO CONSTRUCTION QUALITY ASSURANCE

PG3.1 Description of the Parties

PG3.1.1 Employer

As defined in the Conditions of Contract in the Project Document.

PG3.1.2 Operator

For the purpose of this contract, the Operator is the same as the Owner and the Employer.

PG3.1.3 Engineer

As define in Condition of Contract in the Project Document. The Engineer will also be responsible for issuing a final CQA report, assisted by the Construction Quality Assurance Officer (CQAO).

PG3.1.4 Contractor

As defined in Conditions of Sub-Contract contained in the Project Document.

PG3.1.5 Resin Supplier

The Resin Supplier produces the raw resin for the Geomembrane Manufacturer.

PG3.1.6 Geosynthetic Membrane (GSM) Manufacturer

The GSM Manufacturer, or Manufacturer, is responsible for the production of the GSM and some prefabricated appurtenant components as necessary.

PG3.1.7 Transporter

The Transporter transports the GSM rolls form the Manufacturer to the site.

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PG3.1.8 Land Surveyor

The Land Surveyor performs site surveys to produce the data on which the record drawings are based.

PG3.1.9 Geosynthetic Membrane (GSM) Installer

The GSM installer shall mean the Nominated Sub-contractor appointed for the Supply and installation in term of this Contract.

PG3.1.10 Construction Quality Assurance Officer (CQAO)

The CQA Officer is a party, independent from the Employer, Operator, manufacturer, Geomembrane Installer and Contractor, that is responsible for observing and documenting activities, and providing advice related to the CQA of the production, installation, testing, repair, and covering of the geosynthetic lining system. The CQAO will report to the Engineer.

PG3.1.11 Construction Quality Assurance Laboratory

The CQA laboratory is a party, independent from the Owner, Operator, Manufacturer, Installer, and Contractor, that is responsible for conducting tests on samples of GSM.

PG3.2 Qualification of the parties

All parties must be qualified to perform their responsibilities and have extensive experience of geosynthetic materials and the application thereof. Specific qualifications will be defined in the Specifications.

PG3.2.1 Geosynthetic Membrane Manufacturer

Details of the manufacturer shall be provided by the GSM Installer as part of his Tender.

The manufacturer shall be able to provide sufficient production and qualified personnel to meet the demands of the project.

The Manufacturer shall be approved by the engineer and the Owner. For this purpose the following information regarding the Manufacturer, as a minimum, must be submitted with the tender.

Corporate background and information

Manufacturing capabilities:

- information on plant size, equipment, number of shifts per day, and capacity per shift
- quality control manual for manufacturing, and
- list of material properties, including certified test results together with geomembrane and seam samples.

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A list of at least 10 completed projects totalling a minimum area of 1,000,000m² for which the manufacturer has manufactured geomembrane materials form the same type of resin as that proposed to be used for this Contract. For each facility, the following information will be provided.

- purpose of installation, its location, and start/finish dates
- name of facility owner, project manager, and engineer, and
- type, thickness, and surface area of the installed GSM

PG3.2.2 Geosynthetic Membrane (GSM) Installer

Details of the GSM Installer shall be provided as part of this tender.

The installer must be trained and qualified to install the GSM's specified in this contract. If separate installer is proposed to install the HDPE and FPP membranes, the details of both shall be provided with this Tender.

The following information regarding the GSM Installer must be submitted with the tender.

Corporate background and information

Installation capabilities:

- information of equipment and personnel;
- anticipated daily production;
- quality control manual for installation;
- samples of field seams and certified test results, and
- written confirmation that all design features, Specifications, and requirements of the CQA plan can be complied with.

A list of at least three completed facilities totalling a minimum area of 50 000m², for which the Installer has installed GSM's. For each installation, the following information must be provided.

- purpose of installation, its location, and start/finish dates;
- name of facility, owner, project manager, and engineer;
- type, thickness, and surface area of the installed GSM's, and
- type of seaming and other apparatus used during installation.

All personnel performing seaming or other operations must be qualified by experience. In the case of the HDPE Geomembrane, at least one seamer per crew must have experience of seaming a minimum of 50,000m of seams using the same method of seaming proposed for use

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on this project. The most experienced seamer, The Master Seamer, or his designate with equivalent experience, must be on site whenever seaming is being performed.

At least two weeks prior to the start of installation the Installer shall provide the Engineer with a list of proposed seaming personnel and the professional records. Any proposed seaming personnel deemed insufficiently experienced will not be accepted by the Engineer or will be requested to pass a seaming test.

The Installer shall designate one representative as his Site Supervisor who will represent the Installer at all site meetings and be responsible for acting as the installer's spokesman on site. The supervisor must be qualified by experience. The supervisor must have supervised the installation of a minimum of 300,00m² of geosynthetic membrane. He must also exhibit good management and communication skills. His appointment must be approved by the Engineer.

The Installer shall also designate one representative with responsibility for Quality Control and signing all QC documents

PG3.2.2 Transporter

Details of the Transporter shall be provided by the GSM Installer as part of his Tender.

PG3.2.4 Construction Quality Assurance Officer

The CQA Officer as well as any additional staff who may be involved, will be appointed by the Engineer.

PG3.2.5 Construction Quality Assurance Laboratory(ies)

The CQA Laboratories must have experience in testing geomembranes and seams, and shall be familiar with ASTM, NSF, GRI, FTMS, DIN and other applicable test standards. Copies of valid calibration for all test equipment will be required. The laboratory shall be accredited by the Geosynthetics Accreditation Institute – Laboratory Accreditation Program (GAILAP) for all those tests included in the Specifications and this CQA Plan. The CQA Laboratories shall be approved by the Engineer.

PG3.3 Engineers Personnel

The personnel of the Engineer includes:

The CQA officer, who operates from the office of the Engineer

The Engineer's representative; and

Any other staff or assistants who may be used on the site

PG3.3.1 CQA Officer

A detailed schedule of the duties of the CQA Officer will be provided at the time of construction. For the purposes of this Document, the general duties are set out below.

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The CQA Officer shall review all other site-specific documentation, proposed panel layouts, GSM Installer’s construction programme and methods, and Geomembrane Installer’s internal CQA Plan and he shall attend the Site Meetings where necessary.

The Installer must sign the Compliance Agreement and he shall administer the CQA programme, i.e. assign and manage all CQA personnel, review all field reports, and provide engineering review of all CQA-related issues. He may undertake some, or all, of these duties himself.

He shall provide quality control of the CQA personnel, including making site visits, review the record drawings and prepare the final report and he shall report to the Engineer’s Representative and discuss all GSM-related matters.

PG3.4 Submissions by Nominated Sub-contractor/Installer

- Unit Prices** - The square area and associated pricing shall be based on “measured in place” quantities.
- Measured in place** - Measured in place quantities shall be determined from the project drawings. Final quantities will be payable based on the as-built drawings.
- Delivered to Site** - Delivered quantities shall be determined from the manufacturer’s shipping documents and reflect the total square area delivered to the project site and measured in the place.

PG3.5 Information required with tender

The following shall be submitted with the tender:

Statement of experience from the proposed GSM manufacturer/supplier.

Statement of experience from the proposed GSM Installer.

PG4 COMMUNICATIONS

All formal communications between the Engineer or his Representative, and the GSM Installer must be in writing. The CQA Officer may initiate such communications but they will eventually require the Engineers signature.

Speed and permanent records will be the essence of all communications.

PG5 SCOPE OF CONSTRUCTION QUALITY ASSURANCE

The scope of this CQA Plan including the CQA applicable to the manufacturing, transportation handling, installation and testing of the GSM’s.

PG6 UNITS

In this CQA Plan, all properties and dimensions are expressed in SI units. If the manufacturer, fabricator, or installer presents information or data in US units, the SI units in this plan shall be deemed to govern. It must be noted that the conversion is typically only accurate within the percent (10%).

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PG7 REFERENCES

The CQA Plan includes references to test procedures of:

The American Society for Testing and Materials (ASTM);

The Federal Test Method Standards (FTMS);

Geosynthetic Research Institute Test Methods and standards;

DIN standards; and

All other specifications contained, or referred to, in this Document.

PG8 PROJECT CONTROL

PG8.1 Meetings

In order to ensure good co-ordination and communications, formal site meetings shall be held. In addition to this, regular meetings shall be held in order to address day-to-day matters.

PG9 GEOSYNTHETIC MEMBRANE MANUFACTURING, TRANSPORTATION AND STORAGE

PG9.1 GSM PLANT AUDIT

PG9.1.1 Scope

The Engineer may perform an audit of the manufacturing and quality control procedures used by the Manufacturer, specifically for the production of the HDPE and FPP geomembranes to be used for installation at the Employers facility. The manufacturer shall give the Engineer at least 48 hours notice of the start of production of geosynthetic membrane for this project. The Employer has the right to refuse acceptance of any geosynthetic membrane manufacturer within this 48-hour period. QC Test shall be performed as the geosynthetic membrane is manufactured.

PG9.1.2 Quality Control

The manufacturer shall make available to the Employer and Engineer, manufacturing quality Control manuals, which outline all quality procedures, to be implemented for the manufacture of the geosynthetic membranes.

The manufacturer shall provide calibration certificates for laboratory testing equipment. The Engineer shall verify that, during select runs of material, all MQC procedures are performed.

PG9.1.3 Manufacturing Process

In general, the Manufacturer shall provide access for the Engineer to all equipment used to manufacture the geosynthetic membrane. This does not include divulging trade secrets, formulations, and procedures, which are not commonly known as basic manufacturing processes, used for HDPE and FPP geosynthetic membranes. However, if the process is critical to the integrity of the manufactured geosynthetic membrane, the equipment shall be made accessible to the Engineer.

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The Engineer shall monitor production and testing of GSM material allocated for this project. If material for this project has already been manufactured, the Engineer shall monitor production of the same type of GSM on the same production line to verify that manufacturing controls are in place. In the case of HDPE, the Manufacturer shall provide raw resin QC certificates, resin QA test results, and manufactured GSM QC Certificates to the Engineer prior to the loading and shipping of GSM to the site. Additional tests by one independent laboratory are also required before the material will be approved. The Engineer shall immediately review the QC certificates and notify the Manufacturer in writing which geomembrane rolls are approved for shipping. The Engineer shall be allowed the loading of the geomembrane for shipping.

The contractor shall obtain approval from the Engineer before the GSM material is loaded for shipping.

PG9.2 Manufacturing of the geomembranes

The liner shall be 1.5mm thick, manufacturer from HDPE resin and the floating cover shall be 1.5mm thick manufactured from FPP resin. Manufacturing quality assurance (MQA) testing for the HDPE liner shall be done in accordance with GRI Test Method GM13 and for the FPP floating cover to GRI Test Method GM18. Only one type of resin (one manufacturer, one resin classification) shall be used to manufacture geomembrane for this contract. (See "Raw Material" below). It shall be a smooth membrane.

PG9.2.1 Raw Material

PG9.2.1.1 HDPE Liner

The raw material shall be first quality hexane, polyethylene resin containing no more than 5% clean post-industrial (edge trim) recycled polymer by mass and meeting the following specifications:

Specific Gravity (ASTM D792 Method A or ASTM D1505): 0.938 – 0.950 (with carbon black);

Melt index (ASTM D1238 (19012.16): 0.05 – 1.0; and

Constant Load ESCR (ASTM D5397): > 300 h GRI.GM5(b) > 400h

Quality Control Certificates issued by the Resin Manufacturer, shall be presented by the Geomembrane Installer to the Engineer, to show that these specifications have been met and to identify the type of resin.

Internal Quality Assurance testing will be carried out by the Geomembrane Manufacturer to demonstrate that the incoming resin meets this specification.

If the results of the Manufacturer's Quality Control (QC) laboratory and the CQA laboratory testing differ, the testing will be repeated by the CQA Laboratory, and the Manufacturer will be allowed to monitor this testing. The results of this latter series of tests will prevail, provided that the applicable test methods have been followed.

Prior to the installation of any geomembrane material, the Geomembrane Installer must provide the Engineer with the following information:

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The origin (Resin Supplier's name), identification (type, lot number), and production date of the resin.

A copy of the quality control certificates issued by the Resin Supplier,

Reports on the tests conducted by the manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project. At a minimum, these tests must include specific gravity (ASTM D729 Method A or ASTM D1505), and Melt Index (ASTM D1238 (190/2.16)); and

A statement that no-post-consumer recycled has been added to the resin. However, the use of clean post-industrial polymer recycled during the manufacturing process may be permitted if done with appropriate cleanliness and if recycled polymer does not exceed 5% by mass).

PG9.2.2 Submissions

Prior to the installation of any geomembrane, the Manufacturer shall provide the Engineer with the following:

A certificate of compliance with the GRI Test Methods specified and a certified properties sheet including, at a minimum, all additional specified properties (refer to 9.2.4.3).

A list of quantities and descriptions of materials other than the base polymer, which comprises the geomembrane, and

The internal MQC sampling procedures, frequencies of testing, and results of testing of material supplied to the project.

The Contractor shall verify and the Engineer will approve that:

The property values certified by the manufacturer meet all of the Manufacturer's specifications; and

The measurements of Properties by the manufacturer are properly documented, the test methods used are acceptable, and the geomembrane meets the Project Specifications.

PG9.2.3 Packaging and Identification

Prior to shipment, the manufacturer/subcontractor shall provide the Engineer with Quality Control certificates, covering each roll of geosynthetic membrane provided. The Quality Control certificate will be signed by a responsible party employed by the Manufacturer, preferably the QC Laboratory Manager. The Quality Control certificates will include:

Resin Manufacturer, resin type, resin lot number, and geosynthetic membrane roll numbers; and

Results of Quality Control tests. At a minimum, results must be given for the thickness specific gravity/density, uniaxial tensile strength and elongation (at yield and break), single point stress rupture time, and carbon black content and dispersion, evaluated in accordance with the methods indicated in the specification or equivalent methods previously approved by the project manager and Engineer. No material will be installed until complete QC test data have been provided.

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The Engineer will:

Verify that the Quality Control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls and resin related to it; and

Review the Quality Control certificates and verify that the certified roll properties meet the Manufacturer's and Project Specifications.

PG9.2.4 Conforming testing

Conformance testing is not an opportunity to reproduce the QC testing programme, but is simply a spot-check to provide confidence that satisfactory material is delivered to site.

PG9.2.4.1 In-Plant Testing

The purpose of in-plant Material Conformance Test Sampling is to verify that geosynthetic membrane material which is designated for the Employer's project is confirmed as meeting the Project specifications prior to shipment to the site. As mentioned in PG9.2.1 the Manufacturer must also submit samples for testing to an independent QC testing. In this way barring a transportation accident, the geosynthetic membrane can be installed immediately when it arrives on site.

The manufacturer shall make available all necessary personnel and equipment to assist the Engineer in retrieving conformance samples of the geosynthetic membrane material.

As mentioned above and in PG9.2.1 the Engineer shall, through the Manufacturer send to the independent CQA Laboratory conformance samples for testing. The frequency of sampling shall be at the discretion of the Engineer but shall typically be as stated in table PG9.2.4.3. Material shall be shipped to the site after conformance test results are obtained.

The Engineer will report any non-conformance of sampling procedures to the Project Manager.

PG9.2.4.2 On-site material testing

If in Plant conformance testing is not performed, upon delivery of the rolls of geosynthetic membrane to the site, the contractor shall remove at the frequency specified in the Project Specifications (or at the rate shown in Table PG9.2.4.3, if not specified) and forwarded to the CQA Laboratory for testing to ensure conformance to both the Project specifications and the Manufacturer's list of guaranteed properties.

PG9.2.4.3 Properties of the HDPE Geomembrane

The HDPE geomembrane shall comply with GRI Test Method GM13 and the following specifications:

Table PG9.2.4.3 HDPE Geomembrane Specifications and Conformance Testing Frequency

PARAMETER	UNIT	METHOD	VALUE	CQA TEST FREQUENCY
Average thickness	mm	ASTM D 5994	> 1.5mm	Each roll
Minimum thickness	mm	ASTM D 5999	> 1.5mm	Each roll

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PARAMETER	UNIT	METHOD	VALUE	CQA TEST FREQUENCY
Density	g/cm ³	ASTM D 1505 ASTM D 792	>0.940	1 in 10, 000m ²
Melt Index	G/10min	ASTM D1238 (190/02. 16)	0.05 – 1.0	1 in 25.000 m ²

PG9.2.4 Properties of the FPP Geomembrane:

The FPP geomembrane shall comply with GRI Test method GM18 as specified in SANS1526:2003.

PG9.2.5 Conformance Test

At a minimum, tests to determine the following parameters must be performed on HDPE geomembranes:

Density. Specific gravity;

Melt index;

Carbon black content and dispersion;

Minimum thickness

Uniaxial tensile break strength and elongation; and

Single point notched stress rupture break time

PG9.2.6 Test Procedures

The following test procedures must be complied with:

Density: ASTM D 792-66 D792-66 Method A or ASTM D1505;

Melt index: ASTM D1238 (190/2.16);

Carbon black content: ASTM D2663 (B) or ASTM D5596;

Minimum thickness: ASTM D5994 for smooth and structured geomembrane; optical method of texture geomembranes

Uniaxial tensile properties: ASTM D638 (IV) with no requiring for sample conditioning time; and

Notched constant tensile load break time: GRI.GM5 (b)

Where optional procedures are noted on the test method, the requirements of the Project Specification shall prevail.

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PG9.2.7 Sampling Procedures

Samples must be taken across the entire width of the roll and shall not include the outer wrap of the roll. Unless otherwise specified, samples shall be 500mm long by the roll width. Specimens for testing must be taken across the full width of the sample.

If more than one resin type is used, each resin type shall be sampled and tested at the same frequencies as above.

If roll numbers are very different and non-sequential, consideration shall be given to testing each block of roll numbers at the same frequency.

PG9.2.8 Test Results

The contractor shall examine all results from laboratory conformance testing and provide the test to the engineer for approval.

PG9.2.9 Procedures in the Case of Conformance Test Failure

The following procedure shall apply whenever a sample fails a conformance test that is conducted by the CQA laboratory:

The manufacturer shall replace the roll of geomembrane that is in non-conformance with the specifications with a roll that meets specifications.

The CQA Officer will remove conformance samples for testing by the CQA Laboratory from the next higher and lower numbered rolls. These two samples must both conform to specifications. If either of these samples fail, testing shall continue until the defective rolls are isolated.

These rolls shall be replaced by the Manufacturer, at no expense to the Employer. This additional conformance testing will be at the expense of the Manufacturer.

The Engineer will document actions taken in conjunction with conformance test failures.

PG9.3 Handling and Storage and Quality Assurance

PG9.3.1 Transportation and Handling

This shall include all phases of transportation of the geomembrane, from the place of manufacture, until eventually delivery on site, and is the responsibility of the Manufacturer, GSM Installer, or other party as agreed upon. All handling on-site is the responsibility of the GSM Installer. Note that all rolls shall be moved using slings or specialized lifting equipment using a single time, inserted into the centre of the open end of the roll. The use of fork-lifts will not be permitted.

The Contractor shall ensure that:

Handling equipment used on the site is adequate and does not pose any risk of damage to the geomembrane and particularly to the edges of the geomembrane;

The GSM Installer's personnel handle the geomembrane with care.

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Upon delivery at the site, the GSM Installer and the Engineer shall conduct a visual examination of all the rolls for defects and signs of damage. This examination will be conducted without unrolling rolls unless defects or damage are found or suspected. The Engineer will record and indicate to the GSM Installer Manager:

Any rolls, or portions thereof, which should be rejected and removed from the site because they have unacceptable flaws; and

Any rolls, which contain minor repairable flaws.

PG9.3.2 Storage

The GSM will be responsible for the storage of the geomembrane on-site. The Contractor shall provide storage space in a location (or several locations) such that on-site transportation and handling are minimized. Geomembrane rolls shall be stored on a smooth, dry, level surface in an area where the geomembrane, particularly the roll edge, is protected from damage and degrading processes. Rolls, particularly textured rolls, shall not be allowed to become dirty.

The contractor shall store the geomembrane to prevent damage by dirt, impact, and other sources of damage.

Geomembrane shall not to be stored more than five rolls high. Access must be provided to each end of stored rolls for the examination of identification labels.

PG10 GEOMEMBRANE INSTALLATION

PG10.1 Installation Details

Prior to installation, the GSM Installer must provide the Engineer with detail drawing of the field panel layout, anchor trench, access manholes, fixing and vent systems etc. required to complete the installation.

PG10.2 Earthworks

PG10.2.1 Surface Preparation

The Principal Contractor will be responsible for preparing the supporting soil according to the specifications.

- A Land Surveyor has established all lines and grades;
- The supporting soil meets the necessary specification;
- The surface to be lined has been finished so as to be free of irregularities, protrusions, loose soil, desiccation cracks and abrupt changes in grade;
- The surface of supporting soil does not contain stones or other objects which may be damaging to the geomembrane; and
- There are no areas excessively softened by high water content.

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The GSM Installer must certify in writing that the surface, on which the geomembrane will be installed within the next 24h, is acceptable. The certificate of acceptance must be given by the GSM Installer to the Engineer prior to commencement of geomembrane installation in the area under consideration. The Engineer will also acknowledge approval of the subgrade.

After the supporting soil has been accepted by the GSM Installer. It will be the GSM Installer's responsibility to indicate to the Construction Quality Assurance Officer (CQAO) any change in the supporting soil condition that may require repair work.

PG10.2.2 Anchorage System

Anchor trenches must be excavated by the Contractor (unless otherwise specified) to the lines and widths show on the GSM Installers design drawings, prior to geomembrane placement. The Engineer must verify that anchor trenches have been constructed according to the design drawings.

The edge of the trench, over which the geomembrane enters the trench, must be rounded to avoid sharp bends in the geomembrane.

Water shall not be allowed to stand, or soften the soil, in the anchor trench. The dewatering of the anchor trench shall be the responsibility of the Contractor.

Backfilling if anchor trenches must be conducted in accordance with the drawings.

PG10.3 Geomembrane Placement

PG10.3.1 Fields Panel Identification

A field panel is a single piece of geomembrane (other than a patch or cap strip) which is seamed in the field i.e. a roll or a portion of roll cut in the field.

Each field panel shall to be given an "identification code" (number or letter-number) consistent with the layout plan. This identification code shall be agreed upon by the GSM Installer and Engineer. It shall refer to detail of panel location, geomembrane roll, date of installation and seamer's initials. This field panel identification code must be simple and logical. It will be the responsibility of the GSM Installer to ensure that each field panel is also marked with the original roll number. The identification code and roll number will be marked at a location agreed upon by the GSM Installer and the Engineer.

The CQA Site Superintendent shall establish a table or chart showing correspondence between roll numbers and field panel identification codes. The field panel identification code shall be used for all CQA records.

PG10.3.2 Field Panel Placement

No geosynthetic materials shall be deployed, joined, or tested unless a representative of the Engineer is present to monitor such activities.

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PG10.3.3 Location

The contractor shall provide for approval by the Engineer information regarding field panels and seam orientations are approximately as indicated in the GSM Installer's approved layout plan, or as modified.

PG10.3.4 Intimate Subgrade Contract

Only that area of geomembrane may be deployed in one day that can be covered by other required geosynthetic materials and the required thickness of cover soil or sand. The cover soil or sand must initially be placed as ballast around the periphery of that section of geomembrane.

The contractor shall also provide information of the spreading of cover soil at the start of the first shift of the next day to confirm that the geomembrane is essentially in complete contact with the subgrade at the end of the working day, and is restrained in this position, without excessive tension, by the peripheral soil.

The contractor shall also provide information of the spreading of cover soil at the start of the first shift of the next day to confirm that the geomembrane are covered by soil. The geomembrane must be in intimate contact with the subgrade.

At all times the exposed edges of geosynthetic materials must be kept clean and protected from damage.

PG10.3.5 Installation Schedule

Field panels must be placed on at a time, and each field panel must be seamed immediately after its placement (in order to minimize the number of unseamed field panels exposed to wind).

It is beneficial to "shingle" overlaps in the downslopes direction to facilitate drainage in the event of precipitation. It is also beneficial to proceed downslopes and in the direction of prevailing winds. Scheduling decisions must be made during installation, in accordance with varying environmental conditions. In any event, the GSM Installer will be fully responsible for the decisions made regarding placement procedures.

The Engineer must evaluate every change in the schedule proposed by the GSM Installer. The Engineer must verify that the condition of the supporting soil is still satisfactory for installation of geomembrane.

The Engineer must record the identification code, roll number location weather conditions, and date of installation of each field panel

PG10.3.6 Weather Conditions

Geomembrane placement may not be proceeding at geomembrane temperature below 0°C. Geomembrane seaming may not proceed at gemembrane temperatures below 0°C or above 75°C unless approved by the Engineer, Approval will not be unreasonably withheld provided the GSM Installer can demonstrate the ability to produce satisfactory seams. The frequency of trial seams or seam destructive test sampling, (PG-10.3) may be increased at extreme geomembrane temperatures (<5°C >75°C). Geomembrane shall not be placed during any precipitation, in an area of ponded water, or during excessive winds except as approved in an Action Decision Meeting.

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The Engineer must verify that the above conditions are observed. In addition the Engineer must verify that the supporting soil has not been damaged by weather conditions.

The CQA Officer must inform the Engineer if the above requirements are not observed.

PG10.3.7 Method of Placement

The Engineer must verify that:

- Equipment used does not damage the geomembrane as a result of handling, trafficking, excessive heat, leakage of hydrocarbons, or by other means;
- Any All-Terrain vehicles (ATV's) used to deploy geosynthetic membrane exert ground pressures less than 55 kPa (8 psi).
- ATV's are not operated: (1) at excessive speeds, (2) in tight turning circles, (3) under extreme braking and accelerating conditions, (4) with dirty tires, and (5) over wrinkles that might damage the geomembrane.
- The prepared surface underlying the geomembrane has not deteriorated since previous acceptance, and is still acceptable immediately prior to geomembrane placement.
- Any geosynthetic elements immediately underlying the geomembrane are clean and free debris;
- Personnel working on the geomembrane do not smoke, do not wear hard-soles shoes and do not engage in activities which could damage the geomembrane.
- Frequently used pathways up and down geomembrane on slopes shall be protected by a roll of geotextile.
- The methods used to unroll the panels do not cause excessive scratches or crimps in the geomembrane and do not damage the supporting soil;
- The method use to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels).
- Geomembrane is not allowed to unroll freely down a slope.
- Geomembrane is not placed under tension, unless approved by the Engineer;
- Adequate temporary loading and/or anchoring (e.g. sand bags, tyres), that does not damage the geomembrane, has been placed to prevent uplift by wind.
- Direct contact of equipment with the geomembrane shall not be allowed, except as previously described for ATV's used to deploy geosynthetic membrane. The geomembrane shall be protected by geotextiles, extra geomembrane, soil layers, or suitable materials, in areas where equipment may be used or traffic may be expected.
- Only hook-bladed utility knives are used to cut through the geomembrane;

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- Appropriate care is to be taken to prevent shock and explosions caused by static electricity discharge.
- Panels are not to be moved inform the Engineer if the above requirements are not observed.

