O. R. TAMBO DISTRICT MUNICIPALITY

O.R. TAMBO
DISTRICT MUNICIPALITY

PROJECT NO: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

MUNICIPAL INFRASTRUCTURE GRANT

October 2020

Prepared for:

The Municipal Manager
O. R. Tambo District Municipality
Private Bag x 6043
MTHATHA
5100

Tel. No. (047) 501 6400

Prepared by:

Thuso Development Consultants
No 3 Prestwich Avenue
Central Mthatha
5100

Tel. No. (047) 532 6555

NAME OF BIDDER:_____

CSD SUPPLIER NUMBER:_____

SARS TAX COMPLIANCE STATUS PIN:_____

EMAIL ADDRESS:_____

TENDER AMOUNT:_____

PLEASE CHECK x / √

1. That you have read all the pages of the tender document. …….

2. That you have completed ALL the forms required to be completed
…….
in NON-ERASEABLE INK.

3. That your arithmetic calculation in the pricing schedule is correct.
…….

4. That you have attached ALL necessary documentation relating to the Composition of the tendering entity, i.e.
……..

(a) Company registration documents naming the shareholders and Directors / members of the company, close corporation etc

(b) Joint venture agreement, if tendering entity is a joint venture.

5. That the COMPLETE tender document is submitted.
……..

6. That the FORM OF OFFER is completed in full and signed.
……..

7. That ALL returnable documents are submitted. .…….

8. That ALL returnable schedules are completed and signed. ……..

9. Ensure that your tender is submitted by 12H00PM on the closing date of the tender.

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SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

TENDERS ARE HEREBY INVITED FOR:

CONTRACT: MIS 315 995 B PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME – PHASE 6: SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS
To ensure that your Tender is not exposed to invalidation, documents are to be completed in accordance with the conditions and Tender rules contained in the Tender documents. Supporting documents must be sealed and externally endorsed **CONTRACT: MIS 315 995 B PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME - PHASE 6: SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS** and be submitted in the tender box, Ground Floor, O. R. Tambo District Municipality, Nelson Mandela Drive, O. R. Tambo House, Myezo, Mthatha, not later than the closing date and time as stated.

The lowest or any Bid will not necessarily be accepted and the O. R. Tambo District Municipality reserves the right not to consider any tender not suitably endorsed or comprehensively completed as well as the right to accept a Tender in whole or part. Tenders will be adjudicated in accordance with the Supply Chain Management Policy of the O. R. Tambo District Municipality.

The following documents must be completed, signed (where applicable) and submitted as a complete set:

Document		Colour of pages
Number	**Heading**	
T1.1	Tender Notice and Invitation to Tender	White
T1.2	Tender Data	Pink
T2.1	List of Returnable Documents	Yellow
T2.2	Returnable Documents for tender evaluation purposes	Yellow
C1.1	Form of Offer and Acceptance	Yellow
C1.2	Contract Data	Yellow
C1.3	Operational Health & Safety Specification	Yellow
C1.4	ORTDM Supply Chain Management Policy	Yellow
C2.1	Pricing Instructions	Yellow
C2.2	Activity Schedule	Yellow
C3	Scope of Work	Blue
C4	Site Information	Green
C5	Additional Relevant Documents	White

O. R. TAMBO DISTRICT MUNICIPALITY

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SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

T1.1 TENDER NOTICE AND INVITATION TO TENDER

Tenders are hereby invited from suitably qualified and experienced contractors who are registered with CIDB for the Completion of Booster Pump Stations and Associated works.

Project Number	Name and Description	CIDB Grading	Contract period
MIS 315 995 B	Port St John's Regional Water Supply Scheme Phase 6: Supply and Installation of Mechanical and Electrical Equipment for Pump Stations.	6ME PE/ 7ME or Higher	12 months

A compulsory clarification meeting with representatives of the client will take place at 10H00, 03 November 2020 at the Port ST John's Local Municipal Offices: Port ST John's, before proceeding to site.

THE MUNICIPALITY WILL NOT REPEAT ANY MATTERS ALREADY COVERED IN THE COMPULSORY BRIEFING MEETING TO THE BIDDERS WHO ARRIVE MORE THAN 10 MINUTES LATE TO THE MEETING, NOR WILL IT ALLOW SUCH BIDDERS TO COMPLETE THE ATTENDANCE REGISTER. ANY BID RECEIVED FROM A BIDDER WHO DID NOT ATTEND THE BRIEFING MEETING AND SIGN THE ATTENDANCE REGISTER WILL NOT BE CONSIDERED AND WILL BE RETURNED TO THE BIDDER UNOPENED.

Bid documents may be downloaded on the e-Tender website (www.etenders.gov.za), alternatively on the O.R Tambo District Municipality (www.ortambodm.gov.za) at no Cost.

Bids must be completed tenders in black ink, enclosed in a sealed envelope and clearly marked with the "***Project* number, project name and description*"** must be placed in the tender box, Ground Floor, O. R. Tambo District Municipality Building, Nelson Mandela Drive, Myezo Park, Mthatha, Eastern Cape, not later than 12H00 **Monday, 30 November 2020**.

It must be expressly understood that the Municipality does not accepts no responsibility for ensuring that bid submissions sent by courier or post, or delivered in any other way, are deposited in the Tender Box. It is therefore preferable for the bidder to ensure that its bid submission is placed in the Tender Box by its own staff or representative(s).