PG10.3.8 Damage

The Engineer must visually examine each panel, after placement and prior to seaming, for damage and shall advise the GSM Installer which panels, or portions of panels, shall be rejected or repaired. Damaged panels or portions of damaged panels, which have been rejected shall be marked, and their removal from the work area recorded by the Engineer. Repairs shall be made according to procedure described in PG10.4.3.

At a minimum, the Contractor shall ensure that:

- Each panel is placed in such a manner that it has not been, or is unlikely to be, damaged, and
- Any tears, punctures, holes, thin spots, and damaging inclusions, gouges, and protuberances etc. are marked for repair, or the panel is rejected.

PG10.4 Field Seaming

PG10.4.1 Seam Layout

Prior to the commencement of installation activities the GSM Installer shall provide the Project manager and the Engineer with a proposed panel layout drawing. The Engineer shall review the panel layout drawing and verify that it is consistent with the accepted state-of practice and this CQA Plan. No panels may be seamed in the field without the Engineer’s approval. In addition, panels that significantly change the layout drawing, (e.g. that change the orientation of seams) shall not be installed without the Project Manager’s prior approval. It is, however, recognized that such a drawing is only a guide and will, in practice, require modification.

In general, seam shall be orientated parallel to line of maximum slope, i.e. orientated up and down, not across, the slope. In corners and other geometrically complex locations, the number of seams shall be minimized. No base seam or tee seam shall be less than 2m from the toe of slopes, or areas of potential stress concentrations, unless otherwise authorized by the Engineer.

A seam numbering system compatible with the panel numbering system must be agreed upon at Resolution or Pre-construction Meeting. Seams are usually identified by the panel numbers on each side e.g. 112.

PG10.4.2 Seaming Equipment and Products

Approved methods for field seaming are thermal fusion (hot wedge, hot air, or combination) seaming and extrusion seaming. However, the use of hot air and/or extrusion seaming equipment will only be permitted, for restricted work or repairs. Proposed alternate methods must be documented and submitted to the Engineer for approval. Only apparatus that has been specifically approved by make and model may be used. The GSM Installer shall use appropriate measuring equipment to ensure that required temperatures are being achieved.

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PG10.4.3 Fusion Seaming

Fusion seaming must be done with automated self-propelled machines. The fusion seaming machines will be equipped with gauges giving the applicable temperatures. Temperature, speed, and nip roll pressure settings must be verified by the GSM Installer prior to each seaming period. Nip roll and wedge geometry shall be such as to minimize residual stresses at the edge of the seam, i.e. to minimize reduction in stress cracking resistance of the geomembrane.

The Contractor shall log ambient and geomembrane temperatures, and seaming apparatus temperatures and speeds.

The Contractor shall also verify that:

- The GSM Installer maintains on-site the number of operable seaming machines decided at the Site handover Meeting;
- Equipment used for seaming does not damage the geomembrane;
- For tee seam intersections, any flap on the cross seam is cut back to the edge of the outermost peel-tested track of the seam prior to seaming.
- Electric generators and fuel containers are placed on a smooth protective layer such that no damage occurs to the geomembrane.
- A smooth insulating plate or fabric is placed beneath the hot-seaming apparatus after usage;
- The geomembrane is protected from damage in heavily-trafficked areas, and
- Build-up moisture between the sheets is prevented. To accomplish this, a movable protective layer may be used directly below each overlap of geomembrane that is to be seamed.

PG10.4.3 Extrusion Seaming

Extrusion-seaming apparatus must be equipped with gauges giving the relevant temperatures of the apparatus such as the temperatures of the extrudate, nozzle, and preheat air.

The GSM Installer must provide documentation (including QC certificates) regarding the welding rod or resin pellets to the Engineer, showing that the resin is the same HDPE resin as the geomembrane itself. Other seaming resins must be approved by the Engineer.

The Contractor shall log apparatus temperatures, exudate temperatures, ambient temperatures, and geomembrane temperatures at appropriate intervals.

The Contractor shall ensure that:

- The GSM Installer maintains on-site the number of operable seaming machines decided at the Site Handover Meeting
- Equipment used for seaming does not damage the geomembrane;

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- The extruder is purged prior to seaming until all heat-degraded exudate has been removed from the barrel;
- Feed resin is maintained clean and dry;
- The electric generator and fuel containers are placed on a smooth intermediate layer such that no damage occurs to the geomembrane;
- A smooth insulating plate or fabric is placed beneath the seaming apparatus after usage; and
- The geomembrane is protected from damage in heavily trafficked areas.

PG10.4.5 Seam Preparation

The Contractor shall ensure that:

Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, foreign material, and any mechanical damage.

If seam overlap grinding is required, the process is completed according to the Manufacturer's instructions but within 30 minutes of the seaming operation, and in a way that does not damage the geomembrane;

The abrading does not remove more than 10 percent of the thickness of the geomembrane, and the resulting abrasion marks are covered by the finished extrusion bead;

Any visible abrasion marks, after searching, are essentially perpendicular to the direction of the seam;

Seams/panels are aligned with a minimum of wrinkle and "fish mouths"

PG10.4.6 Weather Conditions for Seaming

The following protocols must be observed during seaming:

Unless authorized in writing by the Engineer, no seaming may be attempted at geomembrane temperatures below 0°C or above 80°C.

Below a geomembrane temperature of 5°C, the need for pre-heating and additional testing must be agreed with the Engineer.

In all cases, the geomembrane in the seaming area must be dry and protected from wind and airborne particulates.

Geomembrane temperatures must be measured with a surface temperature thermocouple or a calibrated infrared pyrometer.

If the GSM Installer wishes to use methods which may allow seaming at geomembrane temperatures below 0°C or above 75°C, the GSM Installer must demonstrate (by testing trial seams) that such methods produce seams which are entirely equivalent to seams produced at geomembrane temperatures above 0°C and below 75°C, and the overall quality of the seam and

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durability of the geomembrane are not adversely affected, in addition, the GSM Installer must prepare written certification stating that the seaming procedure does not cause any physical or mechanical modification to the geomembrane that will generate any short or long-term damage to the geomembrane liner.

The Contractor shall ensure that these requirements are observed.

PG10.4.7 Overlapping and Temporary Bonding

The Engineer shall verify that:

- The panels of geomembrane have an overlap of approximately 100mm, sufficient to allow peel tests to be performed on the track of the seam.
- There is a free flap at the edge of the top geomembrane, a minimum of approximately 10mm wide, to allow a peel test to be performed on the outer track of the seam.
- No solvent or adhesive is used.
- Any procedure used temporarily bond adjacent panels together does not damage the geomembranes. In particular, the temperature of hot air at the nozzle of any spot seaming apparatus must be controlled such that the geomembrane is not damaged. "Damage" includes a loss in durability, and
- Temporary bonds do not interfere with the ability to perform shear and peels tests on the actual production seam.

The Contractor shall log all relevant temperatures and conditions.

If protective layers of geomembrane are placed on the barrier layer geomembrane for any purpose (e.g. puncture protection in drainage trenches), they shall not be tack or spot-welded to the barrier layer. They shall be fully welded along the complete periphery of the protective layer or they shall not be welded at all.

PG10.4.8 Trial Seams

Trail seams shall be made by each machine/operator combination on strips of HDPE geomembrane to verify that seaming can be successfully performed. Such trial seam shall be made at the beginning of each seaming period (i.e. at the beginning and middle of each working shift), but at least once every four hours, for each seaming apparatus/operator combination used in the seaming period. In addition, a new trial seam shall be conducted when welding apparatus has been restarted after being switched off. A trial seam shall also be made in the event that the geomembrane temperature changes more than 25°C since the last passing trial seam. Trial seams shall be made under the same conditions as production seams will be made. When geomembrane temperatures are below 5° or higher than 75°C more frequent trial seams may be required. In general, trial seams will be conducted as follows:

The trail seam sample shall be at least 1.5m long by 0.3m wide with the seam centred lengthwise. Seam overlap shall be as indicated in PG10.3.5. The Contractor shall observe all trial seam procedures.

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Four specimens, each 25mm wide and minimum of 150mm long, must be cut from the middle of the trial seam sample by the GSM Installer. Two Specimens must be tested in shear and two pin peel using sample by the GSM Installer. They shall meet project specifications. If any specimen fails, the entire, the entire operation must be repeated. If the second trial seam fails, the seaming apparatus and seamer will not be approved for production seaming until the deficiencies are corrected and two consecutive successful trial seams are achieved.

The remainder of the successful trial seam sample shall be assigned a number and marked accordingly by the Engineer, and the contractor shall log the date, time, geomembrane temperature, number of seaming unit, settings, name of seamer, and pass or fail description. The remainder of the sample must be cut into two pieces, one each to be retained by the Employer, and the GSM Installer.

A trial seam shall also be prepared by each seaming machine/operator at the completion of seaming each day to determine whether changes in seam quality might have occurred during the last part of the seaming period.

PG10.4.9 General Seaming Procedure

Unless otherwise specified, the general seaming procedure used by the GSM Installer shall be as follows:

For fusion seaming, a movable protective layer of plastic may be placed directly below each overlap of geomembrane that is to be seamed. This is to help prevent any moisture build-up between the sheets to be seamed.

If required, a firm substrate may be provided by using a flat board, or similar hard surface placed directly under the seam overlap.

Fishmouths or wrinkles at the seam overlaps must be cut along the peak of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is adequate must then be patched with an oval or round patch of the same geomembrane material extending a minimum of 150mm beyond the cut in all directions. The end of the cut must be rounded.

If seaming operations are carried out at night, adequate illumination must be provided.

Seaming shall extend to the outside edge of panels placed in the anchor trench.

Each seam must be labelled with the seaming machine number, the operators initials machine temperature and speed settings, date, time and direction seamed.

The Contractor shall monitor the above seaming procedures, and will inform the Engineer of any unsatisfactory deviation from standard practice.

PG10.4.10 Joining of HDPL Pipes and Membranes

It is the responsibility of the subcontractor to join the pipes and the membrane with a watertight seal.

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PG10.4.11 Non Destructive Seam Continuity Testing

Concept

The GSM Installer shall non-destructively test all field seams over their full length using a vacuum test unit, air pressure test (for double fusion seams only), spark test, or other approved method. Vacuum testing, air pressure testing, and spark testing are described in these specifications. The purpose of non-destructive testing is to check the continuity of seams. It does not provide any information on seam strength. Continuity testing will be carried out as the seaming work progresses, not at the completion of all field seaming. Non-destructive testing will not be permitted unless there is, in the opinion of the Engineer, adequate illumination.

The contractor shall:

Observe all non-destructive testing;

Record location, date, test unit number, operator, and outcome of all testing; and Log and inform the GSM Installer and Project Manager of any required repairs.

The GSM Installer must complete any required repairs in accordance with PG10.4.3

The Contractor shall:

Observe the repair and re-testing of the repairs;

Mark on the geomembrane that the repair has been successfully made and tested; and Document the results

The GSM Installer shall write the details of each seam non-destructive test on the geomembrane. For air pressure tests this shall include the initials of the tester, the date, start time and pressure, end time and pressure, and pass or fail results. For vacuum testing this shall include the initials of the tester, the date, and the pass or fail results. When a test fails, the number of the appropriate repair shall also be recorded on the geomembrane.

The Contractor shall provide all information regarding the above to the Engineer on a daily basis.

Submittals

Prior to any non-destructive testing, the GSM shall submit to the Engineer calibration certificates for all pressure gauges to be used during vacuum and air pressure testing, or shall otherwise demonstrate that all gauges are in satisfactory working condition.

Vacuum Testing

The equipment shall comprise of the following:

A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole, valve assembly, and a vacuum gauge;

A vacuum tank and pump assembly equipped with a pressure controller and pipe connections.

A pressure/vacuum hose with fittings and connections;

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A soapy solution that does not cause environmental stress cracking in the geomembrane, and a soap solution applicator

The following procedure shall be followed:

For fusion seams, cut off the free flap with an approved cutter (so that the lower geomembrane is not damaged) prior to testing the seam;

Energize the vacuum pump and reduce the tank pressure to approximately 5kPa gauge;

With a soapy solution, wet a strip of geomembrane which is wider and longer than the Vacuum box;

Place the box over the wetted area;

Close the pressure relief valve and open the vacuum valve;

Ensure that a leak-tight seal is created;

Examine the geomembrane seam through the viewing window for the presence of soap bubbles (large bubbles, or fine froth) for a period of not less than 10 seconds;

If no bubbles or foam appear after 10 seconds, close the vacuum and open the pressure relief valve. Move the box over to the adjoining section of seam, with some overlap, and repeat the process;

All areas where soap bubbles appear must be marked and repaired in accordance with these specifications; and

Excess soap solution shall be cleared or rinsed off the geomembrane and seam.

Air Pressure Testing

The following procedures are applicable to those seaming processes which produce a double track seam with a central channel.

The equipment shall comprise of the following:

An air pump equipped with a pressure gauge capable of generating and sustaining a pressure between 160 and 280 KPa mounted on a cushion to protect the geomembrane.

A pressure hose with fittings and connections;

A sharp hollow needle, or other pressure-feed device attached to a pressure gage; and

Clamps or other devices to seal the ends of the seam to be tested.

The following procedures must be followed:

Seal both pressure-feed device into the channel of the seam;

Insert the pressure-feed device into the channel of the seam;

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Energize the air pump to a pressure between 165kPa and 275 kPa (depending in geomembrane thickness) as indicated in Table PG10.3.11(a), close the valve and allow the temperature of the air in the channel, and thus the pressure, to stabilize for about 2 minutes;

TABLE PG10.3.11(A): AIR CHANNEL TEST PRESSURES FOR HDPE GEOMEMBRANES

Geomembrane Thickness		Minimum Pressure		Maximum Pressure	
(mm)	(in)	(kPa)	(psi)	(kPa)	(psi)
1.0	0.040	165	24	240	35
1.5	0.060	185	27	275	40
>2.0	>0.080	205	30	275	40

Verify that the stabilized pressure is within the required range and note the pressure loss after 5 minutes. If loss of pressure exceeds the amount indicated in Table PG10.3.11(b), or if the pressure does not stabilize, locate the faulty area and repair it in accordance with PG10.4.3.

TABLE PG10.3.11(B): ALLOWABLE LOSS IN AIR CHANNEL TEST

Geomembrane Thickness		Maximum Pressure	Drop
(mm)	(in)	(kPa)	(psi)
1	0.040	28	4.0
1.5	0.060	21	3.0
>2.0	>0.080	14	2.0

Verify that the full length of the seam section has been tested by observing the air pressure gauge for a decrease in the pressure when the seal at the end of the channel away from the air pump is removed. If there is a blockage in the channel, the entire seam must be capped with cap seams being non-destructively tested, or the location of the blockage must be found and the untested part of the seam must be properly tested, and

Remove the needle or other approved pressure-feed device and seal the hole.

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Note that a decrease in the geomembrane temperature e.g. due to clouds) will also cause a reduction in air channel pressure.

Spark Testing

Spark testing is frequently used on short, detail (sump penetration) extrusion welds that cannot be tested by vacuum testing. Occasionally it is used on long extrusion seams as the primary non-destructive test method. The same general test method can also be applied to the geomembrane panels themselves when they are manufactured with an electrically conductive bottom surface layer.

For seams a copper wire or tape is placed within the geomembrane overlap, just to the inside of the centre of the extruded bead. The wire is exposed at one end of the seam or it is buried in the conductive subgrade.

Prior to testing, a trial calibration seam must be made to confirm the minimum voltage required to discharge across a hole in the seam between the search electrode and the copper wire. The test procedure is as follows:

Connect the negative (ground) electrode of the testing equipment to the end of the copper wire, or to a grounding rod of the copper wire is buried in the subgrade.

Connect the positive electrode to the wire brush or other type of search electrode.

Clean all debris and moisture from the same area.

Apply a potential of between 20kV and 55kV DC, as determined in the calibration test, between the electrodes. ASTM G62 provides guidance in calculating the required potential.

Sweep the wire brush electrode over the surface of the seam, maintaining contact with the extruded bead and the top of the lower geomembrane at the edge of the bead.

Monitor for audible and/or visible spark discharges that are indicative of a defect. Mark defects for repair.

Care must be taken when spark-testing almost completed landfill caps – a spark can cause a small landfill gas explosion.

Spark testing shall not be performed when the liner is wet.

Visual Examination

Air pressure, vacuum box, and spark testing methods apply only to seams. GSM Installer and

CQA personnel shall continuously visually examine the geomembrane panels for the presence of other penetrating and non-penetrating defects and shall continuously feel for protuberances when walking on the geomembrane.

Visual examination shall take advantage of low angles of sunlight and early morning condensation on the geomembrane.

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PG10.4.12 Destructive Testing

Concept

Destructive seam tests shall be performed at selected locations. The purpose of these tests is to evaluate seam bond strength and the effects of seaming on the adjacent geomembrane. Seam strength testing shall be done as the seaming work progresses, not at the completion of seaming.

Location and Frequency

The CQA Officer shall select locations where seam samples will be cut out for laboratory testing. Those locations must be established as follows:

A minimum frequency of one sample for every 150m of seam made by each extrusion machine/operator combination and each fusion machine each day – unless a different frequency is stated in the project specifications.

A nominal maximum frequency shall be agreed upon by the GSM Installer, Project manager, and CQA Manager at the Resolution or Pre-construction Meeting.

Test locations shall be determined during seaming at the CQA Site Superintendent's discretion. Selection of such locations may be prompted by suspicion of overheating contamination, offset seams, or any other appearances of imperfect seaming.

If trial seams are not made at the end of the day one sample shall be removed from the last seam made by each seaming machine at the end of each working shift (day).

The GSM Installer shall not be informed in advance of the locations where the seam samples will be taken.

Test frequencies may be increased or decreased at the CQA Site Superintendent's discretion depending on the consistency of the test results.

Sampling procedure

Samples shall be cut by the GSM Installer as the seaming progresses, in order to have laboratory test results before the geomembrane is covered by another material. The contractor shall:

Observe sample cutting;

Assign a number to each sample, and mark is accordingly;

Record the sample location on the layout drawing; and

Record the reason for taking the sample at this location (overheating, stop/start).

All holes in the geomembrane resulting from destructive sample removal must be immediately repaired in accordance with repair procedures described in PG10.4.3.

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The continuity of the new seams in the repaired area shall be tested in accordance with PG10.3.9

Size of samples

At a given sampling location, two types of samples shall be taken by the GSM Installer.

First, two pairs of specimens for field peel and shear testing shall be taken. Each of these specimens shall be 25mm wide by at least 150mm long, with the seam centred across the width. The distance between these two pairs of specimens shall be 1,1m. If both pairs of specimens pass the field tests described in PG10.3.11(e), a sample for laboratory testing must be taken.

The sample for laboratory testing shall be allocated between the two pairs of specimens taken for field-testing. Unless determined otherwise at the Pre-construction Meeting, or in the specifications, the destructive sample shall be 0.3m wide by 1m long with the seam centred lengthwise. The sample will be cut into three parts and distributed as follows:

One portion, measuring 0.3m x 0.3m, to the GSM Installer for QC laboratory testing;

One portion, measuring 0.3m x 0.3m, to the Employer for archive storage; and

One portion, measuring 0.3m x 0.5m, to the Engineer for CQA Laboratory testing

Field Testing

The four 25mm wide specimens mentioned in PG10.3.12(d) shall be tested in the field, by calibrated gauged tensiometer, one of each pair in peel and one in shear. If any field test specimen fails to pass the criteria of table PG10.3.11(a) and (b) and the project specifications, then the procedures outlined in PG10.3.12 (i) will be followed.

The Engineer shall witness all field tests and mark all samples and portions with their unique sample number. The contractor shall also log the date and time of sampling, and test pass or fail description.

If the two pairs of specimens meet the project specifications, the sample qualifies for testing in the laboratory, if they fail, the seam must be repaired in accordance with PG10.3.4

Construction Quality Assurance Laboratory Testing

Destructive test samples shall be packaged and shipped to the CQA laboratory by the Engineer, in a manner, which will not damage the test sample. The Engineer shall verify that packaging and shipping conditions are acceptable. The Engineer will arrange the storing of the archive samples. This procedure shall be fully outlined at the Resolution Meeting. Test samples shall be tested by the CQA laboratory.

Testing shall follow ASTM D4437 as modified in NSF 54 Appendix A, but with no requirement for sample conditioning time. The minimum acceptable values to be obtained in these tests are those indicated in the specifications or as shown in Table PG10.3.11(a) or (b). five specimens shall be tested in peel and five in shear. Specimens shall be selected alternatively by test from the samples (e.g. peel, shear, peel, shear etc.)

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The CQA Laboratory shall provide test results no more than 6 hours after they receive the samples. The CQA Site Superintendent shall review laboratory test results as soon as they become available, and make appropriate recommendations to the Engineer.

Geosynthetic membrane_Installer’s laboratory testing

The GSM Installer’s laboratory test results must be available to the Engineer for review.

Destructive_Sample Pass/Fail Criteria

The criteria shown in the table PG10.3.12, or the requirements of the project specifications (whichever are the more comprehensive) shall be met for the acceptance of peel and shear test specimens:

TABLE PG10.3.12: SEAM SPECIMEN TEST SPECIFICATIONS

PEEL TEST	CRITERIA
Peel Strength	>70% (fusion seam), >65% (extrusion seam) minimum specified geomembrane yield strength
Seam Separation	< 10% of originally bonded area
SHEAR TEST	CRITERIA
Shear Strength	> 95% minimum specified geomembrane yield strength
Elongation	> 100% of distance between edge of seam and nearer grip
Location of Failure	Outside the weld

The yield strength specified by the manufacturer is usually the population average value less 2 standard deviations.

The peel criteria apply to both tracks of double track seams. None out of ten specimens in a seam destructive sample must meet the criteria above for acceptance of the complete destructive sample.

The contractor shall ensure that the CQA Laboratory retains all sample and specimen remnants clearly labelled, for at least 30 days after the last specimen for the project has been tested.

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Procedures if Destructive_Sample Fails

The following procedures shall apply whenever a sample s\fails a destructive test, whether the test is conducted by the CQA Laboratory, the GSM Installers Laboratory, or on the field tensiometer. The GSM Installer has two options:

Reconstruct the seam between the nearest passing destructive test locations on each side of the failed samples; or

Trace the seaming path to an intermediate location (3 minimum from the failed test location in each direction) and take small sample for an additional field test at each location. If these additional samples pass tensiometer testing, then full destructive test samples shall be taken. If these laboratory destructive test samples pass the tests, then the seam shall be reconstructed between these locations by capping. If either sample fails, then the process is repeated to establish the zone in which the seam shall be reconstructed.

Is a fusion type seam fails destructive testing, and the GSM Installer chooses to repair the seam, the only acceptable repair method is as described in PSG10.3.4. applying topping (bead of exudate) is not an approved method of capping any seam, unless it can be shown that this procedure will not reduce the stress rupture resistance of the seam below 75% of that of the parent geomembrane.

Only seams bounded by two locations from which samples passing laboratory destructive test sample have been taken will be considered acceptable. An additional destructive test sample shall be taken from repair seams when a length of a reconstructed seam exceeds 50m. This sample must pass destructive testing or the procedure outlined in this section must be repeated.

The contractor shall record all actions taken in conjunction with destructive test failures.

PG10.5 Defects and Repairs

PG10.5.1 Identification

All seams and non-seam areas of the geomembrane must be examined by the GSM Installer and the Engineer for identification of defects, protruding and penetrating objects, lack of sub-grade support, overheating, over grinding, holes, blisters, un-dispersed raw materials, and any sign of contamination by foreign matter. To facilitate the examination the geomembrane surface must be kept clean by the GSM Installer (or as agreed at the Pre-construction Meeting).

PG10.5.2 Evaluation

Each suspect location, both in seam and non-seam areas, shall be non-destructively tested using appropriate methods, such as vacuum box testing. Additional methods, such as electrical methods and infrared thermography may also be used. Each location, which fails the non-destructive testing, will be marked by the Engineer and repaired by the Geomembrane Installer. Work shall not proceed with any materials, which will cover locations that have been repaired until passing destructive and non-destructive test results have been obtained on the repairs.

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PG10.5.3 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or non-destructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed between the Engineer and the GSM Installer.

The procedures available include.

Patching, used to repair all penetrating holes, tears, un-dispersed raw materials, contamination by foreign matter;

Spot beading, used to repair small surface scratches, or, other minor, localized non-penetrating flaws; and

Capping with a strip of geomembrane, used to repair long lengths of failed seams.

In addition, the following provisions shall be satisfied:

Surfaces of the geomembrane which has to be repaired must be abraded no more than 30 minutes prior to the repair;

All the surfaces must be clean, free of all particulate matter, and dry at the time of the repair;

All seaming equipment used in repairing procedures must be approved.

The repair procedures, materials, and techniques shall be approved in advance of the specific repair by the Project Manager and Engineer;

Patches and caps shall extend at least 150mm beyond the edge of the defect, and all corners of patches shall be rounded with a radius exceeding 75mm;

The geomembrane below large caps shall be appropriately cut to avoid fluid entrapment between the two sheets and resultant pressure increases (that stress the seam) as the liner is covered;

Sharp ends of slits and cuts in the geomembrane must be rounded before patches are placed over them; and

No more than one extrusion bead at any location shall be used to make a repair – multiple beading is not permitted and must be replaced with a patch.

PG10.5.4 Verification of Repairs

Each repair must be numbered and logged. Each repair shall be non-destructively tested using one of the methods described in these specifications or another approved method. Repairs, which pass the non-destructive test, shall be considered acceptable. Large caps may be sufficient extent to require destructive testing, at the discretion of the Engineer. Failed tests shall require a repair to be redone and retested, until passing test results. The Contractor shall observe all non-destructive testing of repairs and shall record the date of the repair and test result, and provide results to the Engineer.

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PG10.5.5 Large Wrinkles

When seaming of the geomembrane is completed 9or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the Engineer, shall observe the sizes and distribution of geomembrane wrinkles. The Engineer shall instruct the Contractor which wrinkles must be cut and re-seamed by the GSM Installer. The seam thus produced shall be tested like any other seam.

PG10.5.6 Bridging of Geomembrane

Bridging or trampolining of the geomembrane at any temperature higher than the design minimum service temperature of higher than the expected covering temperature at any location at any time will be considered unacceptable. Compensating materials shall be installed at these locations.

The geomembrane must be fully supported by the subgrade (except for wrinkles) under all ambient conditions, especially at the time of covering with soil or liquid. The minimum shall be installed at these locations.

PG 10.5.7 Geomembrane Anchoring

The geomembrane shall lie flat against the anchor trench front wall and floor. It shall not be folded. The geomembrane shall not be placed on loose soil in the anchor trench. The Engineer shall ensure that the periphery of the geomembrane is suitably anchored in an anchor trench, welded to an HDPE strip cast into concrete, fastened bay a batten strip, or otherwise clamped such that an access of liquid (contained liquids, rainwater) to the underside of the geomembrane is prevented.