Tender submissions will be opened in public at 12H00, 30 November 2020. Bids will be opened at Ground Floor, O. R. Tambo House, Myezo, Mthatha. The Municipality reserves the right not to accept the only or lowest priced tender or any tender at all, or to accept the whole or part of any tender.

RETURNABLE DOCUMENTS TO BE SUBMITTED WITH THE BID:

- Original or certified copy of BBBEE certificate, or sworn affidavit confirming annual total revenue and level of black ownership, if bidder is an Exempted Micro Enterprise (EME) or Qualified Small Enterprise (QSE);
- Certified copies of business registration documents, as issued by CIPC;
- Certified copy of identity documents of directors/ shareholders/ partners/ members, as the case may be.

INVALID OR NON-SUBMISSION OF THE FOLLOWING RETURNABLE DOCUMENTS WILL DISQUALIFY A BID SUBMISSION:

- CSD supplier number;
- Proof of latest municipal rates and taxes statement indicating that rates and taxes are not in arrears for more than 3 months;
- Proof of registration with CIDB

- Proof of subcontracting at least 30% of the works to any designated enterprises, as stipulated in this document;
- Audited annual financial statements of the bidding entity (for projects in excess of R10 million);
- Unaudited financial statements for close corporations, as required by the close corporation Act (if applicable);
- Joint Venture agreement or consortium (in CIDB format), signed and initialled in each page (where applicable).

PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT NO 5, 2000 (PPPFA) POINTS WILL BE AWARDED AS FOLLOWS: -

The bids will be evaluated in three stages, namely:

- Stage 1 - Prequalification criteria
- Stage 2- Functionality
- Stage 3- Price and BBBEE Points

STAGE 1 – PRE-QUALIFICATION CRITERIA

In terms of the Preferential Procurement Policy Framework Act 2000, Preferential Procurement Regulation 2017, pre-qualification criteria for preferential procurement as specified in Regulation 4 will apply. Tenderers must comply with the requirement to subcontract a minimum of 30% of these works to any of the following enterprises:

(i) an EME or QSE which is at least 51% owned by black people;
(ii) an EME or QSE which is at least 51% owned by Black people who are youth;
(iii) an EME or QSE which is at least 51% owned by Black people who are women;
(iv) an EME or QSE which is at least 51% owned by Black people with disabilities;
(v) an EME or QSE which is at least 51% owned by Black people living in rural or underdeveloped areas or townships;
(vi) a cooperative which is at least 51% owned by black people;
(vii) an EME or QSE which is at least 51% owned by Black people who are military veterans;
(viii) an EME or QSE.

Failure to meet the pre-qualification criteria will render a bid non-responsive, and such bid will be disqualified and not proceed to be evaluated further.

Item	Weight
Stage 2 of Evaluation-Functionality	**100**
• Company Experience with respect to similar projects	30
• Experience of key staff assigned to the contract	30
• Preliminary Quality Assurance Plan	20
• Health and Safety Plan	10
• Preliminary Programme	10
Stage 3 of Evaluation- Price & B-BBEE	**100**
• B-BBEE	20
• Price	80

Tenders may only be submitted on tender documentation issued. No late, faxed, e-mailed, or other form of tender will be accepted.

Technical enquiries: Mr N. Noto 047 501 6400 / 6425, or email nkosiyabon@ortambodm.gov.za All **Supply Chain Management enquiries** may be directed to Mr. S. Hopa, telephone number 047 501 6449 or email: sakhiwoh@ortambodm.org.za during office hours: Monday to Friday 08H00-13H00 and 13H30-16H30.

Tenders will be evaluated in terms of the Supply Chain Management policy of the O. R. Tambo District Municipality and the lowest tender will not necessarily be accepted and the right to accept the whole or part of any tender or not to consider any tender not suitably endorsed is fully reserved by the O. R. Tambo District Municipality. A 80/20 point system shall apply where 80 points is for the price and 20 points is in terms of B-BBEE status level of contributor as follows:

B-BBEE status level of contributor	**Number of points**
1	20
2	18
3	14
4	12
5	8
6	6
7	4
8	2
Non-compliant contributor	0

Joint Ventures will qualify for points for their B-BBEE status level as an unincorporated entity, provided that the entity submits their consolidated B-BBEE scorecard as if they were a group structure and that such B-BBEE scorecard is prepared for every separate tender.

F. Mphako
Acting Municipal Manager

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

T1.2 TENDER DATA

The conditions of tender are the **Standard Conditions of Tender** as contained in Annexure F of the 30 January 2009 edition of the **CIDB Standard for Uniformity in Construction Procurement**. The Standard Conditions of Tender Procurements make several references to the Tender Data for details that apply specifically to the Tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the standard conditions of Tender. Each item of data given below is cross-referenced to the clause in the Standard Conditions of Tender to which it mainly applies.

Please note that the word "Client" is used in this document and referred to as "Employer" in the Standard Conditions of Tender document.

Clause Number	
F.1	**General**
F.1.1	The Client is: The Municipal Manager O. R. Tambo District Municipality Private Bag x 6043 Mthatha 5100
F.1.2	The Tender documents issued by the Client comprise: **Tender** T1.1 Tender Notice and invitation to tender T1.2 Tender Data T2.1 List of Returnable Documents T2.2 Returnable Documents for tender evaluation purposes T2.3 Returnable Documents to be incorporated into the contract
	Contract **Part 1: Agreements and Contract data** C1.1 Form of Offer and Acceptance C1.2 Contract Data C1.3 Special Conditions C1.4 O. R. Tambo District Municipality Health and Safety Specification C1.5 Supply Chain Management Policy **Part 2: Pricing Data** C2.1 Pricing Instructions C2.2 Bill of Quantities **Part 3: Scope of Work** C3.1 Description of the Works C3.2 Engineering Specifications C3.3 Works Specifications C3.4 Particular Specification C3.5 Management of the works

	Part 4: Site Information **Part 5: Drawings** **Part 6: Additional Relevant Documents**	
F1.3	**Interpretation** 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 tender conditions.	
F.1.4	**Communication:** Communication with all stakeholders shall be through the O. R. Tambo Municipality's District Engineer. Ccommunication's shall be in the English language. The Employer shall not take any responsibility for non-receipt of communications from or by a tenderer	
	The Employer is O. R. Tambo District Municipality Private Bag x 6043 Mthatha 5100 Contact person: Mr. Nkosiyabo Noto Tel: 047 501 6400 / 6424	The employer's agent is: Thuso Development Consultants No.3 Prestwich Avenue, Mthatha (047) 532 6555 Email: chris@consulteng.co.za Contact Person : Mr. C Lombard Tel: 082 929 9148
F.1.5	**The employer's right to accept or reject any tender offer**	
F.1.5.1	**Reject or accept** The employer may accept or reject any variation, deviation, tender offer, or alternative tender offer, and may cancel the tender process and reject all tender offers at any time before the formation of a contract. The employer shall not accept or incur any liability to a tenderer for such a cancellation and rejection, but will give written reasons for such action upon written request to do so.	
F.1.6	**Procurement procedures**	
F.1.6.1	a contract will, subject to F.3.13, be concluded with the tenderer who in terms of F.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.	
F.2	**Tenderer's obligations**	
F.2.1.1	**Eligibility** Only those tenders who are registered with CIDB and have in their employ management and supervisory staff satisfying the requirement of the scope of work for labour intensive competencies for supervisory and management staff are eligible to submit tenders.	
F.2.1.2	**CIDB Grading** The required CIDB grading for this **project is 6ME PE / 7CE or higher.**	
F.2.2	**Cost of tendering** Accept that the Employer will not compensate the tenderers 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 satisfy requirements.	
F.2.3	**Check documents** Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.	

F.2.4	**Confidentiality and copyright** Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.	
F.2.5	**Reference documents** Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.	
F2.6	**Acknowledge Addenda** Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary apply for an extension of the closing time stated in the tender data, in order to take the addenda into account.	
F.2.7	The arrangements for a **compulsory clarification meeting** are:	
	Date: 03 November 2020 **Starting time:**10H00	**Location:** Port ST John's Local Municipality then proceed to site
F.2.8	**Seek clarification** Request clarification of the tender documents, if necessary, by notifying the employer at least five working days before the closing time stated in the tender data.	
F2.10	**Pricing the tender**	
F.2.10.1	Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes (except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable 14 days before the closing time stated in the tender data.	
F.2.10.2	Show VAT payable by the employer separately as an addition to the tendered total of the prices.	
F.2.10.3	Provide rates and prices that are fixed for the duration of the Contract, and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.	
F.2.10.4	State the rates and prices in South African Rand	
F2.11	**Alterations to documents** Not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations. Erasures and the use of masking fluid are prohibited.	
F.2.12	**Alternative tender offers** Alternative offers may be submitted only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted. The alternative tender offer is to be submitted with the main tender offer together with a schedule that compares the requirements of the tender documents with the alternative requirements the tenderer proposes.	
F.2.13.5	The Client's address for delivery of Tender offers and identification details to be shown on each Tender offer package are:	
	Location of Tender box: Tender Box, Ground Floor, O. R. Tambo District Municipality Building, Nelson Mandela Drive, Myezo Park, Mthatha, Eastern Cape.	
	Physical address: O. R. Tambo House, Nelson Mandela Drive, Mthatha	
F.2.14	**Information and data to be completed in all respects** Accept that tender offers, which do not provide all the data or information requested completely and in the form required, may be regarded by the employer as non-responsive.	
F.2.15	**Closing time** The closing times for submission of **Tenders are 12H00 on 30 November 2020**	
F.2.15	Telephonic, telegraphic, telex, facsimile or e-mailed Bid offers will **not** be accepted.	
F.2.16	**Tender offer validity** The Tender offer validity period is 90 Days as stated in the tender data.	