PG11 DOCUMENTATION

PG 11.1 General

An effective CQA plan depends largely on recognition of all construction activities that must be monitored, and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The Engineer will ensure that all quality assurance requirements have been addressed and satisfied.

PG11.2 Daily Record Keeping

Standard reporting procedures shall include preparation of daily reports which, at a minimum, will consist of:

field notes, including memoranda of meetings and/or discussions with the Contractor and GSM installer;

observation logs, and testing data sheets, and

construction problem and solution data sheets. This information must be regularly submitted to, and reviewed by the Engineer.

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PG11.3 Observation Logs and testing Data Sheets

Observation logs and testing data sheets shall be prepared daily. At a minimum, these logs and data sheets shall include the following information:

An identifying log/sheet number for cross-referencing and document control;

Date, client name, project name, location and other identification;

Data on weather conditions

A site plan showing all active work areas and test locations;

Descriptions and locations of on-going construction

Equipment and personnel in each work area, including those of all geomembrane related subcontractors,

Descriptions and specific locations of area, or units, of work being tested and/or observed and documented

Locations where tests were done and samples were taken;

A summary of test results,

Calibrations of test equipment, and actions taken as a result of any non-conformance;

Off-site materials received, including quality verification documentation;

Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of non-conformance; and

Signatures of the CQA Officer and the CQA Monitors

These logs must show all non-complying test results (trial seams, field destructive tests, air pressure tests, etc).

Manufacturer/GSM Installer Compliance Agreement

Daily personnel attendance list

Material inventory

Conformance testing

Subgrade acceptance

Material deployment

Trial seaming

Production seaming

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Repairs

Non-destructive testing

Destructive testing

Laboratory test results

Problems and solutions

Soil cover placement

Daily report

These documents shall provide full traceability of men, seaming machines, machines settings, materials, weather, and test results, in the event of in-service operational problems.

The CQA Officer shall incorporate all of these logs in the CQA Final Report.

PG12 CQA FINAL REPORT

PG12.1 Submission of Report

The CQA Final Report, will be subtracted by the Engineer to Employer within 40 days of completion of installation of the lining system.

PG12.2 CQA Final Report Contents

At a minimum the CQA Final Report shall contain the following information:

An outline of the project

An description of the lining/system

Reference to the CQA Plan and other documents used.

Geomembrane and other geosynthetic materials specifications

A summary of on-site CQA activities and quantities (samples, failing results)

A photographic record of construction

Manufacture/GSM Installer Compliance Agreement

Resin QC Certificates

Geomembrane QC certificates

Subgrade acceptance certificates

Copies of all logs

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All test results

Discussion of problems and solutions

Record drawings

Certification statement

PG12.3 Record Drawings

The record drawings must show:

The locations of all geomembranes seams and the types of seams

Geomembrane panel and roll numbers and geomembrane type

The locations of all geomembrane repairs and the types of repairs

Toes of slopes

Crests of slopes

Locations and anchor trenches

Locations and numbers of geomembrane destructive test sample sites

Construction details that differ from as-designed details

PG13 GEOMEMBRANE GUARANTEE

The contractor shall provide a written guarantee, underwritten by an approved insurance company whereby the geosynthetic membranes are guarantee for a period not less than 10 years against failure due to defective materials and workmanship. This guarantee shall bear all costs related to remedial measures, including replacement of the membrane.

PG14 MEASUREMENT AND PAYMENT

PG14.1 Supply of geosynthetic membranes

Minimum 1.5mm thick HDPE liner Unit: m²

Minimum 1.5mm thick FPP floating cover Unit: m²

The unit of measurement shall be the square meter geosynthetic materials delivered on site. The quantity measured for payment will be the nett area placed as measured in PG15.2.

The tendered rate for the supply of the Geomembrane shall include full compensation for all materials, plant labour and other incidentals required to manufacture, purchase, transport, deliver, store the material on and off site, test or comply with all Quality Assurance and Control requirements, in full accordance with the relevant specifications, irrespective of the source or point of manufacture. Waste allowance, overlap etc. shall be deemed to be included in the tendered rate.

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The costs of Freight, Duty, Landing charges and Rates of exchange shall be included in the Tendered Rate as well as an allowance for waste and overlap.

PG14.2 Installation of Geosynthetic Membranes

(a) Minimum 1.0mm thick HDPE liner.....Unit: m²

(b) Minimum 2.0mm thick HDPE liner.....Unit: m²

The unit of measurement shall be the square meter geosynthetic membranes installed.

The tendered rate for the supply of the Geomembrane shall include full compensation for all materials, plant labour and other incidentals required to install the Geosynthetic Membrane. No additional payment will be made for any transport, handling, cutting, waste, placing, joining, overlapping, temporary anchoring/securing, testing or compliance with all Quality Assurance and Control requirements, and Construction Quality Assurance Plans.

PG14.3 Supply and installation of fixing systems (excluding anchor trench)

manholes in floating cover for access to inlet, outlet, repair and inflation,

flotation devices, vents etc.....Unit: Sum

The rate shall cover all costs related to supply and installation of fixing, flotation and inspection systems required for proper maintenance and function of the reservoirs. A4 size layout drawings showing positions of manholes, vents, folds and rainwater pump systems must be submitted with the tender.

PG14.4 Supply of material and construction of reinforced concrete anchor trench

.....Unit: m

The tendered rate shall include the supply and fixing of reinforcing, casting of minimum Grade 25Mpa/19m concrete and manufacturing and testing of 12 concrete test cubes.

PG14.5 Geomembrane Guarantee.....Unit: Sum

The tendered sum shall cover the cost to provide the geomembrane guarantee as specified in Clause PG13.

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PG15 GEOMEMBRANE SUPPLIER & SUB-CONTRACTOR FOR INSTALLATION DETAILS

NAME OF SUB-CONTRACTOR/SUPPLIER:.....

ADDRESS:.....

.....

.....

TELEPHONE NO. :.....

CONTACT PERSON:.....

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SPECIFICATION OF HDPE GEOMEMBRANE

Product Identification/ Properties	Name of Supplier							Units	Test Method
	0,40	0,5	0,75	1,0	1,5	2,0	2,5		
Thickness								mm	SANS 1526-1991
Mass Per Unit Area								g/m ²	SANS 1526-1991
Density at 20°C								Kg/m ³	ASTM D792 Method A
Moisture Vapour Transmission (Per 24 Hour)								g/m ²	ASTM E96 - 66
Thermal Expansion Co-efficient (0-100°C)								cm/c m/ °C	ASTM D 696
Dimensional Stability								%	ASTM D1204
Water Absorption								%	ASTM D471
UV Resistance									
Volatile Loss (Max)								%	ASTM D1203 Method A
Low Temperature Impact								°C	ASTM D476 Procedure B
Strength at Break									SANS 1526-1991
Elongation at Break (Uni-directional)								%	SANS 1526-1991
Strength at Yield									SANS 1526-1991
Elongation at Yield									
Puncture Resistance									SANS 1526-1991
Tear Strength – Initiation									SANS 1526-1991
Abrasion Resistance									Taber Abrader Mass Loss per 1000 cycles

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C3.4 Construction

C3.4.1 Standardised Specifications

The standard specifications on which this contract is based are the South African National of Standard Standardised for Civil Employer's Agenting Construction SABS 1200. (Note to compiler. "SABS1200" has been changed to "SANS1200"; the SABS 1200 specifications are due to be replaced in the foreseeable future by SANS 1200).

C3.4.2 Particular Specifications to Health and Safety, Environmental and Code of Conduct

The following particular specifications shall apply to this contract and are Annexed to this Contract

Annexure A - Health and Safety Specifications for South African National Parks

Annexure B - Environmental Management Plan

Annexure C - Code of Conduct for working in the South African National Parks

C3.4.3 Variations and Additions to the Standard and the Particular Specifications

Variations and additions to SABS 1200 Standardized Specifications are listed above in C3.4.1 and the Particular Specifications of C 3.4.2 are attached in the Annexures.

C3.4.4 Known services

The Contractor shall make himself acquainted with all existing works. Under no circumstances shall the Contractor alter or in any way interfere with the existing works or underground services unless authorised by the Engineer.

Where existing works are of such a nature that the Engineer may require them to be moved by the Contractor, the cost of such work will be paid for at scheduled rates or on day works, plant and materials basis. The Contractor will be held responsible for damages to any existing works and any damages caused shall be made good at his own cost without delay.

The Contractor is to exercise care when the proposed work is to cross an existing service, or work is to be performed close to an existing service. Prior to commencement of the relevant portion of the proposed works the Contractor with the Engineer or his duly appointed representative shall also perform a visual inspection of the area in question. This inspection will not waive the Contractor of his obligations with respect care of the works referenced in the General Conditions of Contract.

C3.4.5 Damage to services

Damage that occurs to unknown services during construction will be paid by the Employer.

However, all services that have been located and exposed, and are subsequently damaged by the Contractor or his subcontractor, shall be reinstated to the same state as it was before the damage occurred at the time and cost of the Contractor.

C3.4.6 Reinstatement of services and structures damaged during construction

The Contractor shall inform the Engineer immediately when a service or structure is damaged. The extent of the damage and a proposal how to reinstate the service or structure shall be submitted to the Engineer on a sketch with dimensions and time frames.

The Contractor shall not be allowed to reinstate any service or structure unless indicated so by the Engineer. The Contractor shall render all reasonable assistance to the service or structure owner with the reinstatement of the service or the structure if required.

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The Contractor shall be liable to reinstate the service or structure to its original state or for the full cost thereof if reinstated by others.

C3.4.7 Services and facilities provided by the employer

C3.4.7.1 Water and Power Supply

Water is available for construction at the main reception building of the Garden Route National Park – Tsitsikamma Section, cost of transporting the water must be included in the contractor’s rates.

The Contractor shall make his own arrangements for the supply of electricity that he may require for the execution of the works and the costs of any connections, additional reticulation and the supply of electricity shall be borne by the Contractor.

C3.4.7.2 Fuel

The contractor must note that there is no fuelling stations with in the Garden Route National Park – Tsitsikamma Section boundaries, all fuel for construction must be carter in to the park.

C3.4.8 Facilities provided by the contractor

The Contractor shall provide, maintain and remove his own facilities to the satisfaction of the Engineer. The Contractor shall provide the area around his office, stores and sheds (i.e. the “Camp”) with adequate security fences to ensure that unauthorised persons do not enter the camp area and security personnel should he deem it necessary.

The tendered sums as scheduled by the Contractor, whether grouped or individually, shall include all costs for the installation, maintenance and removal of the fencing as specified, in addition to all other facilities specified and as required by the Contractor for his own purposes.

C3.4.8.1 Location of Contractors Camp Site

The location of the Contractor’s camp shall be pointed out at the tender briefing meeting.

The Contractor shall note that the site is within a popular public amenity. The Contractor shall comply with all SANParks and Local Authority regulations including those relating to health and fire. The Contractor shall ensure that all camp facilities, including those for fuelling, comply with all such regulations. Should the contract include the end of year builders holidays the camp shall be dis-established prior to end of year close-down and re-established at start up the following year. Provision for this is made in the Bill of Quantities.

The Contractor shall provide sufficient latrine facilities for its workers as required by local regulations and these shall be located in close proximity to the work area.

The Contractor must note that the site camp is within the Garden Route National Park – Tsitsikamma Section boundaries and wild animals will be present in the area – baboons. The must be taken into account when planning the site camp. The camp site shall be properly and neatly fenced using temporary fencing with secure access control. The Contractor shall be responsible for providing and maintaining his own security arrangements for the duration of the Contract.

On completion of the Works, or when ordered by the Engineer, the Contractor shall remove all temporary buildings and latrines and restore the Site to a clean and sanitary condition to the satisfaction of the Engineer and rehabilitate the area in accordance with the EMP.

Access to the site will be in a controlled manner. People visiting the site will have to sign in and

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out on a daily basis.

C3.4.8.2 Housing

No housing is available nor shall be allowed on site for the Contractor's employees. It is the sole responsibility of the Contractor at his own cost to house his employees and transport them to and from the site.

C3.4.9 Facilities for the Engineer

C3.4.9.1 Office accommodation

No office facilities are required for the Engineer.

C3.4.9.2 Survey equipment and assistants

Both are required for the Contract.

C3.4.9.3 Site instruction book and Site diary

The Contractor shall keep a triplicate book for site instructions on the Site at all times and provide a Site diary for daily completion by the Contractor.

C3.4.10 Laboratory Facilities

The Contractor shall provide and allow for his own facilities, apparatus and procedures for the testing of materials and the process control testing of materials and workmanship in order to ensure compliance with the requirements of the Specifications. The Engineer shall only carry out control tests.

C3.4.11 Other facilities and services

C3.4.11.1 Waste Disposal

The Contractor shall make arrangements for solid and liquid waste disposal with SANParks. Disposal will take place at an approved Site.

C3.4.11.2 Telephone Facilities

The Contractor shall be responsible for arranging his own telephone facilities and shall be responsible for all costs relating thereto.

C3.4.11.3 Ablution Facilities

Ablution facilities are not available on site. The Contractor shall therefore make the necessary arrangement to provide these facilities. Chemical serviced toilets shall be the minimum acceptable standard as indicated in the EMP. These must be placed in a position to be approved by the Engineer. The facilities must be to the Engineer's approval and must be maintained in a clean and sanitary condition.

C3.4.12 Notice boards, signs, barricades and advertisements

All notices, signs and barricades may be used only if approved by the Engineer. The Contractor shall be responsible for their supply, erection, maintenance and ultimate removal and shall make provision for this in his tendered rates.

The Engineer shall have the right to instruct the Contractor to move any sign or notice to another position, or to remove it from the Site of the Works if in his opinion it is unsatisfactory, inconvenient

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or dangerous.

C3.4.13 Dealing with water

The Contractor shall make provision and allow for all dewatering and temporary management of stormwater. All costs for this operation for the duration of the contract shall be deemed to be included in the Fixed and Value related charges.

C3.4.14 Dealing with high winds

The site is situated in a region where high winds and seasonal rain can be expected and with strong south-easterly winds during the summer months.

All heaps of materials either forming part of the excavations or imported for use in construction shall be kept covered during high winds to prevent contamination of surrounding in-situ soils.

C3.4.15 Alterations, additions, extensions and modifications to existing works.

The Contractor shall within 20 days or 10% of the construction period after taking possession of the site (whichever is the lesser), satisfy himself that the dimensional accuracy, alignment, levels and setting out of existing structures or components thereof are compatible with the proposed works and shall notify the Engineer of any areas of dissatisfaction.

C3.4.16 Wayleaves, Permissions and Permits

The Contractor shall be responsible for obtaining all of the necessary wayleaves, permissions or permits applicable to working near any existing services or other infrastructure on Site, and shall ensure that any wayleaves, permissions or permits obtained by the Employer's Agent prior to the award of the contract are transferred into the Contractor's name.

The Contractor shall abide by any conditions imposed by such wayleaves, permissions or permits.

The Contractor shall ensure that all wayleaves, permissions and permits are kept on site and are available for inspection by the relevant service authorities on demand.

The Contractor shall also ensure that any wayleaves in respect of electricity services are renewed timeously every three months.

C3.4.17 Construction in restricted areas

All working space will be deemed restricted. The construction method used in these restricted areas largely depends on the Contractor's Plant. Notwithstanding, measurement and payment will be strictly according to the specified cross-sections and dimensions irrespective of the method used, and the rates and prices tendered will be deemed to include full compensation for any difficulties encountered by the Contractor while working in restricted areas. No extra payment or any claim for payment due to these difficulties will be considered.

C3.4.18 Spoiling areas.

Spoiling area will be made available within the park boundaries, hauling tariffs will be applicable.

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Part C4: Site Information

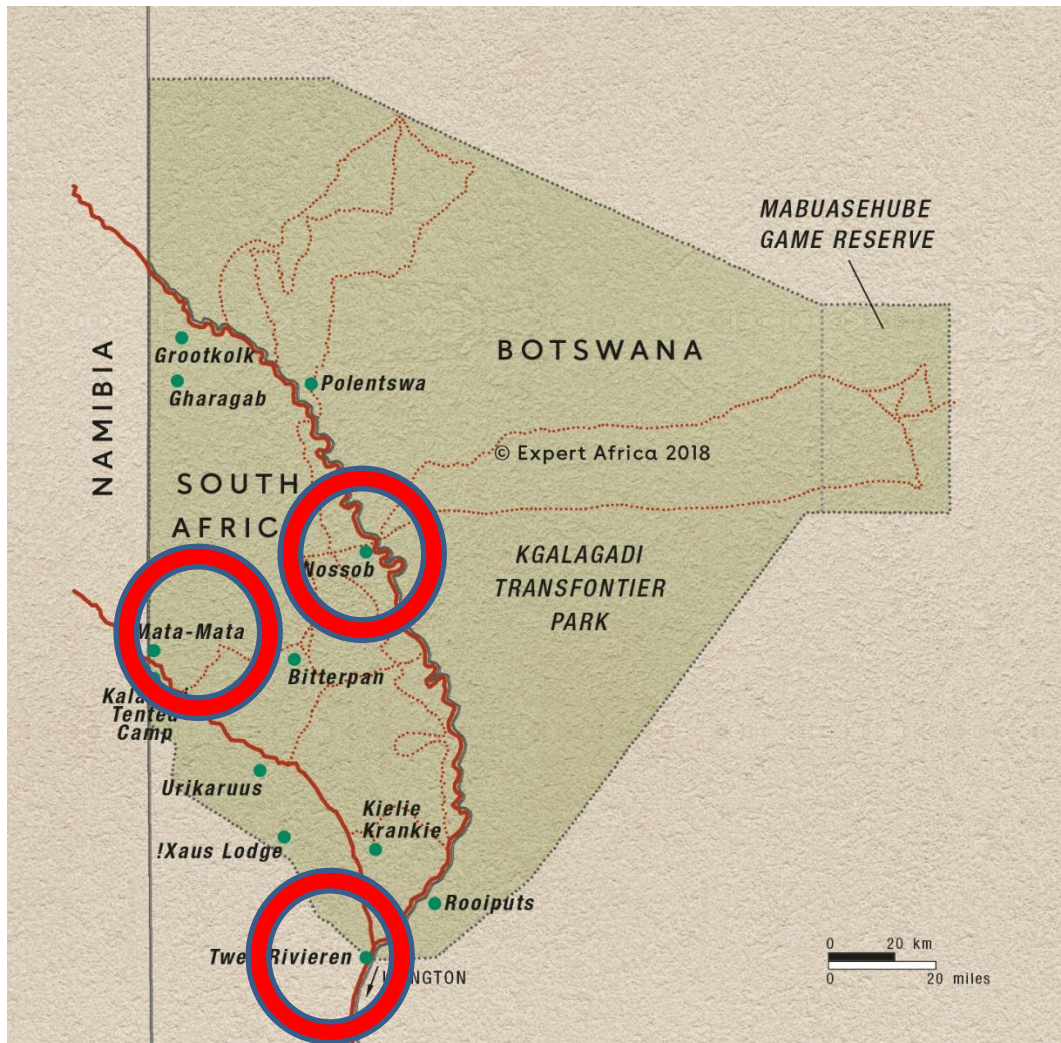
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The proposed sites are in the Kgalagadi Transfrontier Park at the TWEE RIVIEREN, NOSSOB and MATA-MATA Rest Camps in the Northern Cape, 250km and 410km respectively, north of Upington via the R360. Refer to the locality map below.



All construction vehicles must make use of access from the R360 and designated gravel (sandy) roads within the Kgalagadi Transfrontier Park.

Only actual information about physical conditions on the site and its surroundings has been included in this section and interpretation is a matter for the tenderers.

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C4.2 SUBSOIL INVESTIGATIONS

Tenders shall familiarise themselves with the soil and subsoil conditions during the compulsory tender meeting at the proposed construction site. Soil conditions can typically be expected to consist of relatively deep red Kalahari dune sand, although calcrete formations can be encountered in areas between dunes. No excavations on this project are expected to exceed 1.00m in depth.

The Kgalagadi Transfrontier Park lies in the southern Kalahari, an arid region where annual average temperatures range from 4 - 32°C, but extreme temperatures of -11°C and up to 45°C have been recorded.

The Nossob and Auob rivers cross the area. While these riverbeds are normally dry, they do flow once or twice a century after heavy rains. Parallel dunes of both red and white sands, separated by dune valleys, characterise the area.

VEGETATION

Shrubby Kalahari dune bushveld predominates and is characterised by scattered shrubs of grey camel thorn (*Acacia haematoxylon*) and grasses such as dune bushman grass (*Stipagrostis amabilis*), gha grass (*Centropodia glauca*) and giant three-awn (*Aristida meridionalis*).

A second component of vegetation, the thorny Kalahari dune bushveld, is characterised by sparsely scattered trees of camel thorn (*Acacia erioloba*), shepherd's tree (*Boscia albitrunca*) and false umbrella thorn (*Acacia luderitzii*).

Contractors to take note that several tree species in the Kgalagadi TP are protected, subsequently no trees may be removed without written permits from the regulating authority.

The above data does not relieve the Contractor of his sole responsibility to have satisfied himself as to all matters related to ground and subsoil conditions, but merely serves as an indication of what can be expected on the site

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Annexure A

Health and Safety Specifications for South African National Parks

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**HEALTH & SAFETY
SPECIFICATIONS
FOR**

**PROVISION OF POTABLE WATER FOR TWEE RIVIEREN NOSSOB AND
MATA-MATA REST CAMPS
K GALAGADI TRANSFRONTIER NATIONAL PARK**

CONTRACT NO: CI- KH-0028/1

Date: March 2024

Contact person: Zamakhosi Mkhonza

**Address: PO Box 787
Pretoria, 0001**

Tel No: (012) 426 5199

Email Fax: 086 695 9139

Email: zamakhosi.mkhonza@sanparks.org

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1. PURPOSE OF THE HEALTH AND SAFETY SPECIFICATION

This Health and Safety Specification has been prepared to comply with the requirements of the Construction Regulations 2014.

The purpose of this site specific Health and Safety Specification is to comply with legal requirements and to provide health and safety information about specific project risks known by the Client, Designer and Client Agent to be applicable to this project. This document also provides minimum health and safety requirements, standards and expectations that the principal contractor and contractors must adhere to.

The Contractor must take into account all information in this specification and ensure that their tenders include adequate resource and competence to deal with the matters detailed herein so that all relevant contents are dealt with in a way which is in compliance with legislation and the ethical concerns for the safeguarding of employees, contractors and other persons affected by the construction activities.

The Health and Safety Specification will be implemented during construction of the works and any construction activity that the Client has control over.

This will also assist in ensuring that all the costs related to the compliance with Occupational Health Act 85 of 1993 and the Construction Regulations 2014, as well as this Health and Safety Specification, are taken into consideration at Tender stage.

No advice, approval of any document required by the Health and Safety Specification such as hazard identification and risk assessment action plans or any other form shall be construed as an acceptance by the Client of any obligation that absolves the Contractor from achieving the required level of performance and compliance with legal requirements.

Further, there is no acceptance of liability by the Client which may result from the Contractor failing to comply with the Health and Safety Specification unless the Client has issued an instruction to any requirement, i.e., the Contractor remains responsible for achieving the required performance levels.

2. IMPLEMENTATION OF THE HEALTH AND SAFETY SPECIFICATION

This Health and Safety Specification forms an integral part of the Contract, and Contractors shall make it an integral part of their Contracts with Sub Contractors and Suppliers. Contractors employed by the Client are to ensure that the provisions of the Health and Safety

Specification are applied both on the site and in respect of all off site activities relating to the project, in particular in transport activities and project dedicated off site fabrication works.

The Contractor shall enforce the provisions of the Health and Safety Specification amongst all sub-contractors and suppliers for the project.

The Contractor shall sign the acknowledgment on the last page of this safety specification that he/she has familiarized him/herself with the content of the Health and Safety Specification and shall comply with all obligations in respect thereof.

The successful Contractor will be required to compile a Health and Safety Plan based on the requirements of the Occupational Health Act 85 of 1993 and these Specifications, which will need to be approved by Client prior to commencement with construction work.

3. APPLICATION AND INTERPRETATION

This document is to be read and understood in Conjunction with the following inter alia:

- Occupational Health and Safety Act (Act 85 of 1993)
- SABS codes and standards referred to by the Occupational Health and Safety Act
- Regulations as per the Occupational Health and Safety Act (Act 85 of 1993) with specific reference but not limited to:
 - General Safety Regulations (GN 928, 25 June 2003)
 - General Machinery Regulations (GN R1521, 5 August 1988)
 - Electrical Machinery Regulations (GN R250, 25 March 2011)
 - Electrical Installation Regulations (GN R242, 6 March 2009)
 - Driven Machinery Regulations (GN R1010, 18 July 2003)
 - Hazardous Chemical Substance Regulations (GN R930, 25 June 2003)
 - Hazardous Biological Agents Regulations (GN R 1390, 27 December 2001)
- Basic Conditions of Employment Act (Act 75 of 1997)
- SANParks Environmental Management Plan
- SANParks Code of Conduct of working in a National Park

4. DEFINITIONS

ALL REFERENCES TO CLIENT IN THIS HEALTH AND SAFETY SPECIFICATION ALSO REFER TO CLIENT AGENT, WHERE SO APPOINTED.

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Definitions (as per the Construction Regulations 2014) applicable to this Health and Safety Specification:

"agent" means a competent person who acts as a representative for a client.