F.2.17	**Clarification of tender offer after submission** The tenderer shall 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.
F.2.18	**Provide other material** The tenderer shall, when requested by the Employer to do so, 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.
F2.20	**Submit securities, bonds, policies** Submit to the employer before formation of the contract, certificates of insurance required in terms of the conditions of contract identified in the contract data.
F.2.23	**The tenderer is required to submit with his tender:** (1) an original Tax Verification Pin issued by the South African Revenue Services; and (2) Certified copy of the original of all the Companies / CC Registration documents. (3) Joint Venture Agreement where applicable in CIDB format (signed and initialed on each page). (4) Proof of registration with CIDB (5) Certified copies of the original green bar-coded ID copies of Members of the companies.
F.3	**The employer's undertakings**
F.3.1	**Respond to requests from the tenderer**
F.3.1.1	Respond to a request for clarification received up to five working days before the tender closing time stated in the Tender Data and notify all tenderers who drew procurement documents.
F.3.2	**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 seven days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who drew documents.
F.3.4	**Opening of tender submissions**
F.3.4.1	The employer shall open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.
F.3.4.2	Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, preferences claimed and time for completion for the main tender offer only.
F.3.4.3	The client shall not be obliged to make available the record outlined in F.3.4.2 to any tenderer who fail to attend the tender opening.
F.3.6	**Non-disclosure** The client shall not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

F.3.7	**Grounds for rejection and disqualification** Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.
F3.9	**Arithmetical errors, omissions and discrepancies**
F.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.
F.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 F.3.11 for: a) the gross misplacement of the decimal point in any unit rate; b) omissions made in completing the pricing schedule or bills of quantities; or c) arithmetic errors in: i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or ii) The summation of the prices.
F.3.9.3	Notify the tenderer of all errors or omissions that are identified in the tender offer and invite the tenderer to either confirm the tender offer as tendered or accept the corrected total of prices.
F.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.

F.3.10	**Clarification of a tender offer** Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.
F3.11	**Evaluation of tender offers** *Replace the contents of the entire sub-clause with the following:* The procedure for evaluation of responsive tender offers will be method 2 of table F.1 of SANS 294: 2004. Financial offer & Preferences. The bid will be awarded to the bidder who has scored the highest points for price and preferences combined **BUT** the prerequisite will be to obtain at least **60 points** for quality (functionality), which will be explained in Stage 1 below. Nevertheless, O. R. Tambo District Municipality retains the right to accept any bid. C. First stage in evaluation: Compliance with Bid Rules and other Requirements The bids will be checked to ensure that they comply with the bid rules and all other requirements of the project document. In particular the following documentation must be completed and/or included within the bid. • The form of Offer and acceptance • Audited financial statements for any tender price over R10million • Certified company registration documents and ID of members • Form C: Compulsory Enterprise Questionnaire • Form D: Certificate of Authority for Signature • Form E: Amendments, Qualifications and Alternatives

- Form H: Certificate of Good Standing
- Form I: Relevant experience
- Form J: Details of key staff and CVs
- Form M: Preference Points Claim Form in Terms of the Preferential Procurement Regulations 2011

Note:

- All information supporting the above forms such as Curricula Vitae of staff who will work on the project and their functions, details of ownership, relevant experience etc.
- Addenda issued during the bid period, if any.
- The pricing schedule

Failure to supply the required information will compromise the bid

D. Next Stage in Evaluation: Pre-qualification; Quality / Functionality; Price & BBBEE Status Level
The next state in the evaluation process will consist of three stages, as follows:

STAGE 1: PRE-QUALIFICATION CRITERIA

In terms of the Preferential Procurement Policy Framework Act 2000, Preferential Procurement Regulation 2017, pre-qualification criteria for preferential procurement as specified in Regulation 4 will apply. Tenderers must comply with the requirement to subcontract a minimum of 30% of these works to the following enterprises:

(i) an EME or QSE which is at least 51% owned by black people;
(ii) an EME or QSE which is at least 51% owned by Black people who are youth;
(iii) an EME or QSE which is at least 51% owned by Black people who are women;
(iv) an EME or QSE which is at least 51% owned by Black people with disabilities;
(v) an EME or QSE which is at least 51% owned by Black people living in rural or underdeveloped areas or townships;
(vi) a cooperative which is at least 51% owned by black people;
(vii) an EME or QSE which is at least 51% owned by Black people who are military veterans;
(viii) an EME or QSE.

Failure to meet the pre-qualification criteria will render a bid non-responsive, and such bid will be disqualified and not proceed to be evaluated further.

STAGE 2: FUNCTIONALITY/QUALITY EVALUATION

ITEM	WEIGHT
Functionality (see detailed criteria below)	100
• Company Experience with respect to similar projects	30
• Experience of key staff assigned to the contract	30
• Preliminary Quality Assurance Plan	20
• Health and Safety Plan	10
• Preliminary Programme	10

Only bidders who score ***60 points or more*** on stage 2 will be evaluated further and therefore eligible for award.

The maximum score for functionality shall be 100, distributed as follows:

Tender functionality / quality claimed

	Category of Quality / Functionality	Maximum tender evaluation points provided
B1.1	**Experience on similar projects**	**30**
	Experience on similar projects: Proven experience in the Supply and Installation of Mechanical and Electrical Equipment for pump stations. Copies of Certificate of Completion MUST be submitted with the bid. No points will be awarded where Certificates of Completion have not been submitted with the Bid. If the value of completed project is not reflected on the certificate, provide contractor's appointment or letter from the client with values.	**30**
	The Contractor has successfully completed at least **Four (4)** projects that satisfies the sub-criteria and provided evidence whose individual contract value is at least R15 Million.	30
	The Contractor has successfully completed at least **Three (3)** projects that satisfies the sub-criteria and provided evidence whose individual contract value is at least R12 Million.	20
	The Contractor has successfully completed at least **Two (2)** projects that satisfies the sub-criteria and provided evidence whose individual contract value is at least R10 Million.	10
	The Contractor has successfully completed **ONE** project that satisfies the sub-criteria and provided evidence of the experience.	12
	Contractor failed to provide evidence of experience.	0
B1.2	**Experience of key personnel (NB no key personnel member may be assigned more than one duty on the Contract, i.e. different personnel must be assigned for each of the following key positions) Contracts Manager = ND Civil Engineering or Equivalent, Site Agent = N6 or Equivalent and Foreman = N3 or Equivalent**	**30**
	Favourable previous experience in the Built Environment with a minimum of 5 years; **Contracts Manager** = 12 points, 3-4 years = 10 points & 0-2 years = 8 points.	12
	Favourable previous experience in the Built Environment with a minimum of 5 years; **Site Agent** = 10 points, 3-4 years = 8 points & 0-2 years = 6 points.	10
	Favourable previous experience in the Built Environment with a minimum of 5 years; **Foreman** = 8 points, 3-4 years = 6 points & 0-2 years = 4 points.	8
	Contractor failed to provide evidence of qualification and experience.	0
B1.3	**Preliminary Quality Assurance Plan must outline processes, procedures and associated resources, applied by whom and when to ensure sufficient quality Control Procedures are in place to meet the requirements and manage risks and what contribution can be made regarding value management. Particular attention in the plan must be given to Execution, Testing and Commissioning**	**20**
	The Quality Assurance Plan specifies important issues approach in an innovative and efficient way, indicating that the Bidder has outstanding knowledge of state of the art approaches. The approach provides details ways to improve the project outcomes.	20
	The Quality Assurance Plan shows practical and coherent systems to actively manage quality.	15
	The Quality Assurance Plan shows how quality will be actively managed	10

		The Quality Assurance Plan is too generic to show how quality will be actively managed.	5
		Contractor failed to provide a Quality Assurance Plan.	**0**
	B1.4	**Health and Safety Plan: The Tenderer shall prepare and attach a Preliminary Health and Safety Plan in respect of the Works in order to demonstrate the necessary competencies and resources to perform the construction work all in accordance with the Act and Regulation. Tender to note the requirements of the Occupational Health and Safety Act No.85 of 1993 and the Constitution Regulations 2014 issued in terms of Section 43 of the Act.**	**10**
		Health and Safety Plan provided and covers requirements as per the Act and regulations.	10
		The Health and Safety Plan is too generic requirements as per the Act and regulations.	5
		Contractor failed to provide a Health and Safety Plan.	0
	B1.5	**Preliminary Programme: The tenderer shall attach a preliminary programme reflecting the proposed sequence of execution of the activities required for the contract. The programme shall be in accordance with the information supplied in the Project Specification, the contract data and with all aspects of this Tender.**	**10**
		Detailed Programme provided in Gantt Chart format, correlated to the scope of work	10
		Detailed Programme provided but not in Gantt Chart format or no correlation to the Scope of Work	5
		No Programme provided or where provided, the activity schedule is generic with no correlation to the Scope of Work.	0

STAGE 2: EVALUATION FOR PRICE AND PREFERENCE (80/20)
The procedure for Stage 3 of evaluation of responsive tenders is **Method 2**

a) PRICE: ……80

a) B-BBEE STATUS LEVEL OF CONTRIBUTION: ……20

Points Awarded for Price (Ps)

A total of 90 points will be awarded to the Tenderer with the lowest balanced price. The **other tenders will be awarded points on the ratio to bench mark price as follows**

$$Ps = 8\left(1 - \frac{Pt - P\,\min}{P\,\mathrm{mi}}\right)$$

Where
Ps = Points scored for price of bid under consideration
Pt = Rand value of bid under consideration
Pmin = Rand value of lowest acceptable bid

b) Points awarded for B-BBEE Status Level of Contribution

In terms of Regulation 5 (2) and 6 (2) of the Preferential Procurement Regulations, preference points must be awarded to a bidder for attaining the B-BBEE status level of contribution in accordance with the table below:

B-BBEE Status Level of Contributor	**Number of points (80/20 system)**
1	20
2	18
3	14
4	12
5	8
6	6
7	4
8	2
Non-compliant Contributor	0

The total calculated points will be rounded to the second decimal place.

F.3.13 **Acceptance of tender offer**

F3.13.1 Accept the tender offer, if in the opinion of the employer, it does not present any unacceptable commercial risk and only if the tenderer:
a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
c) has the legal capacity to enter into the contract,
d) is not insolvent, in receivership, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,
e) complies with the legal requirements, if any, stated in the tender data, and
f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

F3.13.2 Notify the successful tenderer of the employer's acceptance of his tender offer by completing and returning one copy of the form of offer and acceptance before the expiry of the validity period stated in the tender data, or agreed additional period. Providing the form of offer and acceptance does not contain any qualifying statements, it will constitute the formation of a contract between the employer

	and the successful tenderer as described in the form of offer and acceptance.
F.3.14	**Notice to unsuccessful tenderers** After the successful tenderer has acknowledged the employer's notice of acceptance, after written request, the employer will notify the tenderers that their tender offers have not been accepted in O.R Tambo District Municipality's website: www.ortambodm.org.za by listing the successful tender.
F.3.15	**Prepare contract documents** If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of: a) addenda issued during the tender period, b) inclusion of some of the returnable documents, c) other revisions agreed between the employer and the successful tenderer, and d) The schedule of deviations attached to the form of offer and acceptance, if any.
F.3.16	**Issue final contract** Prepare and issue the final draft of the contract to the successful tenderer for acceptance as soon as possible after the date of the employer's signing of the form of offer and acceptance (including the schedule of deviations, if any).

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRCAL EQUIPMENT FOR PUMP STATIONS

T2.1 LIST OF RETURNABLE DOCUMENTS

The Tenderer must complete the following returnable documents:

T2.2 Returnable Documents required for Tender evaluation purposes		
1	Form 2.2.1	General Information of the Tenderer
2	Form 2.2.2	Authority for Signatory
3	Form 2.2.3	Schedule of Previous Experience
4	Form 2.2.4	Schedule of Current Projects
5	Form 2.2.5	Declaration of good standing regarding tax
6	Form 2.2.6	Certificate of Attendance at Site Meeting
7	Form 2.2.7	Proposed Key Personnel
8	Form 2.2.8	Schedule Equipment to be used
9	Form 2.2.9	Schedule of Proposed Sub-Contractors
10	Form 2.2.10	Financial References

T2.3 Returnable Documents that will be incorporated into the contract		
1	Form 2.3.1	Record of Addenda to Tender Documents
2	Form 2.3.2	Procurement Form

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

T2.2 RETURNABLE DOCUMENTS

RETURNABLE DOCUMENTS REQUIRED FOR TENDER EVALUATION PURPOSES

Form 2.2.1	General Information of Tenderer
Form 2.2.2	Authority of Signatory
Form 2.2.3	Schedule of Previous Experience
Form 2.2.4	Schedule of Current Projects
Form 2.2.5	Declaration of good standing regarding tax
Form 2.2.6	Registration on the Central Supplier Database
Form 2.2.7	Certificate of Attendance at Site Meeting
Form 2.2.8	Proposed Key Personnel
Form 2.2.9	Schedule of Proposed Sub-consultants
Form 2.2.10	Financial References
Form 2.2.11	Declaration of interest

FORM 2.2.1 GENERAL INFORMATION OF TENDERER

1. Name of Tenderer: ……

2. Contact details

Address : ……

Tel no : ……

Fax no : ……

Cell no : ……

E-mail address: ……

3. Legal entity: Mark with an X.

Sole proprietor	
Partnership	
Close corporation	
Company (Pty) Ltd	
Joint venture	

In the case of a Joint venture, provide details on joint venture members:

Joint venture member	Type of entity (as defined above)

4. Income tax reference number: ……..
(in case of a joint venture, provide for all joint venture members)

5. Municipal services area where the enterprise is registered: ……..
(in case of a joint venture, provide for all joint venture members)

6. Company / close corporation Registration Number: ……..
(in case of a joint venture, provide for all joint venture members)

7. VAT Registration number: ……..
(in case of a joint venture, provide for all joint venture members)

8. CIDB registration number: ……..
(in case of a joint venture, provide for all joint venture members)

ATTACH THE FOLLOWING DOCUMENTS HERETO

1. For Closed Corporations

   Certified copies of CK1 or CK2 as applicable (Founding Statement)

2. For Companies

   Certified copies of Shareholders register

3. ID copies

   Certified ID Copies for members

4. CIDB registration

   Proof of registration with CIDB

5. CSD registration

   Proof of registration with Central Supplier Database

6. For Joint Venture Agreements

   Copy of the Joint Venture Agreement between all the parties, as well as the certified documents in (1), and or (2) and (4) and (4) of each Joint Venture member.

7. Copy of the latest municipal service account where enterprise is registered

8. Central Supplier Database Summary Report

FORM 2.2.2 AUTHORITY OF SIGNATORY

Details of person responsible for tender process:

Name : ----------

Contact number : ----------

Office address : ----------

Signatories for close corporations and companies shall confirm their authority by attaching to this form a **duly signed and dated original or certified copy** of the relevant resolution of their members or their board of directors, as the case may be.

"By resolution of the board of directors passed on *(date)*.....

Mr .....

has been duly authorized to sign all documents in connection with the Tender for Contract Number ……and any Contract which may arise there from on behalf of ……

(BLOCK CAPTIALS)

SIGNED ON BEHALF OF THE COMPANY .....

IN HIS CAPACITY AS .....

DATE .....
:.....

FULL NAMES OF SIGNATORY .....

AS WITNESSES: 1. ……...

2. ……

FORM 2.2.2 CERTIFICATE OF AUTHORITY FOR JOINT VENTURES

This Returnable Schedule is to be completed by joint ventures.

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

NAME OF FIRM	**ADDRESS**	**DULY AUTHORISED SIGNATORY**
Lead partner CIDB registration no ……		Signature. . . . . . Name …… Designation……
CIDB registration no ……		Signature. . . . . . Name …… Designation……
CIDB registration no ……		Signature. . . . . . Name …… Designation……
CIDB registration no ……		Signature. . . . . . Name …… Designation……

ATTACH HERETO THE DULY SIGNED AND DATED ORIGINAL OR CERTIFIED COPY OF AUTHORITY OF SIGNATORY ON COMPANY LETTERHEAD

FORM 2.2.3 SCHEDULE OF PREVIOUS EXPERIENCE

Provide the following information on relevant previous experience (indicate specifically projects of similar or larger size and/or which is similar with regard to type of work). (MECHANICAL AND ELECTRICAL WORKS)

Description	Value (R) VAT excluded	Year(s) work executed	Reference		
			Name	Organisation	Tel no

Name of Tenderer: …… Date: ……

Signature : ……..