"angle of repose" means the steepest angle of a surface at which a mass of loose or fragmented material will remain stationary in a pile on the surface, rather than sliding or crumbling away;

"bulk mixing plant" means machinery, appliances or other similar devices that are assembled in such a manner so as to be able to mix materials in bulk for the purposes of using the mixed product for construction work;

"client" means any person for whom construction work is being performed;

"competent person" means a person who has, in respect of the work or task to be performed, the required knowledge, training and experience and, where applicable, qualifications, specific to that work or task: Provided that where appropriate qualifications and training are registered in terms of the provisions of the National Qualification Framework Act, 2000 (Act No.67 of 2000), those qualifications and that training must be regarded as the required qualifications and training; and is familiar with the Act and with the applicable regulations made under the Act;

"construction manager" means a competent person responsible for the management of the physical construction processes and the coordination, administration and management of resources on a construction site;

"construction site" means a work place where construction work is being performed;

"construction supervisor" means a competent person responsible for supervising construction activities on a construction site;

"construction vehicle" means a vehicle used as a means of conveyance for transporting persons or material, or persons and material, on and off the construction site for the purposes of performing construction work;

"construction work" means any work in connection with-

- the construction, erection, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure; or
- the construction, erection, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system; or the

moving of earth, clearing of land, the making of excavation, piling, or any similar civil engineering structure or type of work ;

"construction work permit" means a document issued in terms of regulation 3;

"contractor" means an employer who performs construction work;

"demolition work" means a method to dismantle, wreck, break, pull down or knock down of a structure or part thereof by way of manual labour, machinery, or the use of explosives;

"design" in relation to any structure, includes drawings, calculations, design details and specifications ;

"designer" means a competent person who-

- prepares a design;
- checks and approves a design;
- arranges for a person at work under his or her control to prepare a design, including an employee of that person where he or she is the employer; or
- designs temporary work, including its components;
- an architect or engineer contributing to, or having overall responsibility for a design;
- a building services engineer designing details for fixed plant;
- a surveyor specifying articles or drawing up specifications;
- a contractor carrying out design work as part of a design and building project; or
- an interior designer, shop-fitter or landscape architect;

"excavation work" means the making of any man-made cavity, trench, pit or depression formed by cutting, digging or scooping;

"explosive actuated fastening device" means a tool that is activated by an explosive charge and that is used for driving bolts, nails and similar objects for the purpose of providing fixing;

"fall arrest equipment" means equipment used to arrest a person in a fall, including personal equipment, a body harness, lanyards, deceleration devices, lifelines or similar equipment;

"fall prevention equipment" means equipment used to prevent persons from falling from a fall risk position, including personal equipment, a body harness, lanyards, lifelines or physical equipment such as guard-rails, screens, barricades, anchorages or similar equipment;

"fall protection plan" means a documented plan, which includes and provides for -

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- all risks relating to working from a fall risk position, considering the nature of work undertaken;
- the procedures and methods to be applied in order to eliminate the risk of falling; and
- a rescue plan and procedures;

"fall risk" means any potential exposure to falling either from, off or into;

"health and safety file " means a file, or other record containing the information in writing required by these Regulations;

"health and safety plan" means a site, activity or project specific documented plan in accordance with the client's health and safety specification;

"health and safety specification" means a site, activity or project specific document prepared by the client pertaining to all health and safety requirements related to construction work;

"material hoist" means a hoist used to lower or raise material and equipment, excluding passengers;

"medical certificate of fitness" means a certificate contemplated in regulation 7(8);

"mobile plant" means any machinery, appliance or other similar device that is able to move independently, and is used for the purpose of performing construction work on a construction site;

"National Building Regulations" means the National Building Regulations made under the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977), and promulgated by Government Notice No. R. 2378 of 30 July 1990, as amended by Government Notices No's R. 432 of 8 March 1991, R. 919 of 30 July 1999 and R. 547 of 30 May 2008;

"person day" means one normal working shift of carrying out construction work by a person on a construction site;

"principal contractor" means an employer appointed by the client to perform construction work;

"Professional Engineer or Professional Certificated Engineer" means a person holding registration as either a Professional Engineer or Professional Certificated Engineer in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000);

"Professional Technologist" means a person holding registration as a Professional Engineering Technologist in terms of the Engineering Profession Act, 2000;

"provincial director" means the provincial director as defined in regulation 1 of the General Administrative Regulations, 2003;

"scaffold" means a temporary elevated platform and supporting structure used for providing access to and supporting workmen or materials or both;

"shoring" means a system used to support the sides of an excavation and which is intended to prevent the cave-in or the collapse of the sides of an excavation;

"structure" means-

- any building, steel or reinforced concrete structure (not being a building), railway line or siding, bridge, waterworks, reservoir, pipe or pipeline, cable, sewer, sewage works, fixed vessels, road, drainage works, earthworks, dam, wall, mast, tower, tower crane, bulk mixing plant, pylon, surface and underground tanks, earth retaining structure or any structure designed to preserve or alter any natural feature, and any other similar structure;
- any falsework, scaffold or other structure designed or used to provide support or means of access during construction work; or
- any fixed plant in respect of construction work which includes installation, commissioning, decommissioning or dismantling and where any construction work involves a risk of a person falling;

"suspended platform" means a working platform suspended from supports by means of one or more separate ropes from each support ;

"temporary works" means any falsework, formwork, support work, scaffold, shoring or other temporary structure designed to provide support or means of access during construction work;

"the Act" means the Occupational Health and Safety Act , 1993 (Act No. 85 of 1993);

"tunneling" means the construction of any tunnel beneath the natural surface of the earth for a purpose other than the searching for or winning of a mineral.

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5. GENERAL REQUIREMENTS

5.1 Duties of Principal Contractor / Contractor in terms of Construction Regulations 2014

A Principal Contractor must:

- provide and demonstrate to the client a suitable, sufficiently documented and coherent site specific health and safety plan, based on the client's documented health and safety specifications, which plan must be applied from the date of commencement of and for the duration of the construction work and which must be reviewed and updated by the principal contractor as work progresses;
- open and keep on site a health and safety file, which must include all documentation required in terms of the Act and these Regulations, which must be made available on request to an inspector, the client, the client's agent or a contractor; and
- on appointing any other contractor, in order to ensure compliance with the provisions of the Act –
 - provide contractors who are tendering to perform construction work for the principal contractor, with the relevant sections of the health and safety specifications pertaining to the construction work which has to be performed;
 - ensure that potential contractors submitting tenders have made sufficient provision for health and safety measures during the construction process;
 - ensure that no contractor is appointed to perform construction work unless the principal contractor is reasonably satisfied that the contractor that he or she intends to appoint, has the necessary competencies and resources to perform the construction work safely;
 - ensure prior to work commencing on the site that every contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer as contemplated in the Compensation for Occupational Injuries and Diseases Act, 1993;
 - appoint each contractor in writing for the part of the project on the construction site
 - take reasonable steps to ensure that each contractor's health and safety plan is implemented and maintained on the construction site;
 - ensure that the periodic site audits and document verification are conducted at intervals mutually agreed upon between the principal contractor and any contractor, but at least once every 30 days;
 - stop any contractor from executing construction work which is not

in accordance with the client's health and safety specifications and the principal contractor's health and safety plan for the site or which poses a threat to the health and safety of persons;

- where changes are brought about to the design and construction, make available sufficient health and safety information and appropriate resources to the contractor to execute the work safely;
- discuss and negotiate with the contractor the contents of their health and safety plan and finally approve that plan for implementation;
- ensure that a copy of both the principal contractor and contractor's health and safety plan is available on request to an employee, an inspector, a contractor, the client or the client's agent;
- hand over a consolidated health and safety file to the client upon completion of the construction work, to include a record of all drawings, designs, materials used and other similar information concerning the completed structure;
- in addition to the documentation required in the health and safety file include and make available a comprehensive and updated list of all the contractors on site accountable to the principal contractor, the agreements between the parties and the type of work being done;
- ensure that all his or her employees have 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.

A contractor must prior to performing any construction work-

- provide and demonstrate to the principal contractor a suitable and sufficiently documented health and safety plan, based on the relevant sections of the client's health and safety specification and provided by the principal contractor, which plan must be applied from the date of commencement of and for the duration of the construction work and which must be reviewed and updated by the contractor as work progresses;
- open and keep on site a health and safety file, which must include all documentation required in terms of the Act and these Regulations, and which must be made available on request to an inspector, the client, the client's agent or the principal contractor;
- before appointing another contractor to perform construction work be reasonably satisfied that the contractor that he or she intends to appoint has the necessary competencies and resources to perform the construction work safely;
- co-operate with the principal contractor as far as is necessary to enable each of them to comply with the provisions of the Act;

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- as far as is reasonably practicable, promptly provide the principal contractor with any information which might affect the health and safety of any person at work carrying out construction work on the site, any person who might be affected by the work of such a person at work, or which might justify a review of the health and safety plan.

Where a contractor appoints another contractor to perform construction work, the duties that apply to the principal contractor will apply to the contractor as if he or she were the principal contractor.

A principal contractor must take reasonable steps to ensure co-operation between all contractors appointed by the principal contractor to enable each of those contractors to comply with these Regulations.

No contractor may allow or permit any employee or person to enter any site, unless that employee or person has undergone health and safety induction training pertaining to the hazards prevalent on the site at the time of entry.

A contractor must ensure that all visitors to a construction site undergo health and safety induction pertaining to the hazards prevalent on the site and must ensure that such visitors have the necessary personal protective equipment.

A contractor must at all times keep on his or her construction site records of the health and safety induction training and such records must be made available on request to an inspector, the client, the client's agent or the principal contractor.

A contractor must ensure that all his or her employees have 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 (a template of which can be found in the Construction Regulations, 2014).

5.2 Management and Supervision of Construction Work

A principal contractor must, in writing, appoint one full-time competent person as the construction manager with the duty of managing all the construction work on a single site, including the duty of ensuring occupational health and safety compliance, and in the absence of the construction manager an alternate must be appointed by the principal contractor.

A principal contractor must upon having considered the size of the project, in writing appoint one or more assistant construction managers for different sections thereof: Provided that the designation of any such person does not relieve the construction manager of any personal accountability for failing in his or her management duties in terms of this regulation.

Where the construction manager has not appointed assistant construction managers, or, in the opinion of an inspector, a sufficient number of such assistant construction managers have not been appointed, that inspector must direct the construction manager in writing to appoint the number of assistant construction managers indicated by the inspector, and those assistant construction managers must be regarded as having been appointed.

No construction manager appointed in terms of the Regulations may manage any construction work on or in any construction site other than the site in respect of which he or she has been appointed.

A contractor must, after consultation with the client and having considered the size of the project, the degree of danger likely to be encountered or the accumulation of hazards or risks on the site, appoint a full-time or part-time construction health and safety officer in writing to assist in the control of all health and safety related aspects on the site: Provided that, where the question arises as to whether a construction health and safety officer is necessary, the decision of an inspector is decisive.

No contractor may appoint a construction health and safety officer to assist in the control of health and safety related aspects on the site unless he or she is reasonably satisfied that the construction health and safety officer that he or she intends to appoint is registered with a statutory body approved by the Chief Inspector and has necessary competencies and resources to assist the contractor

A construction manager must in writing appoint construction supervisors responsible for construction activities and ensuring occupational health and safety compliance on the construction site.

A contractor must, upon having considered the size of the project, in writing appoint one or more competent employees for different sections thereof to assist the construction supervisor, and every such employee has, to the extent clearly defined by the contractor in the letter of appointment, the same duties as the construction supervisor: Provided that the designation of such employee does not relieve the construction supervisor of any personal accountability for failing in his or her supervisory duties.

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Where the contractor has not appointed such an employee, or, in the opinion of an inspector, a sufficient number of such employees have not been appointed, that inspector must instruct the employer to appoint the number of employees indicated by the inspector.

No construction supervisor appointed may supervise any construction work on or in any construction site other than the site in respect of which he or she has been appointed: Provided that if a sufficient number of competent employees have been appropriately designated on all the relevant construction sites, the appointed construction supervisor may supervise more than one site.

5.3 Notification of Intention to Commence Construction Work

The Contractor shall notify the Provincial Director of the Department of Labour of the intention to commence construction work at least 7 days prior to the works commencing if the intended construction work will:

- include excavation work
- Include work at height where there is a risk of falling
- Include the demolition of a structure, or
- Include the use of explosives to perform construction work.

If the construction work involves construction of a single storey dwelling for a client, and such client will be residing in such dwelling upon completion, the contractor must also notify the Provincial Director of the Department of Labour at least 7 days before the works commence.

This must be done on a form similar to an Annexure 2 (template of which can be found in the Construction Regulations, 2014). A copy of the notification letter to the Provincial Director shall be forwarded to the Client for record purposes.

5.4 Construction Work Permit

It must be noted that from August 2015 all projects that meet the following criteria will require a construction work permit to be applied for at least 30 days prior to the work being carried out:

- Exceeds 180 days
- Will involve more than 1800 person days of construction work
- Works contract is of a value equal to or exceeding thirteen million rand, or Construction Industry Grading Board (CIDB) grading level 6

It is the client's responsibility to apply for this permit from the Provincial Director and construction work may not commence until the permit has been issued by the Provincial Director.

A copy of this permit will be required to be kept in the principal contractors safety file, and the site specific number issued by the Provincial Director must be displayed at the site entrance.

5.5 Assignment of Contractor's Responsible Persons to Manage Health and Safety on Site

The Contractor shall submit management and supervisory appointments as well as any relevant appointments in writing (as stipulated by the Construction Regulations 2014 and the Occupational Safety and Health Act 1993), prior to commencement of work (refer to **Annexure B** at the end of this Health and Safety Specification).

5.6 Competency for Contractor's Responsible Persons

The Contractor's responsible persons shall be competent in health and safety and be familiar with the Occupational Health and Safety Act 1993, and applicable regulations. Valid proof of pertinent health and safety courses attended by such persons will be required to be presented to the Client.

5.7 Compensation of Occupational Injuries and Diseases Act 130 of 1993 (COIDA)

The successful Contractor shall submit to the Client a valid letter of good standing with the Compensation Insurer prior to appointment.

5.8 Occupational Health and Safety Policy

The Contractor shall submit their Health and Safety Policy, prior to construction commencement, signed by the Chief Executive Officer. The Policy must outline objectives and how they will be achieved and implemented within the operations.

5.9 Health and Safety Organogram

The Contractor shall submit an organogram, prior to construction commencement, outlining the Health and Safety Site Team that will be assigned to the project, if successful with the tender. In cases where appointments have not been made, the organogram shall reflect the position. The organogram shall be updated, when there is a change in the site team.

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5.10 Risk Assessments

Baseline Risk Assessment

The Client shall cause a baseline risk assessment to be conducted by a competent person before the design process and tender process commence, and the assessed risks shall form part of the health and safety specifications.

The Contractor must, before commencement of any construction work, and during construction work, have risk assessments performed by a competent person appointed in writing, which risk assessments form part of the health and safety plan to be applied on the site and must include:

- The identification of the risks and hazards to which persons may be exposed to;
- An analysis and evaluation of the risks and hazards identified; based on a documented method
- A documented plan and applicable safe work procedures to mitigate, reduce or control the risks and hazards that have been identified;
- A monitoring plan; and
- A review plan

The Contractor must ensure that, as far as is reasonably practicable, ergonomic related hazards are analysed, evaluated and addressed in a risk assessment.

The Contractor must ensure that all employees under his control are informed, instructed and trained by a competent person regarding any hazard and the related work procedures and/or control measures **before any work commences** and thereafter **at the times determined in the risk assessment monitoring and review plan of the relevant site.**

The Principal Contractor must ensure that all contractors are informed regarding any hazard that is stipulated in the risk assessment **before any work commences** and thereafter **at the times determined in the risk assessment monitoring and review plan of the relevant site.**

The Contractor must consult with the health and safety committee or with a representative trade union or representative group of employees if no health and safety committee exists, on the monitoring and review of the risk assessments for the site.

The Contractor must ensure that copies of risk assessment for this site are available on site for inspection purposes by interested parties (inspector, the client, client's agent, any

contractor, any employee, a representative trade union, a health and safety representative or safety committee member.

A Contractor must review the relevant risk assessment where changes are effected to the design and/or construction that result in a change to the risk profile, or when an incident has occurred.

Preventative measures must first address the elimination of the hazard or risk. Should PPE be required to reduce risk, the equipment or clothing to be used must be SABS approved

In general the Contractor must ensure that the Risk Assessment involves identifying the hazards present in a work activity on site. This is followed by an evaluation of the extent of the risk involved taking into account those precautions already being taken.

The following general principle should be followed when conducting a risk assessment:

- All relevant risks and/or hazards should be systematically addressed;
- The risk assessment should address what actually happens in the workplace during the work activity;
- All employees and those who may be affected must be considered, including maintenance staff, security guards, visitors and subcontractors;
- The risk assessment should highlight those groups and individuals who may be required to work alone or who have disabilities;
- The risk assessment process should take into account the existing safety measures and controls.
- The level of detail on a risk assessment should be appropriate to the level of risk.

5.11 Safe Work Procedures

Safe Work Procedures are to form part of the H&S Plan and **must be compiled for all the identified activities.**

The safe work procedures must address the following elements:

- The work method to be followed to conduct work safely
- Mitigation of identified risks
- Reducing and controlling risks and hazards that have been identified
- Responsibilities of competent persons
- Required personal protective equipment
- Correct equipment/tools/machinery to be used
- Reference to relevant registers to be completed

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- Reference to applicable risk assessment

5.12 Health and Safety Representative(s)

The Contractor shall ensure that Health and Safety Representative(s) is/are elected and trained to carry out his / her functions. The appointment must be in writing. The Health and Safety Representative shall carry out regular inspections, keep records and report to the supervisor to take appropriate action. He / she shall attend Health and Safety Committee Meetings. The Health and Safety Representative shall be part of the team that will investigate incidents, accidents and non-conformances.

5.13 Health and Safety Committee

Where two or more health and safety representatives have been appointed on site, the Contractor shall ensure that monthly health and safety meetings are held with such representatives and minutes are kept on record. Meetings must be organized and chaired by the Contractor's Health and Safety Committee Chairperson. Minutes of these meetings must be available for the employees of the contractor to refer to.

5.14 Medical Certificate of Fitness

The contractor must ensure that their employees on site have a valid medical certificate of fitness, specific to the construction work being performed, issued by an occupational health practitioner in the form of an Annexure 3 template (refer to the Construction Regulations 2014 on the Department of Labour website for a sample of this form).

5.15 Health and Safety Training

The Contractor shall quarterly conduct a training needs analysis to ascertain what health and safety training is required. A plan of action should be devised and forwarded to the Client for records. Once the identified people have attended the training, the Contractor must provide the Client with copies of certificates obtained.

5.15.1 Induction

No Contractor may allow or permit any employee or person to enter site unless they have undergone health and safety induction training pertaining to the hazards prevalent on site at the time of entry. This includes visitors to site. The Contractor must ensure that visitors to site have the necessary protective equipment (PPE). A copy of attendance registers of all employees who attend inductions shall be kept.

5.15.2 Awareness

The Contractor shall conduct periodic toolbox talks on site, preferably weekly or before any hazardous work takes place. The talks shall cover the relevant activity and an attendance register must be signed by all attendees. This record of who attended and the content of the topic will be kept on the site health a safety file as evidence of training

5.16 Competency

After the Contractor has identified the training to be conducted as part of the competency requirement, and based on Risk Assessment, he shall send the relevant persons on appropriate courses and keep certificates of training for reference. Familiarity with the Health and Safety Act and Regulations is an integral part of the definition of competence.

5.17 General Record Keeping

The Contractor shall keep and maintain Health and Safety records to demonstrate compliance with the Health and Safety Specification and the Occupational Health and Safety Act. The contractor shall ensure that all records of incidents, spot fines, training etc. are kept on site. All documents shall be available for inspection by the Client, or the Department of Labour's Inspectors.

5.18 General Inspection, Monitoring and Reporting

The Contractor shall carry out inspections as required by **Annexure C** in this Health and Safety Specification, as well as by health and safety legislation.

5.19 Emergency Procedures

The Contractor shall submit a detailed Emergency Procedure for approval by the Client prior to commencement on site. The procedure shall detail the response plan including the following:

- List of key personnel;
- Details of emergency services;
- Actions or steps to be taken in the event of the emergency; and
- Information on hazardous materials / situations, including each material's hazardous potential impact or risk on the environment or human and measures to be taken in the event of an accident.

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Emergency procedure(s) shall include, but shall not be limited to, fire, spills, accidents to employees, use of hazardous substances, dangers as a result of riot / service deliver protests / intimidation, etc. The Contractor shall advise the Client in writing of any on-site emergencies, together with a record of action taken, within 24 hours of the emergency occurring. A contact list of all service providers (Fire Department, Ambulance, Police, Medical and Hospital, etc.) must be maintained and available to site personnel.

5.20 First Aid Box and First Aid Equipment

The Contractor shall provide first aid box/es and appoint, in writing, First Aider(s) for this project in line with the results of the Contractor's risk assessment for the project, this health and safety specification as well as the provisions of the General Safety Regulations. The appointed First Aider(s) are to be sent for accredited first aid training before starting on site. Valid certificates are to be kept on site.

First Aid box/es must be adequately stocked at all time, accessible and be controlled by a qualified First Aider. If required by the Client, the Contractor shall have a stretcher on site to be used in case of a serious incident.

5.21 Accident / Incident Reporting and Investigation

The Contractor shall, in addition to the prescribed requirements of the Occupational Health and Safety Act and General Safety Regulations, investigate, record and report all Section 24 reportable incidents to the Client within 24 hours of the incident occurring. Incident investigations shall be conducted by the Contractor's appointed Accident Investigator – this Investigator must be a competent person or persons who have sufficient knowledge to carry out an investigation.

In the event of a fatality or a permanent disabling injury the Contractor must submit proof of reporting of incident to Department of Labour as well as proof of preventative measures to the Client. The Client reserves the right to conduct investigations into any incidents that they deem fit and the Contractor is required to provide full co-operation in this regard.

5.22 Hazards and Potential Situations

The Contractor shall immediately notify other Contractors of any hazardous or potentially hazardous situations, which may arise during performance of the activities.

5.23 Occupational Health and Safety Signage

The Contractor shall ascertain and provide adequate on site health and safety signage. This signage shall include, but shall not be limited to, Hard Hat / Helmet Area; Safety Shoes to be worn on site; Dust Masks to be worn in areas where there might be exposure to excessive dust; Ear Plugs / Muffs to be worn where there might be noise exposure over 85; Gloves; Safety Goggles; Safety Harness, Workers in Excavation, traffic management, etc. The Contractor shall be responsible to maintain the quality and replacement of signage.

5.24 Management of Contractors by Principal Contractor

The Principal Contractor shall ensure that all contractors under his control are complying with the respective Health and Safety Plans, as well as Health and Safety Legislation.

5.25 Stacking of Materials

In addition to the provisions for the stacking of articles in the General Safety Regulations, 2003, the contractor must ensure that –

- a competent person is appointed in writing with the duty of supervising all stacking and storage on a construction site;
- adequate storage areas are provided;
- there are demarcated storage areas; and
- storage areas are kept neat and under control.

5.26 Housekeeping and General Safeguarding on Construction Sites

A contractor must, in addition to compliance with the Environmental Regulations for Workplaces, 1987, promulgated by Government Notice No. R. 2281 of 16 October 1987, ensure that suitable housekeeping is continuously implemented on each construction site, including-

- the proper storage of materials and equipment;
- the removal of scrap, waste and debris at appropriate intervals;
- ensuring that materials required for use, are not placed on the site so as to obstruct means of access to and egress from workplaces and passageways;
- ensuring that materials which are no longer required for use, do not accumulate on and are removed from the site at appropriate intervals;
- ensuring that waste and debris are not disposed of from a high place with a chute, unless the chute complies with the requirements set out in the regulations;

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- ensuring that construction sites in built-up areas adjacent to a public way are suitably and sufficiently fenced off and provided with controlled access points to prevent the entry of unauthorized persons; and
- ensuring that a catch platform or net is erected above an entrance or passageway or above a place where persons work or pass under, or fencing off the danger area if work is being performed above such entrance, passageway, or place so as to ensure that all persons are kept safe in the case of danger of possibility of persons being struck by falling objects.

5.27 Construction Vehicles and Mobile Plant

A contractor must ensure that all construction vehicles and mobile plant-

- are of an acceptable design and construction;
- are maintained in a good working order;
- are used in accordance with their design and the intention for which they were designed, having due regard to safety and health;
- are operated by a person who-
- has received appropriate training, is certified competent and in possession of proof of competency and is authorised in writing to operate those construction vehicles and mobile plant;
- has a medical certificate of fitness to operate those construction vehicles and mobile plant, issued by an occupational health practitioner in the form of Annexure 3.
- have safe and suitable means of access and egress;
- are properly organized and controlled in any work situation by providing adequate signalling or other control arrangements to guard against the dangers relating to the movement of vehicles and plant, in order to ensure their continued safe operation;
- are prevented from falling into excavations, water or any other area lower than the working surface by installing adequate edge protection, which may include guard-rails and crash barriers;
- are fitted with structures designed to protect the operator from falling material or from being crushed should the vehicle or mobile plant overturn;
- are equipped with an acoustic warning device which can be activated by the operator;
- are equipped with an automatic acoustic reversing alarm; and
- are inspected by the authorised operator or driver on a daily basis using a relevant checklist prior to use and that the findings of such inspection are recorded in a register kept in the construction vehicle or mobile plant.

A contractor must ensure that-

- no person rides or is required or permitted to ride on a construction vehicle or mobile plant otherwise than in a safe place provided thereon for that purpose;
- every construction site is organized in such a way that, as far as is reasonably practicable, pedestrians and vehicles can move safely and without risks to health;
- the traffic routes are suitable for the persons, construction vehicles or mobile plant using them, are sufficient in number, in suitable positions and of sufficient size;
- every traffic route is, where necessary, indicated by suitable signs;
- all construction vehicles and mobile plant left unattended at night, adjacent to a public road in normal use or adjacent to construction areas where work is in progress, have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, in order to identify the location of the vehicles or plant;
- all construction vehicles or mobile plant when not in use, have buckets, booms or similar appendages, fully lowered or blocked, controls in a neutral position, motors stopped, wheels chocked, brakes set and ignition secured;
- whenever visibility conditions warrant additional lighting, all mobile plant are equipped with at least two headlights and two taillights when in operation;
- tools, material and equipment are secured and separated by means of a physical barrier in order to prevent movement when transported in the same compartment with employees;
- vehicles used to transport employees have seats firmly secured and adequate for the number of employees to be carried; and
- all construction vehicles or mobile plant travelling, working or operating on public roads comply with the requirements of the National Road Traffic Act, 1996.

5.28 Electrical Installations and Machinery on Construction Sites

A contractor must, in addition to compliance with the Electrical Installation Regulations and the Electrical Machinery Regulations, ensure that –

- before construction commences and during the progress thereof, adequate steps are taken to ascertain the presence of and guard against danger to workers from any electrical cable or apparatus which is under, over or on the site;
- all parts of electrical installations and machinery are of adequate strength to withstand the working conditions on construction sites;
- the control of all temporary electrical installations on the construction site is designated to a competent person who has been appointed in writing for that purpose;
- all temporary electrical installations used by the contractor are inspected at least once a week by a competent person and the inspection findings are recorded in a register kept on the construction site; and

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- all electrical machinery is inspected by the authorized operator or user on a daily basis using a relevant checklist prior to use and the inspection findings are recorded in a register kept on the construction site.

5.29 Use and Temporary Storage of Flammable Liquids on Construction Sites

A contractor must, in addition to compliance with the provisions for the use and storage of flammable liquids in the General Safety Regulations, 2003, ensure that –

- where flammable liquids are being used, applied or stored at the workplace concerned, it is done in a manner that does not cause a fire or explosion hazard, and that the workplace is effectively ventilated;
- no person smokes in any place in which flammable liquid is used or stored, and the contractor must affix a suitable and conspicuous notice at all entrances to any such areas prohibiting such smoking;
- an adequate amount of efficient fire-fighting equipment is installed in suitable locations around the flammable liquids store with the recognized symbolic signs;
- only the quantity of flammable liquid needed for work on one day is taken out of the store for use;
- all containers holding flammable liquids are kept tightly closed when not in actual use and, after their contents have been used up, are removed from the construction site and safely disposed of;
- where flammable liquids are decanted, the metal containers are bonded and earthed; and
- no flammable material, including cotton waste, paper, cleaning rags or similar material is stored together with flammable liquids

5.30 Water environments

Not applicable on this project..