Full name of signatory: ……

FORM 2.2.4 SCHEDULE OF CURRENT PROJECTS

Provide the following information on current relevant projects. **This information is material to the award of the Contract.**

Description	Value (R) VAT excluded	Date Appointed	Reference		
			Name	Organisation	Tel no

Name of Tenderer: ..... Date: .....

Signature : .....

Full name of signatory: .....

FORM 2.2.5 DECLARATION OF GOOD STANDING REGARDING TAX

SOUTH AFRICAN REVENUE SERVICES	Tender No: …….. Closing Date: ……

DECLARATION OF GOOD STANDING REGARDING TAX

PARTICULARS

1. Name of Taxpayer/Tenderer: .....
2. Trade Name: .....
3. Identification Number: (If applicable) | | | | | | | | | | | | | |
4. Company / Close Corporation registration number: | | | | | | | | | | |
5. Income Tax reference number: | | | | | | | | | | |
6. VAT registration number: (If applicable) | | | | | | | | | | |
7. PAYE employer's registration number: (If applicable) | | | | | | | | | | |
8. Monetary value of Bid: | | | | | | | | | | | | | |

DECLARATION

I, …… the undersigned, the above taxpayer/Bidder, hereby declare that my Income Tax, Pay-As-You-Earn (PAYE) and Value-Added-Tax (VAT) obligations of the above-mentioned taxpayer, which include the rendition of returns and payment of the relevant taxes:

(i) Have been satisfied in terms of the relevant Acts; or

(ii) That suitable arrangements have been made with the Receiver of Revenue,…….…….. to satisfy them.*

……	……	……
SIGNATURE	**CAPACITY**	**DATE**

PLEASE NOTE:* **The declaration (ii) cannot be made unless formal arrangements have been made with the Receiver of Revenue with regard to any outstanding revenue/outstanding tax returns.**

ATTACH ORIGINAL

VALID TAX VERIFICATION PIN

FORM 2.2.6 REGISTRATION ON THE CENTRAL SUPPLIER DATABASE

Attach proof of registration with the Central Supplier Database. **This information is material to the award of the Contract.**

ATTACH CERTIFIED PROOF OF REGISTRATION ON THE NATIONAL CENTRAL SUPPLIER DATABASE

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

FORM 2.2.7 CERTIFICATE OF ATTENDANCE AT SITE MEETING

This is to certify that I, …… (Name)

duly authorised representative of ……..(Tenderer)

Address: ……

Date: ……..

Visited the site on ……(date) in the presence of

……
(Engineer)

I have made myself familiar with the sites and all the 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 by the said Engineer and that I understand perfectly the work to be done, as specified and implied, in the execution of this contract.

_____ _____

REPRESENTATIVE OF EMPLOYER REPRESENTATIVE OF TENDERER

FORM 2.2.8 PROPOSED KEY PERSONNEL

The Tenderer shall list below the key personnel **(including first nominee and the second choice alternate) including CV's**, whom he proposes to employ on the project should his Tender be accepted, both at his headquarters and on the Site, to direct and for the execution of the work, together with their qualifications, experience, positions held and their nationalities.

No	Name	Qualification	Designation	YEARS WITH CURRENT COMPANY

Name of Tenderer: …… Date: ……

Signature : ……...

Full name of signatory: ……

FORM 2.2.9 SCHEDULE OF PROPOSED SUB-CONTRACTORS

NAME OF SUB-CONTRACTOR	FULL DESCRIPTION OF WORK TO BE PERFORMED BY SUB- CONTRACTORS

Acceptance of this tender shall not be construed as approval of all or any of the listed subcontractors. Should any of the subcontractors not be approved subsequent to acceptance of the tender, this shall in no way invalidate this tender, and the tendered unit rates for the various items of work shall remain final and binding, even in the event of a subcontractor not listed above being approved by the Engineer.

Name of Tenderer: …… Date: ……

Signature : ……...

Full name of signatory: ……

FORM 2.2.10 FINANCIAL REFERENCES

FINANCIAL STATEMENTS

I/We agree to furnish an audited copy of the latest set of financial statements together with my/our Directors' and Auditors' report for consideration by the Client.

DETAILS OF TENDERERS BANKING INFORMATION

I/We hereby authorise the Client/Engineer to approach all or any of the following banks for the purposes of obtaining a financial reference:

BANK NAME:	
ACCOUNT NAME: *(e.g. ABC Civil Construction cc)*	
ACCOUNT TYPE: *(e.g. Savings, Cheque etc)*	
ACCOUNT NO:	
ADDRESS OF BANK:	
CONTACT PERSON:	
TEL. NO. OF BANK / CONTACT:	
How long has this account been in existence:	0-6 months ☐ 7-12 months ☐ 13-24 months ☐ More than 24 months ☐ (Tick which is appropriate)

Name of Tenderer: …… Date: ……

Signature : ……...