5.31 Fire precautions on Construction Sites

A contractor must, in addition to compliance with the Environmental Regulations for Workplaces, 1987, ensure that –

- all appropriate measures are taken to avoid the risk of fire;
- sufficient and suitable storage is provided for flammable liquids, solids and gases;
- smoking is prohibited and notices in this regard are prominently displayed in all places containing readily combustible or flammable materials;
- in confined spaces and other places in which flammable gases, vapours or dust can cause danger-

- only suitably protected electrical installations and equipment, including portable lights, are used;
- there are no flames or similar means of ignition;
- there are conspicuous notices prohibiting smoking;
- oily rags, waste and other substances liable to ignite are without delay removed to a safe place; and
- adequate ventilation is provided;

- combustible materials do not accumulate on the construction site;
- welding, flame cutting and other hot work are done only after appropriate precautions have been taken to reduce the risk of fire;
- suitable and sufficient fire-extinguishing equipment is placed at strategic locations or as may be recommended by the Fire Chief or local authority concerned, and that such equipment is maintained in a good working order;
- the fire equipment contemplated above is inspected by a competent person, who has been appointed in writing for that purpose, in the manner indicated by the manufacturer thereof;
- a sufficient number of workers are trained in the use of fire- extinguishing equipment;
- where appropriate, suitable visual signs are provided to clearly indicate the escape routes in the case of a fire;
- the means of escape is kept clear at all times;
- there is an effective evacuation plan providing for all -
 - persons to be evacuated speedily without panic;
 - persons to be accounted for; and
 - plant and processes to be shut down; and
 - a siren is installed and sounded in the event of a fire.

5.32 Construction Employees' Facilities

A contractor must, in terms of the Construction Regulations 2014, provide:

- Shower facilities after consultation with the employees or employees representatives, or at least one shower facility for every 15 persons;
- at least one sanitary facility for each sex and for every 30 workers;
- changing facilities for each sex;
- and sheltered eating area.

A contractor must provide reasonable and suitable living accommodation for the workers at construction sites who are far removed from their homes and where adequate transportation between the site and their homes, or other suitable living accommodation, is not available.

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5.33 Fall protection

The Contractor must:

- designate a competent person to be responsible for the preparation of a fall protection plan
- ensure that the fall protection plan contemplated above is implemented, amended where and when necessary and maintained as required; and
- take steps to ensure continued adherence to the fall protection plan.

A fall protection plan contemplated above must include-

- a risk assessment of all work carried out from a fall risk position and the procedures and methods used to address all the risks identified per location;
- the processes for the evaluation of the employees' medical fitness necessary to work at a fall risk position and the records thereof;
- a programme for the training of employees working from a fall risk position and the records thereof;
- the procedure addressing the inspection, testing and maintenance of all fall protection equipment; and
- a rescue plan detailing the necessary procedure, personnel and suitable equipment required to affect a rescue of a person in the event of a fall incident to ensure that the rescue procedure is implemented immediately following the incident.

A contractor must ensure that a construction manager appointed under regulation 8(1) is in possession of the most recently updated version of the fall protection plan.

A contractor must ensure that all unprotected openings in floors, edges, slabs, hatchways and stairways are adequately guarded, fenced or barricaded or that similar means are used to safeguard any person from falling through such openings;

Also that no person is required to work in a fall risk position, unless such work is performed safely as contemplated in above and fall prevention and fall arrest equipment are approved as suitable and of sufficient strength for the purpose for which they are being used, having regard to the work being carried out and the load, including any person, they are intended to bear; and securely attached to a structure or plant, and the structure of plant and the means of attachment thereto are suitable and of sufficient strength and stability for the purpose of safely supporting the equipment and person who could fall, and fall arrest equipment is used only where it is not reasonably practicable to use fall prevention equipment.

5.34 Temporary works

A contractor must appoint a temporary works designer in writing to design, inspect and approve the erected temporary works on site before use.

A contractor must ensure that all temporary works operations are carried out under the supervision of a competent person who has been appointed in writing for that purpose.

A contractor must ensure that-

- all temporary works structures are adequately erected, supported, braced and maintained by a competent person so that they are capable of supporting all anticipated vertical and lateral loads that may be applied to them, and that no loads are imposed onto the structure that the structure is not designed to withstand;
- all temporary works structures are done with close reference to the structural design drawings, and where any uncertainty exists the structural designer should be consulted;
- detailed activity specific drawings pertaining to the design of temporary works structures are kept on the site and are available on request to an inspector, other contractors, the client, the client's agent or any employee;
- all persons required to erect, move or dismantle temporary works structures are provided with adequate training and instruction to perform those operations safely;
- all equipment used in temporary works structure are carefully examined and checked for suitability by a competent person, before being used;
- all temporary works structures are inspected by a competent person immediately before, during and after the placement of concrete, after inclement weather or any other imposed load and at least on a daily basis until the temporary works structure has been removed and the results have been recorded in a register and made available on site;
- no person may cast concrete, until authorization in writing has been given by the competent person contemplated above;
- if, after erection, any temporary works structure is found to be damaged or weakened to such a degree that its integrity is affected, it is safely removed or reinforced immediately;
- adequate precautionary measures are taken in order to-
- secure any deck panels against displacement; and
- prevent any person from slipping on temporary works due to the application of release agents;
- as far as is reasonably practicable, the health of any person is not affected through the use of solvents or oils or any other similar substances;

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- upon casting concrete, the temporary works structure is left in place until the concrete has acquired sufficient strength to safely support its own weight and any imposed load, and is not removed until authorization in writing has been given by the competent person
- the foundation conditions are suitable to withstand the loads caused by the temporary works structure and any imposed load in accordance with the temporary works design.
- provision is made for safe access by means of secured ladders or staircases for all work to be carried out above the foundation bearing level;
- a temporary works drawing or any other relevant document includes construction sequences and methods statement;
- the temporary works designer has been issued with the latest revision of any relevant structural design drawing;
- a temporary works design and drawing is used only for its intended purpose and for a specific portion of a construction site; and
- the temporary works drawings are approved by the temporary works designer before the erection of any temporary works.

No contractor may use a temporary works design and drawing for any work other than its intended purpose.

5.35 Excavation

A contractor must-

- ensure that all excavation work is carried out under the supervision of a competent person who has been appointed in writing for that purpose; and
- Evaluate, as far as is reasonably practicable, the stability of the ground before excavation work begins.

A contractor who performs excavation work-

- must take reasonable and sufficient steps in order to prevent, as far as is reasonably practicable, any person from being buried or trapped by a fall or dislodgement of material in an excavation;
- may not require or permit any person to work in an excavation which has not been adequately shored or braced: Provided that shoring and bracing may not be necessary where-
- the sides of the excavation are sloped to at least the maximum angle of repose measured relative to the horizontal plane; or

- such an excavation is in stable material: Provided that-
- permission has been given in writing by the appointed competent person contemplated above upon evaluation by him or her of the site conditions; and
- where any uncertainty pertaining to the stability of the soil still exists, the decision from a professional engineer or a professional technologist competent in excavations is decisive and such a decision must be noted in writing and signed by both the competent person and the professional engineer or technologist, as the case may be;
- must take steps to ensure that the shoring or bracing contemplated above is designed and constructed in a manner that renders it strong enough to support the sides of the excavation in question;
- must ensure that no load, material, plant or equipment is placed or moved near the edge of any excavation where it may cause its collapse and consequently endangers the safety of any person, unless precautions such as the provision of sufficient and suitable shoring or bracing are taken to prevent the sides from collapsing;
- must ensure that where the stability of an adjoining building, structure or road is likely to be affected by the making of an excavation, steps are taken to ensure the stability of such building, structure or road and the safety of persons;
- must cause convenient and safe means of access to be provided to every excavation in which persons are required to work, and such access may not be further than six meters from the point where any worker within the excavation is working;
- must ascertain, as far as is reasonably practicable, the location and nature of electricity, water, gas or other similar services which may in any way be affected by the work to be performed, and must before the commencement of excavation work that may affect any such service, take the steps that are necessary to render the circumstances safe for all persons involved;
 - must ensure that every excavation, including all bracing and shoring, is inspected-
 - daily, prior to the commencement of each shift;
 - after every blasting operation;
 - after an unexpected fall of ground;
 - after damage to supports; and
 - after rain,

by the competent person, in order to ensure the safety of the excavation and of persons, and those results must be recorded in a register kept on site and made available on request to an inspector, the client, the client's agent, any other contractor or any employee;

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- must cause every excavation which is accessible to the public or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered, to be –
 - adequately protected by a barrier or fence of at least one metre in height and as close to the excavation as is practicable; and
 - provided with warning illuminates or any other clearly visible boundary indicators at night or when visibility is poor, or have resort to any other suitable and sufficient precautionary measure where this is not practicable;
- must ensure that all precautionary measures stipulated for confined spaces as determined in the General Safety Regulations, 2003, are complied with by any person entering any excavation;
- must, where the excavation work involves the use of explosives, appoint a competent person in the use of explosives for excavation, and must ensure that a method statement is developed by that person in accordance with the applicable explosives legislation; and
- must cause warning signs to be positioned next to an excavation within which or where persons are working or carrying out inspections or tests.

5.36 Demolition Work

Not applicable on this project.

5.37 Tunnelling

Not applicable on this project.

5.38 Scaffolding

A contractor must appoint a competent person in writing who must ensure that all scaffolding work operations are carried out under his or her supervision and that all scaffold erectors, team leaders and inspectors are competent to carry out their work.

A contractor using access scaffolding must ensure that such scaffolding, when in use, complies with the safety standards incorporated for this purpose into these Regulations under section 44 of the Act.

5.39 Bulk mixing plant

A contractor must ensure that the operation of a bulk mixing plant is supervised by a competent person who has been appointed in writing and is –

- aware of all the dangers involved in the operation thereof; and
- conversant with the precautionary measures to be taken in the interest of health and safety.

No person supervising or operating a bulk mixing plant may authorize any other person to operate the plant, unless that person is competent to operate a bulk mixing plant.

A contractor must ensure that the placement and erection of a bulk mixing plant complies with the requirements set out by the manufacturer and that such plant is erected as designed.

A contractor must ensure that all devices to start and stop a bulk mixing plant are provided and that those devices are placed in an easily accessible position and constructed in a manner to prevent accidental starting.

A contractor must ensure that the machinery and plant selected is suitable for the mixing task and that all dangerous moving parts of a mixer are placed beyond the reach of persons by means of doors, covers or other similar means.

No person may remove or modify any guard or safety equipment relating to a bulk mixing plant, unless authorized to do so by the appointed person.

A contractor must ensure that all precautionary measures stipulated for confined spaces as determined in the General Safety Regulations, 2003, are complied with when entering any silo.

A contractor must ensure that a record is kept of all repairs or maintenance to a bulk mixing plant and that the record is available on site to an inspector, the client, the client's agent or any employee.

5.40 Rope Access Work

Not applicable on this project.

5.41 Hazardous Chemical Substances (HCS)

In addition to the requirements in the HCS Regulations, the principal contractor must provide proof in the Health and Safety Plan that:

- Material Safety Data Sheets (MSDS's) of the relevant materials / hazardous chemical substances are available prior to use by the contractor. All MSDS's shall be available for inspection by the agent at all times.

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- Risk assessments are done at least once every 6 months.
- Exposure monitoring is done according to OESSM and by an Approved Inspection Authority (AIA) and that the medical surveillance programme is based on the outcomes of the exposure monitoring.
- How the relevant HCS's are being/going to be controlled by referring to:
 - Limiting the amount of HCS
 - Limiting the number of employees
 - Limiting the period of exposure
 - Substituting the HCS
 - Using engineering controls
 - Using appropriate written work procedures
- The correct PPE is being used.
- HCS are stored and transported according to SABS 072 and 0228.
- Training with regards to these regulations was given.

The Health and Safety plan should make reference to the disposal of hazardous waste on classified sites and the location thereof (where applicable).

The First Aider must be made aware of the MSDS and trained in how to treat HCS incidents appropriately.

5.42 Hazardous Biological Substances (HBS)

Because of the possible exposure of workers to raw sewage the H&S Plan shall include details of the following:

- The conducting of Risk Assessment specifically aimed at exposure to HBA which shall include the following
 - Nature and dose of HBA
 - Where HBA may be present and in what physical form
 - The nature of work or process
 - Steps in the event of failure of control measures
 - The effect of the HBA
 - The period of exposure
 - Control measures to be implemented
- Monitoring of exposure of workers shall be conducted to establish whether any worker is infected with an HBA associated with working or being exposed to raw sewage, in terms of the following:
 - By an occupational medical practitioner

- Before entering the site to establish the workers baseline
- During the period of the contract the risk assessment indicate possible exposure
- After completion of the contract
- Medical surveillance should such be required after the above-mentioned by an occupational health practitioner.
- Indication on how all records of assessment, monitoring, etc. will be kept, taking into account that records have to be kept for a period of 40 years.
- How exposure to HBA is to be controlled
- The provision of personal protective equipment
- What information and training is to be provided to employees regarding the following:
 - The contents of these regulations
 - Potential risks to health
 - Control measures to be implemented
 - The correct use and maintenance of personal protective equipment
 - The results of the risk assessment.

5.43 Noise Induced Hearing Loss

Where noise is identified as a hazard the requirements of the NIHL regulations must be complied with and the following must be included / referred to in the Health and Safety Plan:

- Proof of training with regards to these regulations.
- Risk assessment done within 1 month of commencement of work.
- That monitoring carried out by an AIA and done according to SABS 083.
- Medical surveillance programme established and maintained for the necessary employees.
- Control of noise by referring to:
 - Engineering methods considered
 - Admin control (number of employees exposed) considered
 - Personal protective equipment considered/decided on
 - Describe how records are going to be kept for 40 years.

5.44 Explosives and Blasting

Not applicable on this project.

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5.45 Personal Protective Equipment (PPE)

The Contractor shall carry out PPE or clothing needs analysis in accordance with his risk assessment, to determine the necessary PPE or clothing to be used during construction. The Contractor shall make provision and keep adequate quantities of SABS approved PPE or clothing on site at all times.

The Contractor must ensure that personnel are trained in the correct use of PPE to be used.

The Contractor must ensure that lost, stolen, worn out or damaged PPE is replaced as required and receipt signed for by employees on site.

5.46 Asbestos

Not applicable on this project.

Should asbestos be identified as a hazard whilst work is carried out, the following must be included in the health and safety plan:

- Notification to the Provincial Director in writing, prior to commencement of asbestos work.
- Proof of a structured medical surveillance programme, drawn up by an occupational medicine practitioner.
- Proof that an occupational health practitioner carried out an initial health evaluation within 14 days after commencement of work.

- Copies of the results of all assessments, exposure monitoring and the written inventory of the location of the asbestos at the workplace.
- Only proof that medical surveillance has been conducted and not the actual records itself since these areas of a confidential nature.
- How records are going to be kept safe for the stipulated period of 40 years.
- Proof that asbestos demolition (if applicable) is going to be done by a registered asbestos contractor and provide proof that a plan of work for such demolition is submitted to an Approved Asbestos Inspection Authority 30 days prior to commencement of the demolition.
- Provide proof that the plan of work was approved by the asbestos AIA and submitted to the provincial director 14 days prior to commencement of demolition work together with the approved standardised procedures for demolition work

5.47 Lead

Not applicable on this project.

Should lead be identified as a hazard whilst work is carried out, the following must be included in the health and safety plan:

- Proof that an occupational health practitioner carried out an initial health evaluation within 14 days after commencement of work.
- Copies of the results of all assessments, exposure monitoring and the written inventory of the location of the lead at the workplace.
- Only proof that medical surveillance has been conducted and not the actual records since these are of a confidential nature.
- How records are going to be kept safe for the stipulated period of 40 years.

5.48 Pressure Vessels (Including Gas Bottles)

Not applicable on this project.

5.49 Fire Extinguishers and Fire Fighting Equipment

The Contractor shall provide adequate, regularly serviced fire extinguishers located at strategic points on site. The Contractor shall keep spare serviced portable fire extinguishers. The Contractor shall have adequate persons trained or competent to use the Fire Fighting Equipment.

Safety signage shall be posted up in all areas where fire extinguishers are located.

5.50 Lifting Machinery and Tackle

Not applicable on this project.

5.51 Ladders and Ladder work

The Contractor shall ensure that all ladders are numbered and inspected regularly keeping record of inspections. It should be noted that Aluminium ladders are preferred to wooden ladders.

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5.52 General Machinery

The Contractor shall comply with the Driven Machinery Regulations, which include inspecting machinery regularly, appointing a competent person to inspect and ensure maintenance, issuing PPE or clothing and training those that use machinery and enforce compliance.

5.53 Portable Electrical Tools

The Contractor shall ensure that use and storage of all explosive actuating fastening devices and portable electrical tools are in compliance with relevant legislation.

The Contractor shall consider that:

- A competent person undertakes routine inspections;
- Only authorised persons use the tools;
- There are safe working procedures applied;
- Awareness training is carried out and compliance is enforced at all times; and
- PPE and clothing is provided and maintained.

5.54 High Voltage Electrical Equipment

The Contractor shall ensure that, where the work is under, on or near high-voltage electrical equipment the Electrical Installation Regulations, together with safety instructions (Regulations of the Owner of the Equipment) are complied with. Such equipment includes:

- Eskom and the Local Authority equipment
- The Contractor's own power supply; and
- Electrical equipment being installed but not yet taken over from a Contractor by The Client.

5.55 Public Health and Safety

The Contractor shall ensure that each person working on or visiting a site, and the surrounding community, shall be made aware of the dangers likely to arise from on-site activities and the precautions to be observed to avoid or minimize those dangers. Appropriate health and safety signage shall be posted at all times.

5.56 Night Work

Not applicable on this project.

5.57 Lighting

Where poor or lack of illumination is identified as a hazard the lighting regulations must be complied with and the following must be included in the H&S Plan:

- How lighting will be ensured/ provided where daylight is not sufficient and /or after hours are worked.
- Planned maintenance programme for replacing luminaries.
- Proof of illumination levels of artificial illumination equipment.

5.58 Environmental Conditions and Flora and Fauna

The Contractor must be mindful of adverse weather conditions upon the health and safety of the workforce. This includes inclement weather, strong wind, heat stress, extreme cold, etc. The Contractor's risk assessment process must take into account the risks associated with such weather conditions. The same is true when working in an environment where there is a risk to employees' health and safety from presence of poisonous flora, or wildlife (including bees, snakes, etc.). The Contractor's risk assessment process must take these risks into account.

5.59 Occupational Health

Exposure of workers to occupational health hazards and risks are very common in any work environment, especially in construction. Occupational health hazards and risks exposure is a major problem and all Contractors are to ensure that proper health and hygiene measures are put in place to prevent exposure to these hazards and risks.

The occupational hazards and risks may enter the body in three ways:

- Inhalation through breathing e.g. cement dust;
- Ingestion through swallowing maybe through food intake;
- Absorption through the skin (pores) e.g. painting or use of thinners.

The contractor is required to ensure that all his personnel are medically fit prior to being allowed onto the work site.

All Contractors should ensure that Occupational Hygiene surveys are conducted as per the Occupational Health and Safety Act to ensure employees are not exposed to hazards. Risk Assessments should identify areas where surveys are to be conducted.

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5.60 Suspended Platforms

Not applicable on this project.

5.61 Material Hoists

Not applicable on this project.

5.62 Explosive Actuated Fastening Device

Not applicable on this project

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6. TRAINING, INSPECTIONS AND RECORDS

The Contractor must be aware of the following additional requirements:

What	When	Output
Awareness training (Toolbox Talks)	At least fortnightly and before hazardous work is carried out	Attendance Register
Health and Safety Committee Meetings	Monthly	Minutes signed by employer
Health and Safety Reports	Monthly	Report covering: a) Incidents / Accidents and investigation b) Non conformance c) Health and Safety Training d) HIRA Updates e) Internal & External Audits
General Inspections	As per Health and Safety Specifications & OHSA	Report of Health and Safety Specifications and OHSA compliance: a) Scaffolding b) Lifting Machinery c) Excavations d) Construction vehicle
General Inspections	Monthly	Covering: a) Fire Fighting Equipment b) Portable Electrical Equipment c) Hand Tools d) Ladders
Record Keeping	On-going	Covering: a) General Complaints b) Fines c) General Incidents d) MSDS e) Surveillance Medicals f) Inspection Registers g) Department of Labour Notices

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ANNEXURE A

The contractor shall submit the info below in an Annexure 2 prior to construction commencement.

Item No.	Health and Safety Specification Requirement	OHSA Requirement	Submission date
1	Notification of Intention to Commence Construction	Construction Regulation 2014	At least 7 days before commencement on site
2	Construction Work Permit	Construction Regulation 2014	At least 30 days prior to project commencement
3	Assignment of Responsible Person to Manage Building Work Via Health and Safety Organogram	Construction Regulation 2014	Before commencement on site
4	Competency for Health and Safety Positions	Client / Client Agent requirement	Before commencement on site
5	Letter of Good Standing	Compensation of Occupational Injuries & Disease Act (COIDA) 130 of 1993	Before commencement on site
6	Occupational Health and Safety Policy	Client / Client Agent requirement	Before commencement on site
7	Risk Assessment, Safety Plan, Demolition Method Statement	Client / Client Agent requirement	Before commencement on site

ANNEXURE B: APPOINTMENTS

The Contractor shall make the following appointments:

No	Description	No	Description
1	Chief Executive Officer (OSHACT 16(1))	17	Material Hoist Inspector (CR19(8)(a))
2	Contract Director/Manager (OSHACT 16(2))	18	Material Hoist Operator (CR19(6))
3	Construction Manager (CR 8(1))	19	Bulk Mixing Plant Supervisor (CR20(1))
4	Construction Supervisor (CR 8(7))	20	Bulk Mixing Plant Operator (CR20(2))
5	Assistant Construction Supervisor (CR 8(8))	21	Controller of Explosive Actuated Fastening Devices (CR21(2)(g)(1))
6	Construction Safety Officer (CR 8(5))	22	Construction Vehicle and Mobile Plant Operator (CR23(1)(d)(i))
7	Construction risk assessor (CR 9(1))	23	Controller of Temporary Electrical Installations (CR24('c))
8	Fall Protection Competent Person (CR 10(1))	24	Stacking Supervisor (CR28(a))
9	Traffic Safety Officer	25	Fire Extinguishing Equipment Inspector (CR29(h))
10	Safety Representative (where > 20 employees on site)	26	Fire Fighters (CR29(i))
11	Temporary work Designer (CR 12(1))	27	First Aider (GSR 3)
12	Temporary work Supervisor (CR12(2))	28	Fall Protection Plan Developer (CR 10(1)(a))
13	Excavation Supervisor (CR13(1)(a))	29	Incident Investigator (OSHACT 9(2))
14	Demolition Supervisor (CR14(1))	30	Competent Person – Confined Spaces (GAR 5(1))
15	Scaffold Supervisor (CR16(1))	31	Health and Safety technical Committee (CR 31)
16	Suspended Platform Supervisor (CR17(1))	32	General Machinery Competent Person (GMR 2)

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7. PROJECT DETAILS

PROJECT DIRECTORY:		
Client	<p>SA National Parks 643 Leyds Street Muckleneuk Pretoria 0001</p> <p>GM: Infrastructure & Special Projects</p> <p>Contact: Ms Antionet van Wyk</p>	<p>Tel: 012- 426 5126 email: antionet.vanwyk@sanparks.org</p>
Client Agent	<p>Technical Services - ARID REGION</p> <p>RPM: Infrastructure & Special Projects</p> <p>Contact: Mr Marius Reinhardt</p>	<p>Cell: 082 796 9986 email: marius.reinhardt@sanparks.org</p>

PROJECT DETAILS:
<p>Description of Works The Provision of Potable Water for Twee Rivieren Nossob and Mata-Mata Rest Camps in Kgalagadi Tranfrontier National Park</p>
<p>Anticipated Construction Duration 2 Months Contract</p>
<p>Provisional Start Date August 2024</p>
<p>Completion Date September 2024</p>

EXISTING ENVIRONMENT:
<p>Hazards particular to this project by virtue of location:</p> <p>Wild Animals: The site is located in the Arid Region. A lookout for snakes and scorpions is going to be required to protect the workers.</p> <p>Members of public and children: All necessary steps to be taken to protect them from any dangers associated with the construction works being undertaken.</p> <p>Public Roads: Use of roads network to be carefully planned to accommodate public, tenants and traffic</p>
<p>Overhead, Above Ground and Underground Services crossing the site:</p> <p>Overhead: Not Applicable</p> <p>Underground: Applicable</p> <p>Ground Level: Applicable</p> <p>Services Drawings available: Applicable</p> <p>Way leaves required: Not Applicable</p> <p>Permits required: Applicable</p> <p>Isolation required: Not Applicable</p>

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<p>Existing structures and surrounding land use: All three sites are adjacent to staff villages. All necessary steps to be taken to protect the staff and their children from any dangers associated with the construction works being undertaken.</p>
<p>Existing ground conditions and ground survey report: There is no Geo Tech report available.</p>

<p>Existing Traffic Systems:</p> <p>Conditions: Gravel (sandy) Roads</p> <p>Restrictions to access: Applicable</p> <p>Speed restrictions: Normal road restrictions: 40km/h</p>
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<p>PROJECT HEALTH AND SAFETY REQUIREMENTS:</p>
<p>Significant health and safety hazards identified by Designer and Client Agent:</p> <p>Accommodation of Traffic (Management Plan): The Principal Contractor must supply a proper and comprehensive Traffic Management Plan for the various sites within this identification, i.e. the Site camp and surrounds as well as the work area and surrounds.</p> <p>Members of the Public: The Principal Contractor is responsible for the safety of the workers as well as the public. The Principal Contractor will have to have sufficient warning & information signage to assist with the information to the public.</p> <p>Wild animals: There are probably snakes and scorpions roaming the area and the principal Contractor will have to ensure that they or the workers do not get killed or hurt during the construction phase.</p> <p>Normal construction hazards expected are as follow:</p> <p>Compacting and filling / Compactors Operations Excavations Hand Tools Members of public Plant / Vehicle and Equipment Operations Site Establishment Snakes & Scorpions Temporary Works Transportation of workers</p> <p>NOTE: Please refer to the end of this Health and Safety Specification for the baseline risk assessment of these risks.</p>

<p>ACTIVITIES REQUIRING APPROVED METHOD STATEMENTS</p>
<p>Protection of Public and staff</p>

<p>ACTIVITIES REQUIRING PERMITS</p>
<p>Permit to Dig / Permit to Enter Excavations: Not applicable on this project</p> <p>Permit to Work with Electricity: Not applicable on this project</p>

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Confined Space Permit:	Not applicable on this project
Hot Works Permit:	Not applicable on this project
Permit to work under Power Lines:	Not applicable on this project
Blasting:	Not applicable on this project Yes - Authorization in writing by competent person
Temporary Works:	None

GENERAL ARRANGEMENTS	
Restrictions on times:	Monday - Friday 07:00 to 17:00 Saturday 07:00-13:00
Access to site by Construction Vehicles:	Yes, principal contractor to manage
Access to site by Construction workers & Visitors:	Visitors and personnel to report to site office
Site camp location and set up:	Restrictions/requirements, storage areas and security to be advised in consultation with principal agent
Ablution and Welfare:	Contractor to provide as per regulations
Environmental Conditions:	Contractor must take into account that Kgalagadi Tranfrontier Park is an echo sensitive conservation area and implement control measures to mitigate risk
Induction Training:	All workers to receive induction training prior to commencement on site. Special reference to SANParks EMP and Code of Conduct

PROTECTION OF SITE AGAINST UNAUTHORIZED ACCESS BY PUBLIC	
Excavation Fencing: Note that excavations accessible to public, or adjacent to public roads / through fares, must have (1) barrier / fence of at least 1m in height, and (2) warring illuminates at night or when visibility is poor, or have other suitable precautionary measures if both are not practicable. The entire site is to be fenced off with ready fencing. There needs to be access control as well as security personnel on site at all times.	
Warning Notices: Construction site, Visitors to report to the site office. Visible signage for Fire Extinguisher, First Aid, Emergency Assembly area and Emergency telephone numbers. Safety boots, hard hats, and dust masks signage to be displayed.	

PERSONAL PROTECTIVE EQUIPMENT (PPE)	
The Client requires the Contractor to ensure that employees (and other under his/her control) wear the following minimum PPE:	
Overalls:	Yes, required
Safety Harnesses:	May be required
Hard Hats:	Yes, required
Safety Footwear:	Yes, required

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Reflective Vests:	Not required
Goggles / Gloves / ear and respiratory protection	As per job function
Specialist equipment:	As per job function

HAZARDOUS SUBSTANCES

The following materials and substances have, or may have, to be used in the works and are identified as potentially posing special health and / or safety hazards during the project. Appropriate measures will need to be specified for their control:

Petrol	Cement
Diesel	Silicone
Paint	Other

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Baseline Risk Assessments

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PROJECT: Provision of Potable Water for Twee Rivieren, Nossob and Mata-Mata Rest Camp in Kgalagadi Transfrontier National Park

Risk Rating is measured by determining the Likelihood (L) and Consequence (C) and using the Matrix to determine the Risk Rating (R).

Risk Ranking below 9 is deemed Tolerable, between 10 and 19 is deemed Medium Risk and above 20 is deemed High Risk

Steps in operation	Ref No.	Hazard	Risk	Risk Rating			Controls Measures	Action to mitigate
				P	F	S		
General Onsite Activities	A1	Access to Site	Pedestrian & people equipment interaction causing injury	4	2	12	Occupational Health and Safety Act 24(1)	Area to be secured and barricaded / fenced
			Dust Inhalation	3	1	4	Hazardous Chemical Substances Regulation (36)(37)(38)	Induction Training & PPE
			Unauthorised entry	3	2	8	Occupational Health and Safety Act 12(2)	Site Visit Register, signage, Permit for vehicle access
			Slip,trip,and fall	3	2	8	Occupational Health and Safety Act 12(1)(b)(c)	Induction Training & PPE
	A2	Placing of office/ containers if lifting is involved	Heavy objects swinging out of control causing injury/damage	2	4	14	Driven Machinery 18(11)	Safe work area, Induction Training, Trained operator, Lifting Plan
			Crane/lifting tackle failure causing object to fall	2	4	14	General Machinery Regulations 7(a)9b)	Inspection Register, Trained operator
			Accidental collision with overhead power lines	2	4	14	General Machinery Regulations 7(a)(b)	Assign a flag man, determine safe work area
			Lifting machine/crane falling over	2	4	14	General Machinery Regulations 5(1)(2)	Assign a flag man, determine safe work area
	A3	Hand Loading and offloading of heavy machinery & equipment	Items rolling/slipping falling causing injury	4	2	12	General Machinery Regulations 2(1)	Induction training, PPE
			Incorrect Lifting procedure resulting in injury	3	2	8	General Machinery Regulations 3(2)	Induction training, Proper lifting procedure, PPE
	A4	Machine loading and offloading of heavy machinery & equipment	Failure of machinery causing injury	3	3	13	Driven Machinery 18(1)(a)(b)	Supervision
			Equipment falling	3	3	13	General Machinery Regulations 2(2)	PPE

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Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
			Collision of vehicles	3	3	13	General Machinery Regulations 7(a)(b)	Flag men
	A5	Traffic	Equipment interaction	3	4	18	Construction Regulation 23(1)(d)(i)(ii)	Traffic management plan
			Pedestrian collision	3	4	18	Construction Regulation 23(2)(c)	Pedestrians Walkways
	A6	Lack of employees' facilities	Lack of drinking water, dehydration of workers	3	5	22	Construction Regulation 30(1)(a)	Provision of drinking water & Induction training
			Lack of sanitary facilities, unhygienic conditions	3	5	22	Construction Regulation 30(1)(b) and 30(2)	Provision of chemical toilets & proper housekeeping
	A7	Stacking & Storage	Fall, slip resulting in potential injury/damage	4	3	17	Construction Regulation 28(d)	Storage plan, induction training and restricted access
			Obstructing critical equipment and walkways	4	3	17	Construction Regulation 27 (a)(c)(g)	Storage plan, induction training and restricted access
			Flammable liquids catching fire	3	3	13	Construction Regulation 25(a)(b)(c)	Storage plan, induction training and firefighting equipment
			Hazardous storage of materials	3	3	13	Hazardous Chemical Regulation (25)9A (2)	Storage plan, regular inspections
	A8	Handling of chemicals and fuels	Exposure	3	3	13	Hazardous Chemical Regulation 9A (1) (a-p)	PPE
			Inhalation	3	3	13	Hazardous Chemical Substances Regulation (36)(37)(38)	
			Burns to Skin	3	3	13	Hazardous Chemical Substances Regulations 9A (2); Material Data Sheet	
	A9	Temporary Low voltage Electrical installation	Exposure to live wires-electrocution	2	5	19	Construction Regulation 24(a)(b)	Lockable DB box, Inspection register
			Faulty earth leakage	2	5	19	SANS 10142	Competent person to do installation & inspection
			Short circuit causing fire	2	4	14	Construction Regulation 24(b)	Weekly inspection, Induction Training & Firefighting equipment
	A10	Issue of PPE	Incorrect PPE	4	2	12	General Safety Regulation 2(1)	PPE Register

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Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
	A11	Usage of PPE	Incorrect use of PPE	4	2	12	General Safety Regulation 3(2)	PPE Register, Induction Training, supervision
			Negligence to use PPE	4	2	12	General Safety Regulation 5	PPE Register, Induction Training, supervision
	A12	Adverse storms	Struck by lightning	2	5	19	Induction Training Safe Operation Procedure	Proper warning system
	A13	Adverse heat	Dehydration, Sunburn, heat stroke	3	4	18	Induction Training Safe Operation Procedure	Proper drinking water, PPE
	A14	Working in excessive winds	Exposure to dust	3	4	18	Hazardous Chemical Substances Regulation (36)(37)(38)	PPE
	A15	House keeping	Objects lying around can result in slip/fall	4	2	12	Construction Regulation 27(a)(b)	Regular cleaning of site
			Unhygienic conditions	3	3	13	Construction Regulation 27(d)	Induction Training
	A16	Fire prevention	Open Fires	3	3	13	Construction Regulation 29(a)	SANParks EMP & Code of conduct
			Inadequate firefighting equipment	4	3	17	Construction Regulation 29(g)(h)	Inspection register, supervision
			Run-away fires	4	4	21	Emergency evacuation plan	SANParks EMP & Code of conduct
			Accidental Fires	3	4	18	Construction Regulation 29(a)(d)(iii)	Designated smoking areas
	A17	Environmental pollution	Pollution of ground, air,workspace	3	2	8	Environmental Regulation 6(d)	SANParks EMP & Code of conduct
			Littering	4	2	12	SANParks Environmental Management Plan	Induction Training, Provide proper trash bins
	A18	Working near hazardous animals incl snakes, spiders & scorpions	Poisons bites/ attack by large animals	3	3	13	SANParks Environmental Management Plan	Induction Training, SANParks ranger where required, Proper treatment in first aid kit
	A19	Working in close proximity of water	Falling into water & drowning	3	4	18	Construction Regulation 26(1)(a)(b)	Safe work area, Induction Training, barricades

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Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
			Pollution of water body	3	4	18	SANParks Environmental Management Plan Construction Regulation 26(2)	Induction Training
Plant or vehicle & equipment	B1	Construction vehicles	Equipment Failure	4	4	21	Construction Regulation 23(1)(k)	Vehicle check list and regular maintenance
			Speeding/ Operation	3	4	18	Construction Regulation 23(2)(l)	Safe traffic route, imply penalties, traffic calming measures
			Potential accident/collision	4	4	21	General Machinery Regulations 7(a)	Induction Training, Reflective vests, safe work area
			Material/equipment fall from vehicle	4	4	21	Construction Regulations 23(1)(b)(g)(h)	Properly secure all goods
	B2	Licencing of operators	Vehicle/plant not used for correct purpose	3	3	13	Construction Regulations 23(1)(b)(c)	Supervision, controlled access to vehicle/plant
			Unauthorized operation of equipment	3	3	13	Construction Regulation 23(1)(d)(i)(ii)	Valid operator, restricted access to machinery, supervision
			Expired licenses	3	1	6	Construction Regulation 23(1)(d)(i)(ii)	Keep OHS file up to date
	B3	Parking of vehicles	Runaway vehicle	3	4	17	Safe Operation Procedures (SOP)	Vehicle check list, use stop block behind tyres
			Parking in unsafe areas	3	1	4	Construction Regulation 23(2)(i)(j)	Demarcate proper parking areas
Transportation	C1	Transportation of employees	Interaction with other vehicle-collision	4	4	21	Construction Regulation 23(1)(b)(j)	Supervisor
			Equipment not roadworthy	3	1	4		Vehicle checklist, vehicle must meet required standards
			Equipment not licensed	3	1	4	Construction Regulations 23(a)(b)	Supervision and monitor
			Operator of vehicle transporting employees not licensed and authorized	3	1	4	Construction Regulation 23(2)(i)(j)	Supervision and monitor if Driver has Valid PDP
			Vehicle not equipped to transport employees	3	1	4	Construction Regulation 23(d)(i)(j)	Vehicle checklist, vehicle must meet required standards

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			Not Adhering traffic legislation	3	1	4	Construction Regulation 23(2)(j)	Supervision, implement fines
	C2	Transportation of material or equipment with people	Material/equipment fall from vehicle	4	4	21	Construction Regulation 23(g)(h)	Properly secure all goods
			Potential accident/collision	4	4	21	Construction Regulation 23(2)(g)(h)(j)	Induction Training, Reflective vests, safe work area
			Towing coupler failure	3	3	13	Construction Regulation 22(e)	Inspection Register
Hand Tools	D1	Injury Due to	Incorrect tools used	4	3	17	Hand tool register, Induction Training,	Supervision
			Defective tools	4	3	17	Safe Operation Procedure	Supervision
			Struck by flying debris	3	3	13	Safe Operation Procedure	PPE

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Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
	D2	Hand Drills	Clothing being grabbed by rotating drill	3	3	13	Safe Operation procedure, Toolbox Talks Electrical Machinery Regulations 10(3)(4)	PPE, Supervision
			Unsecured work piece rotating with drill	3	3	13		PPE, Supervision
			Shaving flying into eyes	3	3	13		PPE, Supervision
			Accidental injury	4	3	17	Electrical Machinery Regulations 10(4)	PPE, Supervision
			Electrocution	3	5	22	Electrical Machinery Regulations 10(1)(a)(b)	Tool inspection register
	D3	Explosive actuated fastening device	Malfunction of equipment causing injury/damage	3	3	13	Explosive Regulations 15(a)(b)	Tool inspection register, inspect extension cord
			Accidental injury	3	3	13	Explosive Regulations 15(b)	PPE, Supervision
			Accidental discharge	3	3	13	Explosive Regulations 15(a)(b)	Safety mechanism working, Store in unloaded condition
	Site Clearance	E1	Site/Bush Clearing	Moving machinery accident	4	3	17	Construction Regulation 23(2)(b)
Injury due to hand tools				4	3	17	Safe Operation Procedures (SOP)	Induction Training, PPE, First Aider
Snakes/ Spider bites				3	3	13	SANParks Environmental Management Plan	Induction Training, Proper First Aid treatment available
Dangerous animals in vicinity				3	3	13	SANParks Environmental Management Plan	Induction training, armed rangers escort
Electrical cables and other services in way of work area				3	4	17	Construction Regulation 24(c)	Properly mark & demarcate existing services
E2		Tree felling	Injury from chainsaw	3	3	13	Safe Operation Procedures (SOP)	Trained operator, PPE
			Injury from falling tree	3	3	13		Safe work area, PPE
			Felling from height	3	3	13		Safety Harness, Fall Protection Plan, PPE

Contractor

Witness for Contractor

Employer

Witness for Employer

Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
			Exposure to electrical cables	3	3	13	Electrical Installation Regulations (5)(1)(2)	Safe work area, PPE
	E3	Removal of waste	Moving machinery accident	4	4	22	Construction Regulation 23(1)(b)(c)	Reflective vests, restricted access, induction training
			Waste material falling of vehicle	3	3	13	Construction Regulations 23(h)	Secure load, stay within maximum vehicle load capacity
			Dust Inhalation	3	2	8	Hazardous Chemical Substances Regulation (36)(37)(38)	Induction Training & PPE
	E4	Demolition	Structure/rubble falling on person	3	3	13	Construction Regulation 14(1); 4(ii)	Induction Training, PPE, demarcate area
			Dust Inhalation	3	2	8	Hazardous Chemical Substances Regulation (36)(37)(38)	Induction Training & PPE
			Presence of lead	2	4	14	Lead Regulations (3)	PPE, Induction Training
			Presence of Asbestos	2	4	14	Asbestos Regulations (4)	PPE, Induction Training
			Hitting electrical cable - electrocution	3	5	22	Construction Regulation 24(a)	Induction training, Site map indicating existing services
			Hitting of gas line - explosion	3	5	22	Construction Regulation 14(1)(2)	Induction training, Site map indicating existing services
Excavation & backfilling	F1	Hand Digging of holes/trenches	Injury due to defective tools	4	3	18	Construction Regulation 13(a)	Hand tool register, Induction Training
			Injury due to improper work method	4	3	18		Induction training, supervision
			Trip/fall into holes	3	3	13		Demarcate area, induction training, PPE
	F2	Machine Digging of holes/trenches	Collapse of trench	3	3	13	Construction Regulation 14(4) (iii)	Excavation inspections register by component person daily
			Collapse of adjacent structure	3	3	13	Construction Regulation 11(1)(a)	Safeguard adjacent structures
			Malfunction of machinery	3	3	13	General Machinery Regulations 2(2)	Machinery Inspection Register

Contractor

Witness for Contractor

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Employer

Witness for Employer

Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
			Unauthorized driver	2	2	5	General Machinery Regulations 2(1)	Trained operator, supervision, restricted access to machinery
			Unnecessary Damage to environment	3	2	9	SANParks Environmental Management Plan	Induction Training, designated work area
	F3	Tipping of material	Material falling on to person	3	3	13	Construction Regulation 23(g)	PPE, Safe Work area, Flag men
			Malfunction of equipment causing injury/damage	3	3	13		
	F4	Hitting of electrical cable and services	Electrocution	3	5	22	Construction Regulation 24(a)(b)(c)	Induction training, Site map indicating existing services
	F5	Opening trenches	Risk of collapse	3	3	13	Construction Regulation 13(h)(l)	Stabilize trench, work permit, induction training
			Fall, slip into trench	4	3	17	General Safety Regulations 2(5)(6)	Barricade trench, PPE
	F6	Compaction	Personal Injury	3	3	13	General Safety Regulations 2(5)	PPE, Trained operator
			Collision of machinery	3	3	13	General Machinery Regulations 4(1)	Induction Training, Reflective vests, safe work area
			Dust Inhalation	3	2	8	Hazardous Chemical Substances Regulation (36)(37)(38)	Induction Training & PPE
Installation of Pipes/cables	K1	Installation of sewer/water pipes in trenches	Fall, slip into trench	4	3	17	Electrical Installation Regulations (5)(1)(12)	Barricade trench, PPE
			Exposure to Hazardous biological agents	3	3	13	Hazardous Biological Agents Regulations 5(2)	Hazardous biological
			Pipe handling/lifting resulting in injury	3	3	13	Hazardous Biological Agents Regulations 5(2)	Hazardous biological

Contractor

Witness for Contractor

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Employer

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Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
	K2	Installation of electrical cable in trench	Fall, slip into trench	4	3	17	Electrical Installation Regulations (2)(1)(2)	Barricade trench, PPE
			Cable handling/lifting resulting in injury	3	3	13	Electrical Installation Regulations (2)(1)	Induction Training, PPE
Concrete	J1	Manual Mixing	Cement dust inhalation	3	2	8	Hazardous Chemical Substances Regulations 9A (2)(2) Material Safety Data Sheet (MSDS)	Material Safety Data Sheet, PPE Supervision
			Hazardous substance contacts dry cement mix	3	3	13		PPE, Induction Training
			Spillage/pollution	3	3	13		PPE, Concrete mixing sheet
			Injury during mixing/cement burns	3	3	13		Induction Training, Supervisor, PPE
	J2	Concrete Mixer Machine	Poor ventilation causing ill health	3	2	8	General Safety Regulations 5(5)	PPE, Additional ventilation
			Accidental injury through flying objects	3	3	13	Hazardous Chemical Substances Regulations 10(3)	Induction Training, Supervision
			Spillage/Pollution	3	3	13		Induction Training, PPE
			Clothing/body parts getting caught in open pulley V -BELT	3	3	13		Induction Training, inspection register, moving parts covered with guard
			J3	Bulk Mixing Plant	Unauthorised operations	3		3
	Malfunction of equipment causing injury/damages	3			3	13	Construction Regulation	PPE, Fall Protection Plan, Safe Work area
	L4	Work on Water pipeline reticulation	Person coming into contact with liquid under pressure	3	3	13	Safe Work Procedure Hazardous Biological Agents Regulation 10(1)(a)(b); 2(a)(b)(c)	PPE

Contractor

Witness for Contractor

Employer

Witness for Employer



Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
			Exposure to thread sealant	3	3	13		PPE
			Release of pressure during pressure test	2	2	5		PPE
	L5	Work on Sewer pipeline reticulation	Person coming into contact with hazardous biological agents	3	2	8	Safe Work Procedure Hazardous Biological Agents Regulation 10(1)(a)(b); 2(a)(b)(c)	PPE
			Explosion due to hazardous fumes	3	2	8		PPE, Induction Training
			Suspended pipe work, pipe falling on person	3	2	8		
			Person coming into contact with liquid under pressure	3	3	13		PPE
	L6	Medium Voltage reticulation	Electrocution	3	5	22	Construction Regulation 24(a)(b)(c)	Competent person to do installation & inspection
			Dangerous/unsafe cable Joints	3	3	13	Construction Regulation 24(d)(e)	Supervision
			Accidental switch on while work in progress	3	5	22		Apply lockout procedure before doing connections
			Short circuit can blow up when switching	3	5	22		PPE
L7	Exposure to mechanical components	Injury from moving parts	3	3	13	Occupational Health and Safety Act 24(1)(a)(c)		
		Electrocution	3	3	13			
		Explosions	3	3	13			

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Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
	L8	Water & Sewerage Treatment	Chemical Exposure Slip and fall Exposure to UV lights				Hazardous Chemical Substances Regulations 4(a)(b)(d)(f)(g) Material Date Sheet	Sampling
	L9	High Voltage reticulation > 1000V	Discharge of cable	3	5	22	Electrical Installation Regulations 9(1) General Machinery Regulations 2(1)(2)(3)(i)	Correct measuring equipment
			Electrocution	3	5	22	Construction Regulation 24(a)(b)(c)	Competent person to do installation & inspection
	L10	Exposure to plant material with reedbed construction	Dangerous/unsafe cable Joints	3	3	13	Electrical Installation Regulations 2(1)(2)(3)	Supervision
			Accidental switch on while work in progress	3	5	22		Apply lockout procedure before doing connections
			Short circuit can blow up when switching	3	5	22		PPE
Metalwork	M1	Welding and flame cutting	Unsafe flame cutting/ welding equipment	3	5	22	General Safety Regulations 9(1)(a)(b)(d) General Safety Regulations 9(4)(a)(b)(i)(ii)	Flame cutting equipment to be fitted with flashback arrestors, supervision
			Employees not competent to perform duty	3	3	13		Supervision
			Unsafe storage	3	3	13		Proper storage facility
			Injury / burns to person	3	3	13	Occupational Health and Safety Act 24(1)(a)(c)	Burn shield in First Air Box
			Accidental fire	3	3	13		Firefighting equipment
	M2	Steel fixing	Injuries from tie wire	3	3	13	Construction Regulations 10(4)(b)(c)(i)(ii)	PPE, Induction Training

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Steps in operation	Ref No.	Hazard	Risk	P	F	S	Controls Measures	Action to mitigate
			Fall from heights	3	3	13		PPE, Fall Protection Plan
			Falling components	3	3	13		PPE, safe work area, catch nets
			Back injuries from manual handling	3	3	13	Construction Regulations 10(4)(b)(c)(i)	PPE, limit lifting weight
			Steel structure collapsing	3	3	13		PPE, Supervision

Contractor

Witness for Contractor

Employer

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INITIALS	SURNAME	DESIGNATION	CONTACT DETAILS	HIRA TRAINING	SIGNATURE	DATE
M	Reinhardt	Regional Project Manager	082 796 9986	Yes		
F	Marais	Manager Technician	082 796 9986	Yes		
C	Jonker	Senior Manager Technical Services	012 426 5303	Yes		
Z	Mkhonza	OHS Coordinator Compliance	012 426 5199	Yes		26.03.2024

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LIKELIHOOD RATING	DESCRIPTION	FREQUENCY
5 - Almost certain	Expected to occur in most circumstances	Recurring event e.g. More than once per month.
4 - Likely	The event will probably occur	Event that may occur frequently once per year
3 - Possible	Might occur occasionally	Event that may occur. Once in 3 years
2 - Unlikely	Could happen some time	Event that is unlikely to occur. Once in 10 years
1 - Rare	May happen only in exceptional circumstances	Event that is very unlikely to occur

IMPACTS				
CONSEQUENCE RATING	ENVIRONMENTAL	SAFETY	HEALTH	FINANCIAL IMPACT
5 - Critical	Permanent environmental damage to an extensive area	Fatality. Permanent disabling injuries.	Life threatening or permanently disabling illness.	>R 500 000
4 - Major	Long term environmental damage extending to a large area requiring high level intervention	Severe irreversible damage to one or more persons. Lost Time Injury greater than 10 days.	Severe and irreversible health effects or disabling illness.	R100 000 –R499 000
3 - Moderate	Short term environmental damage requiring some intervention	Reversible injury or moderate irreversible impairment. Less than 10 days lost time	Severe but reversible health effects. Results in a lost time illness of less than 10 days.	R10 000 - R99 999
2 - Minor	Short term environmental damage affecting a small area easily remediated	Medically treated injury. Does not lead to restricted duties.	Reversible health effects of concern that results in medical treatment but does not lead to restricted duties.	R1 000 – R9 999
1 - Insignificant	Minimal environmental damage affecting a very small area immediately remediated	Single minor injury to one person. First aid or no treatment required. No lost time.	Reversible health effects of minor concern only requiring minor medical treatment.	R0 - R1 000

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LIKELIHOOD							
CONSEQUENCE			1	2	3	4	5
			RARE	UNLIKELY	POSSIBLE	LIKELY	ALMOST CERTAIN
	1	INSIGNIFICANT	1	2	3	4	5
	2	MINOR	2	4	6	8	10
	3	MODERATE	3	6	9	12	15
	4	MAJOR	4	8	12	16	20
	5	CRITICAL	5	10	15	20	25

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Contractor

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Risk rating	Risk magnitude	Response
16 - 25	High	Immediate action required to reduce risk. Introduce hard barriers and adequate controls to reduce risk. Control hazards/ Monitor regularly. Ensure the risk has been eliminated so far as is reasonably practicable
9 - 15	Moderate	Urgent attention to improve controls & reduce inherent risks. Monitor systems controls, implement controls, or minimised in accordance with the hierarchy of controls so far as is to reduce the risk.
0 - 8	Low	Tolerable risk level. Carry out activity following review and implementation of effective risk controls in accordance with the hierarchy of controls. Ongoing monitoring and management required by employees and line supervisors to use safe working procedure

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DEFINITIONS		Probability (1 - 5)		Determining your prioritisation rating (AP)			
Hazard	Is a condition, activity, object or substance that has the ability to cause harm.	1	Highly improbable	%	Prioritization indicator	Action	
Risk	Is the chance or likelihood of a hazard causing harm or damage.	2	Less than even chance	1% - 20%	E	Monitor the situation	
Probability	The likelihood of a specific outcome/consequence	3	Improbable	21% - 40%	D	Within six months	
Frequency	A measure of the rate of occurrences of an event expressed as the number of occurrences at a given time	4	Probable	41% - 60%	C	Within one month	
Severity	Degree or harm of the outcome/consequence	5	Inevitable	61% - 80%	B	Within one week	
This HIRA does not necessarily cover all hazards associated with the operation / equipment. It is designed as a guide to compliment the Operational Specific HIRA, which must be carried out for each task forming part of an operation.				81% - 100%	A	Immediate	
Frequency (1 - 5)		Severity (1 - 15)					
1	Hazard arise 2 yearly	1	Superficial injuries, minor cuts and bruises, nuisance and irritations (e.g. eye irritations & headaches), ill health leading to temporary discomfort.	6	Laceration, burns, concussion, serious sprains, minor fractures, deafness, dermatitis, asthma, work related upper limb disorder, ill health leading to permanent minor disablement.	11	Amputation, major fractures, poisoning, multiple injuries, fatal injuries, Occupational cancer, other severely life shortening diseases, acute fatal diseases.
2	Hazard arise yearly	2		7		12	
3	Hazard arise every month	3		8		13	
4	Hazard arise every week	4		9		14	
5	Hazard permanently present	5		10		15	

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10. HEALTH AND SAFETY SPECIFICATION ACKNOWLEDGEMENT RECEIPT

Contractor's Acknowledgement:

I, _____ representing
_____ (Contractors), have satisfied
myself with the content of this Health and Safety Specification and have made the relevant provision
under my Preliminary & General Section for any and all costs involved to ensure compliance of this
Specification and shall we be the successful contractor, we shall ensure that our employees and
contractors on site comply with the requirements of this documents, our safety documentation and
health and safety legislation.

.....

Signature of Contractor

.....

Date

Comments:

Contractor

Witness for
Contractor

Employer

Witness for
Employer

Annexure B

Environmental Management Plan

Contractor

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Contractor

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Employer

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Employer

Environmental Management Plan

Part
1

General construction activities

Park: **KGALAGADI TRANSFRONTIER PARK**

Project: PROVISION OF POTABLE WATER FOR TWEE RIVIEREN, NOSSOB AND MATA-MATA REST CAMPS
CONTRACT NO: CI-KH-0028/1

Prepared by:



South African National Parks
P.O. Box 787
PRETORIA
0001

1. ENVIRONMENTAL MANAGEMENT PLAN

A. DECLARATION

I the undersigned in my capacity as designated below to hereby undertake to ensure that the conditions and recommendations in terms of the Environmental Management Plan (EMP) for the renovation, upgrading, and construction activities in a National Park are implemented and assume responsibility and accountability in this respect.

I further understand that officials from SANParks may during any phase of the project, conduct an inspection of the development in order to ensure compliance with the conditions and recommendations in the EMP.

EMPLOYER

Name: _____

Signature: _____

Date: _____

CONTRACTOR

Name: _____

Signature: _____

Date: _____

Contractor

Witness for
Contractor

Employer

Witness for
Employer



Part 1

1. ENVIRONMENTAL MANAGEMENT PLAN

1.1 GENERAL

Definition of an **“Environmental Management Plan”**:

A plan or programme that seeks to achieve a required end state and describes how activities, which have or could have an adverse impact on the environment, will be mitigated, controlled, and monitored.

The EMP will address the environmental impacts during the design, construction and operational phases of a project. Due regard must be given to environmental protection during the entire project. In order to achieve this, a number of environmental specifications/recommendations are made. These are aimed at ensuring that the contractor maintains adequate control over the project in order to:

- Minimise the extent of impact during construction.
- Ensure appropriate restoration of areas affected by construction.
- Prevent long term environmental degradation.

The contractor must be made aware of the environmental obligations that are stipulated in this document, and declares himself/herself to be conversant of all relevant environmental legislation. The contractor should also be aware that the Park Manager / Environmental Control Officer will monitor the implementation of the procedures.

1.2 OBJECTIVES OF THE EMP

The EMP has the following goals:

- Identifying those construction activities that may have a detrimental impact on the environment;
- Detailing the mitigation measures that will need to be taken, and the procedures for their implementation;
- Establishing the reporting system to be undertaken during the construction.

The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactory prevented or mitigated, corrective action will have to be taken. The document should, therefore, be seen as a guideline that will assist in minimising the potential environmental impact of activities.

Definition of **“mitigation measures”**:

Mitigation seeks to find better ways of doing things, by the implementation of practical measures to reduce, limit, and eliminate adverse impacts or enhance project benefits and protect public and individual rights.

The EMP also defines the arrangements that will be put in place to ensure that the mitigation measures are implemented by including recommendations of the roles and responsibilities of the project proponent, environmental management team and contractors.

1.3 COMPONENTS OF THE “EMP”

1.3.1 Introduction

This EMP adopted a precautionary approach, or in the case of management recommendations, a philosophy of ‘best practice’. Mitigation measures may then be of a more generic nature without compromising its importance to be implemented.

Therefore the purpose of this EMP is to draft and maintain a detailed management plan that, if put into practise, will effectively prevent/minimise environmental degradation.

1.3.2 The EMP in Context

This EMP will form part of a project tender and contract. Pre-construction and construction phase mitigation guidelines and clauses should be written into the construction contract documents as specifications. The contents of this EMP shall be deemed to be included in the rates tendered to execute and complete the works.

1.3.3 Flexibility

The EMP is a dynamic and flexible document subject to review and updating. During the implementation of a project there is always the possibility that unforeseen issues could arise, this EMP should therefore be revised where necessary to mitigate unanticipated impacts.

1.3.4 EMP Implementation Period

The EMP will focus on and operate during the whole implementation / construction period and maintenance phase of the projects.

1.3.5 Roles and Responsibilities

Supervision and monitoring are fundamental to the successful implementation of an EMP. Therefore, it is vital that monitoring of the extent to which the mitigation measures of this EMP, are adhered to by consultants and contractors, takes place.

All of the issues described and discussed in this document will require monitoring, and it will be the responsibility of SANParks to undertake this monitoring according to the specifications of this EMP.

- To draft and implement a monitoring programme to assess compliance with the EMP.
- To appoint an Environmental Control Officer (ECO) during the Construction Phases.

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Contractor

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- To undertake the monitoring of operations during the operational phase. Any problems that are identified or encountered must be reported to SANParks management so that appropriate action may be taken to rectify the situation.

1.3.5.1 Appointment of an Environmental Control Officer

The position of Environmental Control Officer has been created to ensure that the mitigation measures and other requirements set forth in the EMP are adhered to. It is recommended that SANParks appoint an Environmental Control Officer (ECO) during the construction phase of the project. The ECO can be a Section Ranger.

The following guidelines apply to the functions of an ECO:

- The ECO should have the ability to understand the contents of the Environmental Management Plan (EMP) and explain it to the contractor, the site staff, the supervisors and any other relevant personnel or I&AP's.
- The ECO would have to be on site on a regular basis – preferably daily to supervise environmental actions associated with construction activities.
- The ECO should be able to understand, interpret, monitor, audit and implement the EMP. This is his most important function.
- The ECO must then give feedback of the audits to SANParks and Contractors. This must be in the form of a written report.
- The ECO must ensure that the contractor understands what is to be done to rectify and address any problems that have arisen from the audit.

1.3.6 Feedback to Park Manager and ECO

Reporting to the Park Manager and ECO should take place during site meetings – in the case of potential “fatal flaws”/crises developing due to implementation of the project, reporting should be done immediately and the potentially adverse activities immediately halted in order that corrective action can be taken.

Reporting on the status of implementation of the EMP and the results of the environmental monitoring programme must be recorded and summarised in a monthly report by the ECO and submitted to the Park Manager.

1.3.7 Failure to comply with EMP

Outlined below are a number of steps, relating to increasing severity of environmental problems, which will be implemented. The principle is to keep as many issues within the first few steps as possible.

- **Step 1**
The ECO discusses the problem with the contractor or guilty party, and they work out a solution together. The ECO records the discussion and the solution implemented.

- **Step 2**
The ECO or SANParks observes a more serious infringement, and notifies the guilty party in writing, with a deadline by which the problem must be rectified. All costs will be borne by the contractor.
- **Step 3**
The ECO shall order the contractor to suspend part, or all, the works. The suspension will be enforced until such time as the offending party(ies), procedure or equipment is corrected and/or remedial measures put in place if required. No extension of time will be granted for such delays and all cost will be borne by the contractor.
- **Step 4**
Breach of contract - One of the possible consequences of this is the removal of a contractor and/or equipment from the park and/or the termination of the contract, whether a construction contract or an employment contract. Such measures will not replace any legal proceedings that SANParks may institute against the contractor.

Contractor

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Part 2

2. DESCRIPTION OF MITIGATION MEASURES

This section of the report serves to prescribe mitigation measures to reduce, limit, eliminate or compensate for impacts, to acceptable/insignificant levels. In setting mitigation measures, the practical implications of executing these measures must be borne in mind. With early planning, both the cost and the impacts can be minimised.

The stipulations of this report should be conveyed to contractors prior to the commencement of construction.

2.1 PRE-CONSTRUCTION MANAGEMENT PLAN

The pre-construction or planning management plan is to be used as a guide during the planning, design and detailing of the development components. This part of the plan is to be referenced by all involved in decision making during the planning and design phases.

2.1.1 EMP TRAINING

Mitigation / Management Action	Responsible Agent
The Contractor shall arrange for Environmental and Heritage Awareness Training programmes for the personnel on site, to the satisfaction of the Park Manager and ECO, and familiarise his/her/its employees with the contents of this EMP, either in written format or verbally.	ECO & Contractor

2.1.2 CONTRACT AREAS

Mitigation / Management Action	Responsible Agent
The ECO must indicate/point out to contractors the areas that they will have in their possession for the duration of the contract (this shall include access roads to be used, construction lay-down areas, materials storage and delivery requirements, contractors' offices, operational demarcation etc.). Aspects pertaining to temporary housing for persons involved in the project shall also be included. A material delivery and storage area should be demarcated. The facility must be planned and laid out in such a way that the total footprint area is minimised.	ECO & Contractor

2.1.3 SENSITIVE ECOLOGY

Mitigation / Management Action	Responsible Agent
<p>Prior to the commencement of construction, the proposed site/s and roads, must be inspected by SANParks Scientific Services (where necessary), in order to:</p> <ul style="list-style-type: none"> Confirm the absence of Red Data Book Species; Relocate, demarcate or recommend conservation / preservation measures for any identified ecologically "sensitive" and/or protected species and areas, and Point out and/or demarcate all ecologically "sensitive" areas to the contractors (e.g. red data habitats & species, rivers, streams, drainage lines, wetlands, sensitive soils, steep slopes and areas susceptible to erosion). 	SANParks, ECO & Contractor

2.1.4 HERITAGE AREAS

Mitigation / Management Action	Responsible Agent
<p>In known archaeological sensitive areas the South African Heritage Resources Agency (SAHRA) must inspect all above-mentioned contract areas, in order to:</p> <ul style="list-style-type: none"> Confirm the absence of archaeological sites and/or artefacts; Relocate, demarcate or recommend further conservation / preservation actions and measures for any identified archaeologically "sensitive" area and/or artefacts prior to the commencing of any work at these sites, and Point out and/or demarcate all archaeologically "sensitive" areas to the contractors. 	SANParks, ECO & Contractor

2.1.5 ROADS

Mitigation / Management Action	Responsible Agent
The final alignment of the access routes and internal camp roads shall be planned in conjunction with the Park Manager, SANParks Scientific Services, Section Ranger and ECO and once finalised only the agreed roads must be used.	ECO & Contractor
Roads must be planned to deviate around significant trees and Red Data Species marked out in an approved manner by the ECO.	ECO & Contractor

Contractor

Witness for Contractor

Employer

Witness for Employer



2.1.6 SITE ESTABLISHMENT

Mitigation / Management Action	Responsible Agent
Construction camps and staff accommodation facilities on the site will be required to be established in appropriate locations prior to the commencement of construction, preferably within already disturbed areas. After completion of the contract, these areas will be required to be rehabilitated.	ECO & Contractor
<p>Site Plan: Before construction can begin, the Contractor shall submit a site layout plan to the ECO for approval, including:</p> <ul style="list-style-type: none"> • Site access (including entry and exit points). • All material and equipment storage areas (including storage areas for hazardous substances such as fuel and chemicals). • Construction offices and other structures. • Security requirements (including temporary and permanent fencing, and lighting) and accommodation areas for security staff. • Solid waste collection facilities and waste treatment facilities for litter, kitchen refuse, sewage and workshop-derived effluents. • Storm water control measures. • Provision of potable water and temporary ablution facilities. • Only designated areas may be used for the storage of materials, machinery, equipment and site offices. The site offices should not be sited in close proximity to steep areas, as this will increase soil erosion. Preferred locations would be disturbed areas along routes. Offices (and in particular the ablution facilities, aggregate stockpiles, spoil areas and hazardous material stockpiles) must be located as far away as possible from any watercourse. Regardless of the chosen site, the Contractor's intended mitigation measures shall be indicated on the plan. 	Contractor
Throughout the period of construction, the contractor shall restrict all activities to within the designated areas on the construction layout plan. Any relaxation or modification of the construction layout plan is to be approved by the ECO.	ECO & Contractor
<p>Site Camps: The following restrictions or constraints should be placed on the site camp, and construction staff in general:</p> <ul style="list-style-type: none"> • The use of rivers and streams for washing of clothes. • The use of welding equipment, oxy-acetylene torches and other bare flames where veld fires constitute a hazard. • Indiscriminate disposal of rubbish or construction wastes or rubble. • Littering of the site. • Spillage of potential pollutants, such as petroleum products. • Collection of firewood. 	ECO & Contractor

<ul style="list-style-type: none"> • Poaching of any description. • Use of surrounding veld as toilets. • Burning of wastes and cleared vegetation. • No concrete structures allowed, if the site camp is within the Park boundaries. 	
<p>Vegetation clearing: The natural vegetation encountered on the site is to be conserved and left as intact as possible. Only trees and shrubs directly affected by the works, and such others as may be approved by the ECO in writing, may be felled or cleared. A firebreak shall be cleared and maintained around the perimeter of the site camp/s and office sites where necessary.</p>	ECO & Contractor
<p>Water for human consumption: Water for human consumption should be available at the site offices and at other convenient locations on site.</p>	ECO & Contractor
<p>Sewage Treatment: Sanitary arrangements should be to the satisfaction of the Park Manager and ECO. In no other ablution facilities are available, chemical toilets must be supplied (1 per 15 persons) and must be regularly cleaned and maintained by the contractor. The positioning of the chemical toilets is to be done in consultation with the ECO. The Contractor should arrange for regular emptying of toilets and will be entirely responsible for enforcing their use and for maintaining such latrines in a clean, orderly and sanitary condition to the satisfaction of the ECO. If necessary, the ablution facilities must be screened from the public view. In remote areas where chemical toilets may not be a viable option, agreement must be reached on alternatives before construction starts.</p>	ECO & Contractor
<p>Cooking Fuel: The Contractor shall provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings. Collection of firewood is not permitted.</p>	ECO & Contractor
<p>Waste Management: Solid waste shall be stored in an appointed area within the site camp in covered drums for collection and disposal. Disposal of solid waste shall be at an approved landfill site – this must be agreed to with the Park Manager. During the construction period, the facilities shall be maintained in a neat and tidy condition, and the site is to be kept free of litter. At all places of work, the Contractor shall provide litter collection facilities for later safe disposal at approved waste disposal sites.</p>	ECO & Contractor

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2.1.7 MATERIALS HANDLING, USE AND STORAGE

Mitigation / Management Action	Responsible Agent
The Contractor's management and maintenance of his plant and machinery will be strictly monitored according to the criteria given below, regardless of whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop) or not.	ECO & Contractor
Safety: All the necessary handling and safety equipment required for the safe use of petrochemicals and oils shall be provided by the Contractor to, and used or worn by the staff whose duty it is to manage and maintain the Contractor's and his subcontractor's and supplier's plant, machinery and equipment. Contractor must comply with the Occupational Health and Safety Act (Act 85 of 1993) and Construction Regulations, 2003 as this governs what the contractor has to do/provide for his staff.	ECO & Contractor
Hazardous Material Storage: Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials will be stored in a secured, appointed area that is fenced and has restricted entry. Storage of hazardous products shall only take place using suitable containers approved by the ECO. In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure.	ECO & Contractor
Fuels and Gas Storage: Fuel should be stored in a secure area in a steel tank supplied and maintained by the contractor according to safety procedures. Gas welding cylinders and LPG cylinders should be stored in a secure, well-ventilated area. The contractor must supply sufficient fire fighting equipment in event of an accident and strictly no smoking will be allowed where fuel is stored and used.	ECO & Contractor

2.1.8 WATER SUPPLY

Mitigation / Management Action	Responsible Agent
Water supply pipelines will be according to contract specifications, following the most direct, yet most ecologically responsible route agreed to with the engineer and as per contract documentation.	ECO & Contractor
Point out to contractors where they can obtain water (e.g. water for mixing of cement as well as for drinking). Contractors shall not make use of/collect water from any other source than those pointed out to them as suitable for use by them.	ECO

2.1.9 LIQUID WASTE

Mitigation / Management Action	Responsible Agent
Under the General Authorisations in terms of Section 39 of the National Water Act (Act No. 36 of 1998), DWAF does not permit the construction of wastewater disposal sites (such as septic tank systems) within the 100 year flood line of any watercourse, or alternatively, within 100 metres of the edge of a water resource.	SANParks
The treatment and disposal of effluent will comply with all applicable legislation and the relevant permit regarding the disposal of purified effluent into the natural environment will have to be obtained from DWAF if so required during construction and operations.	SANParks
The design, installation and operation of septic tanks and soak-always will conform to Water Act, including all the regulations made under section 26 of the National Water Act.	SANParks

2.2 CONSTRUCTION MANAGEMENT PLAN

The Construction Management Plan forms part of the contract documentation. The plan must be read in conjunction with the contract documents including the relevant Bill of Quantities and Specifications.

2.2.1 VEHICULAR ACCESS AND MOVEMENT OF CONSTRUCTION VEHICLES

Mitigation / Management Action	Responsible Agent
During construction, use should be made of existing access routes to construction areas where possible. Construct approved vehicle turning areas, avoiding selected ecological sensitive areas or species, and have turning area routes approved by the ECO. Temporary access roads must be rehabilitated after usage as per prior agreement between the Park Manager and Contractor.	ECO & Contractor

2.2.2 MOVEMENT OF CONSTRUCTION PERSONNEL, LABOURERS AND EQUIPMENT

Mitigation / Management Action	Responsible Agent
The Contractor must ensure that all construction personnel, labourers and equipment remain within the demarcated construction sites at all times. Where construction personnel and/or equipment wish to move outside the boundaries of the site, the contractor/ labourers must obtain permission from the ECO.	ECO & Contractor

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Witness for Employer



2.2.3 VEGETATION CLEARING

Mitigation / Management Action	Responsible Agent
The extent of all construction site footprints will be minimised and limited to existing and / or already disturbed areas wherever possible.	ECO & Contractor
The areas needing to be cleared and the degree of clearing required will be determined and demarcated in consultation with the ECO before clearing begins.	ECO & Contractor
The Contractor may not deface, paint or otherwise mark and / or damage natural features / vegetation on the site, unless agreed beforehand with the ECO. Any features / vegetation defaced by the Contractor will be restored to the satisfaction of the ECO.	ECO & Contractor
The ECO must be present during vegetation clearing.	ECO
Plant Search and Rescue: <ul style="list-style-type: none"> Plant search and rescue (i.e. the location and removal of specified plant species, without unnecessary damage, and their transfer to a specified location) and the collection of seed, shall be conducted by the ECO prior to the onset of any site clearing operations, should the ecologist/ SANParks Scientific Services indicate this to be necessary. Sensitive areas and/or species that have been selected for conservation by the ecologist / SANParks Scientific Services, Park Manager or ECO, shall be demarcated with danger tape. No activity shall take place at these areas. De-stumping shall only occur at the request of the ECO. Where roots can act as erosion protection, trees should be cut as close as possible to the ground level. During the clearing of woody vegetation no basal cover or grass and topsoil shall be removed and damage to this layer shall be minimised as far as possible. 	ECO & Contractor
Vegetation Removal and Trimming in Watercourses: No heavy machinery shall be permitted within watercourses for any purpose, except emergency procedures, without the prior approval of the ECO. Clearing of vegetation shall be conducted by hand. All cleared and trimmed vegetation shall be removed from any watercourse to prevent flooding/snagging hazards being created.	ECO & Contractor
Rehabilitation: The Park Manager, ECO, and Contractor must agree on rehabilitation of areas. The Contractor shall be held responsible for rehabilitation for all areas disturbed during construction. This includes, for example, service roads, stockpile areas, stop/go facilities, windrows and wherever material generated for, or from, road construction has to be stored temporarily or otherwise within the road reserve, or at designated or instructed areas outside the road reserve. This responsibility shall extend until expiry of the Defects Liability Period.	ECO & Contractor

2.2.4 PROTECTION OF FAUNA

Mitigation / Management Action	Responsible Agent
<ul style="list-style-type: none"> Under no circumstances shall any animals be handled, removed, killed or be interfered with by the Contractor, his employees, his subcontractors or his subcontractors' employees. The Contractor and his employees shall not bring any domesticated animals onto the site. The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals. No poaching of fauna and flora shall be tolerated by the Contractor or his personnel on Site or elsewhere. 	ECO & Contractor

2.2.5 HERITAGE AND/OR ARCHAEOLOGICAL SITES

Mitigation / Management Action	Responsible Agent
Historical and Archaeological Sites: If any artifact on site is uncovered, work in the immediate vicinity shall be stopped immediately. The Contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the ECO of such discovery. The South African Heritage Resources Agency (SAHRA) or the National Monuments Council shall be contacted such that an archaeological consultant can be appointed to excavate and record the site. Work may only resume once clearance is given in writing by the archaeologist. No stones/rock or any material may be removed from any site in the park without approval by the ECO, and after confirmation that materials do not form part of a cultural site.	ECO & Contractor

2.2.6 SOIL MANAGEMENT

Mitigation / Management Action	Responsible Agent
Topsoil: The Contractor is required to strip topsoil together with grass / groundcover from <u>all</u> areas where permanent or temporary structures are located, construction related activities occur, and access roads are to be constructed, etc. This must be read together with the contract specifications & conditions. Topsoil must be stockpiled for later use.	ECO & Contractor
Topsoil is to be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify.	ECO & Contractor
Topsoil stockpiles are not to exceed 1.5 m in height and should be protected to prevent erosion where needed.	ECO & Contractor

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Topsoil stockpiles are to be maintained in a weed free condition. The ECO can assist with guidance as to which plants are weeds and require removal.	ECO & Contractor
Topsoil is to be replaced by direct return where feasible (i.e. replaced immediately on the area where construction is complete), rather than stockpiling it for extended periods.	ECO & Contractor
Spoil Material: The location of spoil stockpile sites shall be agreed upon by the ECO prior to the onset of any operations that will generate spoil materials. No spoil material shall be dumped outside the defined site. The Contractor shall ensure that the material does not blow or wash away. If the spoil material is in danger of being washed or blown away, the contractor shall cover it with a suitable material, such as hessian or plastic.	ECO & Contractor

2.2.7 EROSION CONTROL

Mitigation / Management Action	Responsible Agent
The Contractor shall protect all areas susceptible to erosion and shall take measures, to the approval of the ECO. The Contractor shall not allow erosion to develop on a large scale before effecting repairs and all erosion damage shall be repaired as soon as possible.	ECO & Contractor
The specifics of erosion protection work will vary from situation to situation. These specifics should be cleared with the Park Manager and/or ECO and comply with the contract specifications.	ECO & Contractor
Where required, cut-off trenches can be installed to divert substantial run-off and prevent erosion.	ECO & Contractor
During construction, areas susceptible to erosion must be protected by installing temporary or permanent drainage works and energy dispersion mechanisms and could include – to be agreed to by SANParks and Contractor and with considerations of implications on costs: <ul style="list-style-type: none"> • Vegetation, • Mitre drains (afleivore), • Benches (grondwalle), • Benches consisting of sandbags, • Packing branches and rocks in small gullies and disturbed areas. 	ECO & Contractor
Storm water drainage measures are required on site to control runoff and prevent erosion.	ECO & Contractor

2.2.8 SLOPE PROTECTION

Mitigation / Management Action	Responsible Agent
Cut and fill slopes shall be shaped and trimmed to approximate the natural condition and contours as closely as possible and, where possible, be undulating. Levels incongruous to the surrounding landscape, shall be reshaped as per contract specifications.	ECO & Contractor

Slopes that need protection shall be identified by the ECO and the specifications needed must be established using the latest approved methods and technology.	ECO & Contractor
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2.2.9 ACCESS ROADS

Mitigation / Management Action	Responsible Agent
Construction staff may only use authorised paths and roads.	ECO & Contractor
The proclaimed speed limit in the Park must be strictly adhered to.	ECO & Contractor
ECO will monitor the conduct of drivers and report any negative impact to the contractor immediately.	ECO & Contractor
Construction roads must follow existing roads and tracks and should not be wider than necessary with a maximum width of 3 m. Should a wider road be required, this will require the approval of the ECO.	ECO & Contractor
If two-way traffic movement is to take place, passing bays are to be used where specified by the ECO to prevent access / detours into the surrounding areas. The drivers delivering construction materials to site are to be made aware of this. They may not drive off the road in order to allow another vehicle to pass.	ECO & Contractor
Continual use of dirt access roads by heavy machinery and increased transport loads means they will have to be carefully monitored and regularly graded as soon as potholes or rutting occurs.	ECO & Contractor
Upon completion of the construction period, the Contractor will ensure that the access roads are returned to a state no worse than prior to construction commencing.	ECO & Contractor

2.2.10 EXCAVATION, BACKFILLING AND TRENCHING

Mitigation / Management Action	Responsible Agent
Where at all possible, excavations must not stand open longer than 2 days, and should preferably be opened and closed on the same day. They should not be permitted to stand open longer than a week under any circumstances. Excavations must be marked with tape to clearly demarcate the area and warn against access.	ECO & Contractor
Excavations must not be undertaken until such time that all required materials / services etc. are available on-site, to facilitate immediate laying of such services or the construction of subsurface infrastructure.	ECO & Contractor
Any such excavations should ideally be undertaken within the confines of an established construction site - i.e. a site that is either protected with a peripheral fence, or a site that has a regular / continual human presence. Failing this, regular daily inspections are essential.	ECO & Contractor

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Mitigation / Management Action	Responsible Agent
If need be, spread the rocks in as natural looking manner as possible in the veld.	ECO & Contractor
Excess rocks and sand as a result of excavation activities is not to be dumped along next to construction site – rocks to be spread in a natural looking manner in the surrounding area.	ECO & Contractor
Removed soil is to be used to backfill areas where required (i.e. such as existing and un-rehabilitated gravel pits).	ECO & Contractor
Excavated material is to be stockpiled along the trench within the working servitude, unless otherwise authorised.	ECO & Contractor
Deficiency of backfill material will not be made up by excavation within the protected area. Where backfill material is deficient, it must be made up by importation from an approved borrow pit area.	ECO & Contractor

2.2.11 LEVELLING

Mitigation / Management Action	Responsible Agent
Excess sand and soil resulting from levelling activities of the work area should be stored in low heaps either on the access road or already disturbed area.	Contractor
Excess topsoil is to be spread evenly over the area in a manner that blends in with the natural topography.	ECO & Contractor
Once heavy machinery has cleared the bulk of these material stockpiles, the disturbed areas should be levelled and cleared of any foreign material manually e.g. with spades. It is unacceptable to leave foreign material behind with the knowledge that it will become hidden amongst the rejuvenating vegetation with time.	ECO & Contractor

2.2.12 SAND EXTRACTION

Mitigation / Management Action	Responsible Agent
This is a specialised and potentially environmentally impacting activity, which must be undertaken with the approval and overall management of the Park.	Contractor / SANParks
Regular inspections must be undertaken by the local Section Ranger and ECO to monitor and audit the effects and impacts of such removals.	ECO & Contractor
On completion of the sand-winning activity, the river bed will be rehabilitated to the satisfaction of the ECO and Section Ranger.	ECO & Contractor

2.2.13 STOCKPILING, HANDLING AND STORAGE OF BUILDING MATERIALS

Mitigation / Management Action	Responsible Agent
Stockpiles and storage yards will be demarcated in areas already disturbed or where they will cause minimal disturbance.	ECO & Contractor

Clearly indicate which activities are to take place in which areas within the site e.g. the mixing of cement, stockpiling of materials etc. Limit these activities to single sites only. This may not always be possible for example for heaps of topsoil, but should definitely be the case for other building materials.	ECO & Contractor
Stockpiles of expensive materials such as cement bags should be such that they can easily be removed from the site over weekends or during rainy weather.	Contractor
Specific sites should be allocated for construction waste e.g. empty cement bags, discarded planks, etc. A low temporary fence may be erected around such a site in order to contain the waste and assist the effective removal thereof from the site.	ECO & Contractor
Old cement mixing bags will be placed in wind and spill proof containers as soon as they are empty. The Contractor will not allow closed, open or empty bags to lie around the site.	ECO & Contractor
The Contractor will ensure that all operations that involve the use of cement and concrete are carefully controlled.	ECO & Contractor
Concrete mixing may only take place in the construction camp or in agreed specific areas on site.	ECO & Contractor
Concrete may not be mixed directly on the ground. No mixed concrete may be deposited directly onto the ground prior to placing. A board or other suitable platform / surface is to be provided onto which the mixed concrete can be deposited whilst it waits placing.	ECO & Contractor
All visible remains of excess concrete will be deposited in a designated area awaiting removal to an approved landfill site.	ECO & Contractor

2.2.14 SERVICING AND RE-FUELLING OF CONSTRUCTION EQUIPMENT

Mitigation / Management Action	Responsible Agent
All maintenance and repair work will be carried out at the main construction camp within an area designated for this purpose, equipped with necessary pollution containment measures.	ECO & Contractor
The ground under the servicing and refuelling areas must be protected against pollution caused by spills and / or tank overfills (bunded / lined).	ECO & Contractor
The Contractor may only change oil or lubricant at agreed and designated locations, except if there is a breakdown or emergency repair, and then any accidental spillages must be cleaned up / removed immediately.	ECO & Contractor
In such instances the Contractor will ensure that he has drip trays available to collect any oil or fluid.	ECO & Contractor
Construction vehicles are to be maintained in an acceptable state of repair. No vehicles or equipment with leaks or causing spills will be permitted to operate at any of the construction sites. These will be sent immediately back to the maintenance yard for repair.	ECO & Contractor
All equipment that leaks must be repaired immediately or must be removed from site.	ECO & Contractor

Contractor

Witness for Contractor

Employer

Witness for Employer



Mitigation / Management Action	Responsible Agent
Fuels required during construction must be stored in a central depot at the construction camp. This storage area should be located on a slab and be contained within a bund capable of containing at least the volume of one of the containers.	ECO & Contractor
Temporary fuel storage tanks and transfer areas also need to be located on an impervious surface adequately bounded to contain accidental spills. Appropriate run-off containment measures must be in place.	Contractor

2.2.15 SOLID WASTE MANAGEMENT

Mitigation / Management Action	Responsible Agent
An adequate number of 'scavenger proof' refuse bins must be provided at the construction sites and at the construction camps.	ECO & Contractor
These bins must be provided with lids and an external closing mechanism to prevent their contents blowing out and must be scavenger-proof to prevent baboons and other animals that may be attracted to the waste.	ECO & Contractor
The Contractor will ensure that all personnel immediately deposit waste in the waste bins provided.	ECO & Contractor
All refuse and solid waste generated at all work sites will be stored in appropriate scavenger proof containment vessels at the relevant site and removed to the main construction camp, where the waste will be sorted and stored within a fenced waste storage area.	ECO & Contractor
All waste must be transported in an appropriate manner (e.g. plastic rubbish bags).	ECO & Contractor
The Contractor may not dispose of any waste and / or construction debris by burning, or by burying.	ECO & Contractor
Discard all construction waste at a registered waste management facility / landfill site, particularly those wastes or products that could impact on surface or groundwater quality by leaching into or coming into contact with water.	ECO & Contractor
The contractor will maintain 'good housekeeping' practises as ensure that all work sites and construction camp are kept tidy and litter free.	ECO & Contractor

2.2.16 LIQUID WASTE MANAGEMENT

Mitigation / Management Action	Responsible Agent
The Contractor must take reasonable precautions to prevent the pollution of the ground and / or water resources on and adjacent to the site as a result of his activities.	Contractor
The Contractor may discharge 'clean' silt laden water overland and allow this water to filter into the ground. However, he must ensure that he does not cause erosion as a result of any overland discharge.	ECO & Contractor

No natural watercourse is to be used for the cleaning of tools or any other apparatus. This includes for purposes of bathing, or the washing of clothes etc.	ECO Contractor &
All washing operations will take place off-site at a location where wastewater can be disposed of in an acceptable manner.	ECO Contractor &
Trucks delivering concrete may not be washed on site or anywhere inside the park.	ECO Contractor &
No spills may be hosed down into a storm water drain or sewer, or into the surrounding natural environment.	ECO Contractor &
Adequate ablution facilities are to be provided at each construction site, conveniently located near to work areas to avoid localised water pollution from camp sewerage.	ECO Contractor &
All soil contaminated, for example by leaking machines, refuelling spills etc. is to be excavated to the depth of contaminant penetration, placed in 200 litre drums and removed to an appropriate landfill site.	ECO Contractor &

2.2.17 HAZARDOUS MATERIALS

Mitigation / Management Action	Responsible Agent
The Contractor must comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials.	Contractor
The Contractor will furthermore be responsible for the training and education of all personnel on site who will be handling the material about its proper use, handling and disposal.	Contractor
The Contractor will be responsible for establishing an emergency procedure for dealing with spills or releases of petroleum.	Contractor
Storage of all hazardous material is to be safe, tamper proof and under strict control.	ECO & Contractor
Petroleum, chemical, harmful and hazardous waste throughout the site must be stored in appropriate, well maintained containers.	Contractor
Exercise extreme care with the handling of diesel and other toxic solvents so that spillage is minimised.	ECO & Contractor
Any accidental chemical / fuel spills to be corrected immediately.	ECO & Contractor
Timber products should be treated off-site prior to use in construction.	ECO & Contractor
Periodic on-site application of timber treatment products (for maintenance purposes) should take place with due care for the nature of the product (toxicity) and for potential spillages that may occur. Areas where timber is to be treated should have secondary containment measures instituted, such as the placement of a plastic layer (some form of covering) over soils, beneath the timber structures to prevent contamination of the soil surface.	ECO & Contractor

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2.2.18 RUN-OFF FROM CONSTRUCTION CAMPS

Mitigation / Management Action	Responsible Agent
The Contractor must ensure that rainwater containing pollutants does not run-off into natural areas and thus result in a pollution threat.	ECO/Contract or
A drainage diversion system is to be installed to divert runoff from areas of potential pollution, e.g. batching area, vehicle maintenance area, workshops, chemical and fuel stores, etc.	ECO/Contract or

Noise levels must be kept within acceptable limits for a protected area, and must not be of such nature as to detract from the natural experience of other visitors to the protected area.	Contractor
The contractor shall take into consideration that the project areas are located within a natural environment and that noise could be a major disturbance/nuisance for the fauna and visitors to the park. Project management should endeavour to keep noise generating activities associated with construction activities to a minimum and within working hours.	Contractor

2.2.19 FIRE

Mitigation / Management Action	Responsible Agent
The Contractor must take all the necessary precautions to ensure that fires are not started as a result of activities on site.	Contractor
No fuels or chemicals may be stored under trees.	ECO/Contract or
Gas and liquid fuel may not be stored in the same storage area.	ECO/Contract or
The Contractor must ensure that there is adequate fire-fighting equipment at the fuel stores.	ECO/Contract or
No open fires for heating or cooking will be permitted on site, unless otherwise agreed and then only in designated areas.	Contractor
The Contractor will supply all living quarters, site offices, kitchen areas, workshop areas, material stores and any other areas identified with suitable, tested and approved firefighting equipment.	Contractor
The construction site must be protected against fire, and a sufficient fire break must be constructed, on advice by the Section Ranger, around each construction site and the construction camp where necessary.	ECO/Contract or

2.2.21 VISUAL

Mitigation / Management Action	Responsible Agent
Security lighting must be placed such that it is not a nuisance to residents and visitors to the area. Shields may be required to prevent lights from being visible from other parts of the protected area.	ECO/Contract or
Care will be taken when positioning the lights to ensure the least visual impact, while still providing a safe work environment for construction staff.	ECO/Contract or
Should any construction activities take place where Park tourists can see the construction activities, then clear signboards must be erected to inform the tourists of the activity taking place. SANParks to provide boards. Contractor to erect boards as required.	Contractor
The Contractor shall not establish any activities which, in the opinion of the ECO, are likely to adversely affect the scenic quality of the area. The ECO may direct the Contractor to refrain from such activities or to take ameliorative actions to reduce the adverse effects of such activities.	ECO/Contract or
No painting or marking of natural features shall take place. Marking for surveying and other purposes shall only be done with pegs and beacons.	ECO/Contract or
All packed rock and exposed rock cuttings shall be treated in order to blend their colour with the colours of the natural weathered rocks of the adjacent environment.	ECO/Contract or

2.2.20 DUST

Mitigation / Management Action	Responsible Agent
The Contractor shall take precautions to the satisfaction of the ECO to limit the production of dust and damage caused by dust.	ECO/Contract or

2.2.22 SITE CLEAN-UP AND REHABILITATION

Mitigation / Management Action	Responsible Agent
The Contractor must ensure that all temporary structures, materials, waste and facilities used for construction activities are removed upon completion of the project.	Contractor / ECO
Fully rehabilitate (e.g. clear and clean area, rake, pack branches etc.) all disturbed areas and protect them from erosion.	Contractor / ECO
Only indigenous plants which are able to establish easily and will need less maintenance because they have already adapted to the local conditions should be considered.	Contractor / ECO

2.2.21 NOISE

Mitigation / Management Action	Responsible Agent
Machinery and vehicle silencer units are to be maintained in good working order. Offending machinery and / or vehicles will be banned from use on site until they have been repaired.	Contractor

Contractor

Witness for Contractor

Employer

Witness for Employer

Before final decisions about the choice of plant species are taken the Section Ranger should be approached for their advice.	Contractor / ECO
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2.3 MONITORING OF EMP IMPLEMENTATION

The correct and successful implementation of impact mitigation measures in order to reduce adverse impacts on environmental conditions needs to be ensured by a proper monitoring programme.

Monitoring of the general implementation of/adherence to the EMP, shall be the responsibility of the ECO. Reporting on adherence/compliance to stipulations as communicated to contractors, shall take place during scheduled site meetings.

Contractor

Witness for
Contractor

Employer

Witness for
Employer



2.3.1 Monitoring Form:

A list of environmental issues addressed in the EMP is drawn up. A tick box monitoring form is compiled which makes provision for compliance or non-compliance to the EMP requirements for each environmental issue. This monitoring form makes room for a brief description of the non-compliance(s). The issues identified on the monitoring form must be discussed in detail with the contractor and the Park Manager. A reasonable date of completion of the remedial action must be jointly agreed upon, between the contractor, ECO and Park Manager. This monitoring form must be signed by all parties and a copy be provided to the Park Manager.

The following Monitoring Form may serve as an **example** or point of departure.

Name:	Date:
Project:	

ENVIRONMENTAL MONITORING CHECKLIST (NC = NON-COMPLIANCE, C = COMPLIANCE, NA = NOT APPLICABLE)											
Item		Rating	Item		Rating						
1.	Vehicular access and movement of construction vehicles		13.	Stockpiling, handling and storage of building materials							
2.	Movement of construction personnel, labourers and equipment		14.	Servicing and re-fuelling of construction equipment							
3.	Vegetation clearing		15.	Liquid waste management							
4.	Protection of fauna		16.	Hazardous materials							
5.	Cultural and/or archaeological sites		17.	Run-off from construction camps							
6.	Soil management		18.	Fire							
7.	Erosion control		19.	Dust							
8.	Slope protection		20.	Noise							
9.	Access roads		21.	Visual							
10.	Excavation, backfilling and trenching		22.	Site clean-up and rehabilitation							
11.	Levelling		A.	Others							
12.	Sand extraction										
Remedial Action on Non-compliance: (Action and Time Plan)											
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> Close out: Environmental Control Officer Name _____ Date _____ </td> <td style="width: 50%; border: none; vertical-align: top;"> Response required by: Contractor Name _____ Date _____ </td> </tr> </table>						Close out: Environmental Control Officer Name _____ Date _____	Response required by: Contractor Name _____ Date _____				
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Annexure C

Code of Conduct for Working in a National Park

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SOUTH AFRICAN NATIONAL PARKS

CODE OF CONDUCT FOR WORKING IN A NATIONAL PARK

OUTSIDE ORGANISATIONS WORKING TEMPORARILY IN A NATIONAL PARK

CODE OF CONDUCT FOR PERSONNEL FROM OTHER ORGANISATIONS TEMPORARILY WORKING IN NATIONAL PARKS

1. INTRODUCTION

You will presently begin an important task in a national park, which is an area controlled by South African National Parks (SANParks). For obvious reasons your task must be completed in the shortest possible time and to accomplish this, there has to be co-operation at all levels between yourselves and personnel from SANParks.

In the past, you and your sub-ordinates worked in uncontrolled areas, but you are presently in a controlled area and furthermore in a national park.

As the name implies, the main objective with a national park is the protection, conservation and utilization of our heritage, in such a way to allow future generations to enjoy, appreciate and admire nature in its unspoiled state. This great endeavor can only be achieved if every individual who works in a national park admits to and accepts nature conservation as part of their heritage (daily life). Certain procedures were followed in the past to accomplish your tasks, but now you must accept that adaptations will have to be made to complete your task in a national park without disturbing the natural environment.

You will also be subjected to certain necessary restrictions during your stay and operations in a national park. Certain expectations will be made in accordance with your work commitments. Restrictions will be kept to a minimum, those that are enforced must please be respected and seen in a positive light to promote co-operation and to prevent any unpleasantness.

Depending on where you are resident while working in a national park, you are requested to discuss any problems you may encounter, with the Park Manager, (*Section Ranger or the person in charge of Visitor Services*). You can be assured that these officials will do everything in their power to ensure that you have a pleasant and productive stay in the national park.

Please study and commit yourself to the attached Code of Conduct.

Any uncertainties must be cleared up with a SANParks' official.

We wish you a pleasant and productive stay in our national parks.

2. PRINCIPLES WITH RESPECT TO BEHAVIOUR AND DISCIPLINE

All persons residing in or working in a national park, are subject to the National Environmental Management Protected Areas Act 57 of 2003.

The following principles should be complied with at all times in a national park:

- 2.1 No prospecting or mining is allowed on any land forming part of a national park or protected area.
- 2.2 No person, except an employee authorized by SANParks may:
 - 2.2.1 Enter or reside in a national park without permission;
 - 2.2.2 Be in possession of an unsealed weapon, explosives, traps or poison in the park or convey the same into a park;
 - 2.1.3 Hunt or kill an animal, collect, damage or destroy a bird's nest or it's eggs;
 - 2.1.4 Purposely or negligently cause a veld fire or damage any object of geological, archaeological, historical, ethnological or of any other scientific value to SANParks;
 - 2.1.5 Bring any animal or pet into a national park or allow domestic animals to stray into a national park, if found it will be confiscated and destroyed by an official;
 - 2.1.6 Remove any animal (dead or alive) or parts thereof from the park (unless lawfully brought into the park);
 - 2.1.7 Cut down trees or remove plants from a park or in any way damage any tree, plant or seeds;

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<p>2.1.8 Feed animals in national parks;</p> <p>2.1.9 Drive a vehicle without a licence or allow a minor to drive a vehicle under his control;</p> <p>2.1.10 Spend the night anywhere in a national park, (other than in a designated area) except in a rest camp or private home, without the permission of SANParks;</p> <p>2.1.11 Enter a national park in an:</p> <ul style="list-style-type: none"> • Unlicensed (or unregistered) vehicles; • Enter or use any closed road (no entry); <p>2.1.12 Vehicles may not be driven recklessly or negligently in a national park.</p> <p>2.1.13 All drivers must consider other drivers and all animals.</p> <p>2.1.14 No person under the influence of alcohol or drugs may drive a vehicle in a national park or be in the drivers seat of a vehicle with the engine running.</p> <p>2.1.15 Without special permission, no person may organize or perform public entertainment or fund-raising campaigns.</p> <p>2.1.16 Angling in rivers or dams is prohibited.</p> <p>2.1.17 Angling, where permitted, is only allowed from sunrise to sunset.</p> <p>2.1.18 Swimming is prohibited at designated angling areas.</p> <p>2.1.19 No person may damage property or endanger property belonging to SANParks.</p> <p>2.1.20 No person may use a radio or musical instruments in such a way as to cause a disturbance to others.</p> <p>2.1.21 No person may dispose of any article or rubble other than in containers provided by SANParks.</p> <p>2.1.22 No person may remove sand, stone or wood without the permission of SANParks.</p> <p>2.1.23 Unless issued with an official late permit, no one may travel from a rest camp or entry gate after gate closing times. Permits are issued by the Park Manager or designated person after acceptance of a legitimate motivation.</p> <p>2.1.24 The proclaimed speed limit in a national park must be strictly adhered to, except if and when concessionary speed limits have been approved.</p>	<p>3. RESPONSIBILITIES TOWARDS NATURE CONSERVATION</p> <p>3.1 Antiquities or objects of historical value which you may discover during your operation in a national park, are and remain the property of SANParks. These items must be handed the Park Manager or designated person as soon as possible. Any person found possession of such articles, either to keep or sell, will be liable to prosecution.</p> <p>1.2 No firewood may be collected or removed without the permission of a Nature Conservation official. Under no circumstances will permission be granted to remove firewood from the park unless proof of sale from one of the shops can be produced.</p> <p>1.3 Stone, sand and/or soil may not be removed from any area, unless permission has been granted by the Park Manager or designated person. These products may only be removed from sites specified by the Park Manager.</p> <p>1.4 On request, the Park Manager or local Section Ranger will point out to the foreman, the sites allowed for removal of stone, sand and/or water for building or other purposes. No water may be taken from existing boreholes unless the Park Manager or designated person gives permission.</p> <p>1.5 The removal, cutting down or damage to any living plant in a national park is illegal and may only be done with permission. Where the construction of roads, buildings etc. necessitates the destroying of indigenous trees, shrubs or plants, it must be kept to an absolute minimum.</p> <p>1.6 Gravel pits must, where at all possible, not be visible from any road. After construction, these gravel pits must be rehabilitated as per contract document and/or Environmental Management Plan.</p> <p>1.7 No animals may be killed in the park.</p> <p>1.8 Other than SANParks employees, personnel resident in a park, but not employed by SANParks, may only kill an animal in an emergency, to protect a life or property or when specifically authorized to do so by SANParks. A report of all animals killed and the circumstance surrounding if, must be sent to the Park Manager or designated person as soon as possible.</p> <p>NB Snakes may only be killed in residences, rest camps and living quarters if it cannot be captured and removed by a knowledgeable person. Under no circumstances may poisonous or non-poisonous snakes be killed in the bush or elsewhere. Residents in a park are encouraged to study the poisonous and non-poisonous snake species for their own protection.</p>
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4. FIREARMS

Only authorized persons are allowed to possess firearms in a park. Firearms will only be allowed in exceptional circumstances, where an employee may need it in the execution of his duties and will be subject to certain strict conditions.

5. LITTER

All residents and work teams are expected to have proper respect towards the scenic beauty of a national park and not litter tins, paper etc. as well as construction debris, where new roads, bridges, dams or buildings are being constructed. It is the duty of the contractor and/or his supervisors to ensure that after completion of the projects, all litter is carted away. Under no circumstances may this litter be dumped in the bush or anywhere else. It is your responsibility to find out from the Park Manager or designated person if and where litter may be dumped. Littering is a serious offence and perpetrators can be prosecuted.

NB: After completion of any project, a contractor is required to obtain a report from the Park Manager declaring his satisfaction with the condition of the terrain and immediate surroundings.

6. PETS

No dogs or other pets are allowed in a national park without written permission of the Executive Director: Parks.

7. PERSONNEL RELATIONS

7.1 Park Managers or any designated person are officials of the SANParks and are responsible for the enforcement of the Protected Areas Act 57, 2003 in their respective parks. To uphold the organization's authority, they have to be aware of all activities and especially extraordinary activities in their park. It is therefore not only a matter of courtesy but of necessity to report all activities to the Park Manager. It is very important that all new building activities, the construction of new roads, etc., be reported by the supervisor to the Park Manager. It is just as important to report the use of firebreak roads as well as unscheduled night trips to the Park Manager.

7.2 No person residing or working in a rest camp may leave the rest camp gate after gate closing times, without the Park Manager's or designated person's permission.

8. TRAVELLING TIMES AND TRANSPORT MATTERS

1.1 All private and official trips within a national park, must be undertaken during daylight hours and permission to travel after-hours will only be given in emergencies, by the Park Manager or designated person.

1.2 No person (employee or visitor) may transport passengers on the back of an open vehicle within a national park, unless in the execution of official duties.

9. ROAD RULES AND SPEED LIMITS

9.1 Road Rules

All personnel, whether in an official or private capacity, must ensure that their driving sets an example to other drivers. Although all people working in a park with the necessary approval, may drive at a faster speed than the tourists, they must do this as unobtrusively as possible by approaching another vehicle at a decreased speed, passing it and then accelerating slowly to the required speed. As soon as an oncoming vehicle is in sight, speed must once again be decreased until the vehicle is out of sight.

9.2 Speed limit for personnel

All employees of SANParks, as well as employees from outside organizations with written consent working in a national park, may travel at a maximum speed of 65km/h during the day and 50km/h at night regardless of the speed limit. These speed limits are applicable to all official trips and may only be exceeded in emergencies. Personnel and/or their spouses may also drive at 65km/h during the day, whilst in their private vehicles en route to the entrance gate closest to their residence. During private trips in the rest of the park, the designated speed limit has to be adhered to as well as in all the rest camps and personnel villages.

Please take note that all transgressors of this privilege will be prosecuted in the same way as tourists who disregard the speed limit.

10. CONTROL AT ENTRANCE AND RESTCAMP GATES

When entering or leaving an entrance gate of a national park, you must identify yourself to the tourist officer in charge. No one may leave a rest camp after hours unless the Park Manager or designated person has granted permission and anyone arriving after hours at a rest camp must report to the Park Manager or designated person.

11. ENTRANCE TO NO-ENTRY ROADS

Fire-break and patrol roads

Please take note that no one may drive along a fire-break or patrol road with a no-entry sign in their private capacity or along any road which has been closed in any way. Only the Park Manager or designated person may give permission to do so. When a fire-break or patrol road has to be used officially the Park Manager or designated person must preferably be given prior notice of the date and the route. If it is not possible to notify him, it must be done immediately on completion of the trip.

12. GUEST PRIVILEGES

Arrangements regarding guests must be made by the site supervisor with the Park Manager or designated person.

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	13.10	Aimlessly loiter or hang around near or in a rest camp or personnel accommodation at any time.
1. GENERAL DISCIPLINE	13.11	Introduce, brew or be in possession of alcohol.
It is the responsibility of every supervisor in a park to ensure that the following rules and regulations are brought to the attention of every employee under their supervision and to see that it is adhered to.	13.12	Be in possession of habit forming drugs.
13.1 Every employee residing in living quarters in a rest camp or on a designated site must:	13.13	Be in possession of any fresh meat, especially raw venison or other animal products and, if required legally, it may not be transported out of the park without the necessary veterinary permits.
13.1.1 Obey all reasonable and lawful rules given by the Park Manager or designated person;	13.14	Hitch-hike in a national park.
13.1.2 Reside only in specific quarters/designated site reserved for them;	13.15	Possess a firearm or any dangerous weapon without the necessary permission or permit.
13.1.3 Maintain cleanliness and sanitation in his place of residence.	13.16	Where work teams reside and work in the field, wander away from the work site or living quarters.
13.2 No person residing, working or officially present in a park, is allowed to:	13.17	Temporary work teams (supervisors excluded) are not allowed to receive visitors in a national park.
13.2.1 Accommodate any unauthorized person, assist him or give him permission to enter or live in any designated living areas;	13.18	It is the contractor's responsibility to ascertain the rules and regulations laid down by SANParks.
13.2.2 Behave in such a way as to be detrimental to maintaining discipline, order for health in such living areas;	14. MALARIA AND MALARIA CONTROL	Some of the national parks, e.g. Kruger National Park and Mapungubwe National Park are in an endemic malaria area and the residents are constantly exposed to the disease and must be aware of the fact.
13.3 Without written permission from the Park Manager or designated person;	Malaria is a potentially dangerous disease and if not treated timeously and correctly, can be fatal. It is therefore extremely important that all residents, their children and their employees take adequate preventative measure to protect themselves from disease. Malaria is a disease caused by small parasites, which destroy red blood corpuscles of an affected person. Parasites are transmitted from person to person by the <i>Anopheles</i> mosquitoes. Various types of malaria occur of which <i>plasmodium falciparum</i> is the most common and also the most dangerous.	
13.3.1 Keep live animals or poultry;		
13.3.2 Excavate or have excavations made	The possibility of contracting the disease can be reduced by avoiding mosquito bites and taking prophylactics which prevent the development of parasites in the body. Please contact the local physician for precautionary measures or if you think you have malaria.	
13.3.3 Build or make any alterations to existing building;		
13.4 In any way, either directly or indirectly, hinder any employee, Security Officer, Ranger or anyone authorized by the Park Manager, in the execution of their duties; inspections or any investigations deemed necessary or purposely hinder, obstruct, mislead or refuse to divulge information when requested to, or refuse to assist in any way or heed legitimate request or command.	END	
13.5 Purposely disturb the peace by making a noise, shouting, screaming, arguing, causing violence or acting violently or improperly.		
13.6 Enter or leave a Park or living quarters other than through the official gates.		
13.7 Gamble in any way.		
13.8 Defecate in a place or manner as to offend any other person.		
13.9 Dispose of rubble or leftovers in any place other than in bins provided.		

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Part C5: Drawings

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C5: List of Drawings

DESIGN SERVICES AND ACTIVITY MATRIX

Works designed by, per design stage:

Concept, feasibility and overall process	Consulting Engineers for Employer
Basic engineering and detail layout to tender stage	Consulting Engineers for Employer
Final design to approved for construction stage	Consulting Engineers for Employer
Temporary works	Contractor
Preparation of "as built" drawings	Contractor

DRAWINGS

The drawings listed below are attached in order to give an overview of the project.

Additional construction drawings will, in terms of Clause 13 of the General Conditions of Contract (2015), be issued to the Contractor by the Engineer/Employer on the commencement date and from time to time as required.

<u>Drawing No.</u>	<u>Description</u>
34496.00-100-01-0	Proposed Site Locality Plan for Twee Rivieren Rest Camp Water Plant
34496.00-100-02-0	Proposed Site Locality Plan for Mata-Mata Rest Camp Water Plant
34496.00-100-03-0	Proposed Site Locality Plan for Nossob Rest Camp Water Plant
34496.00-100-04-0	Typical Water Treatment Plant Layout
34496.00-100-04-1	Fencing Details
34496.00-201-01-0	Water Treatment Plant Details
34496.00-201-02-0	Evaporation Pond Details
34496.00-380-01-0	Power point and lighting layout
34496.00-700-01-0	Proposed Piping and Instrumentation Diagram: Sheet 1 of 2
34496.00-700-02-0	Proposed Piping and Instrumentation Diagram: Sheet 2 of 2

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