Full name of signatory: ……

ATTACH AUDITED FINANCIAL STATEMENTS

FORM 2.2.11 MUNICIPAL BIDDING DOCUMENTS

MBD 1

PART A
INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF *O. R. TAMBO DISTRICT MUNICIPALITY*					
BID NUMBER:	**MIS 315 995 B**	**CLOSING DATE:**	**30 NOVEMBER 2020**	**CLOSING TIME:**	**12.00PM**
DESCRIPTION:	**PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6: MECHANICAL AND ELECTRICAL**				

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT:

TENDER BOX, GROUND FLOOR, O. R. TAMBO DISTRICT MUNICIPALITY BUILDING
NELSON MANDELA DRIVE
MYEZO PARK
MTHATHA
EASTERN CAPE

SUPPLIER INFORMATION					
NAME OF BIDDER					
POSTAL ADDRESS					
STREET ADDRESS					
TELEPHONE NUMBER	**CODE**		**NUMBER**		
CELLPHONE NUMBER					
FACSIMILE NUMBER	**CODE**		**NUMBER**		
E-MAIL ADDRESS					
VAT REGISTRATION NUMBER					
TAX COMPLIANCE STATUS	**TCS PIN:**			**CSD No:**	
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE [TICK APPLICABLE BOX]	☐ **Yes** ☐ **No**		**B-BBEE STATUS LEVEL SWORN AFFIDAVIT**	☐ **Yes** ☐ **No**	

[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES & QSEs) MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]

ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	☐**Yes** ☐**No** **[IF YES ENCLOSE PROOF]**	**ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?**	☐**Yes** ☐**No** **[IF YES, ANSWER PART B:3]**
TOTAL NUMBER OF ITEMS OFFERED		**TOTAL BID PRICE**	**R**
SIGNATURE OF BIDDER	……	**DATE**	
CAPACITY UNDER WHICH THIS BID IS SIGNED			

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO:		**TECHNICAL INFORMATION MAY BE DIRECTED TO:**	
DEPARTMENT	**SCM DEPARTMENT**	**CONTACT PERSON**	**MR. N NOTO**
CONTACT PERSON	**MR. SAKHIWO HOPA**	**TELEPHONE NUMBER**	**047 501 6425**
TELEPHONE NUMBER	**047 501 6557**	**FACSIMILE NUMBER**	**N/A**
FACSIMILE NUMBER	**N/A**	**E-MAIL ADDRESS**	**nkosiyabon@ortambodm.gov.za**
E-MAIL ADDRESS	**sakhiwoh@ortambodm.gov.za**		

PART B
TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:

1.1. BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.

1.2. **ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED–(NOT TO BE RE-TYPED).**

1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.

2. TAX COMPLIANCE REQUIREMENTS

2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.

2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VIEW THE TAXPAYER'S PROFILE AND TAX STATUS.

2.3 APPLICATION FOR THE TAX COMPLIANCE STATUS (TCS) CERTIFICATE OR PIN MAY ALSO BE MADE VIA E-FILING. IN ORDER TO USE THIS PROVISION, TAXPAYERS WILL NEED TO REGISTER WITH SARS AS E-FILERS THROUGH THE WEBSITE WWW.SARS.GOV.ZA.

2.4 FOREIGN SUPPLIERS MUST COMPLETE THE PRE-AWARD QUESTIONNAIRE IN PART B:3.

2.5 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.

2.6 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.

2.7 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.

3. QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS

3.1.	IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO
3.2.	DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO
3.3.	DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO
3.4.	DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO
3.5.	IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO

IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 ABOVE.

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

SIGNATURE OF BIDDER: ……

CAPACITY UNDER WHICH THIS BID IS SIGNED: ……

DATE: ……..

MBD 4

DECLARATION OF INTEREST

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

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

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

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

3.2 Identity Number: ……..

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

……

3.4 Company Registration Number: ……

3.5 Tax Reference Number: ……

3.6 VAT Registration Number: ……

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

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

3.8.1 If yes, furnish particulars…….....

……

[1] MSCM Regulations: "in the service of the state" means to be –
(a) a member of –
  (i) any municipal council;
  (ii) any provincial legislature; or
  (iii) the national Assembly or the national Council of provinces;

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

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

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

3.9.1 If yes, furnish particulars…….

……..

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

3.10.1 If yes, furnish particulars ……

……

3.11 Are you, aware of any relationship (family, friend, other) between any other bidder and any persons in the service of the state who may be involved with the evaluation and or adjudication of this bid?..... **YES / NO**

3.11.1 If yes, furnish particulars……

……

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

3.12.1 If yes, furnish particulars ……

……

3.13 Are any spouse, child or parent of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state?..... **YES / NO**

3.13.1 If yes, furnish particulars……

……

3.14 Do you or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company have any interest in any other related companies or business whether or not they are bidding for this contract?..... **YES / NO**

3.14.1 If yes, furnish particulars ……

……

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

Full name	**Identity number**	**State employee number**

…… ……
Signature **Date**

…… ……..
Capacity **Name of Bidder**

MBD 5

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

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

NO.	QUESTION	ANSWER (TICK WHICH RESPONSE IS APPLICABLE)	
		YES	NO
1.	Are you by law required to prepare annual financial statements?		
1.1	If yes, submit audited annual financial statements for the past three years or since the date of establishment if established during the last 3 years.		

NO.	QUESTION	ANSWER (TICK WHICH RESPONSE IS APPLICABLE)	
		YES	NO
2.	Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than 3 months or any other service provider in respect of which payment is overdue for more than 30 days?		
2.1	If no, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than 3 months or other service provider in respect of which payment is overdue for more than 30 days.		
2.2	If yes, provide details: …….. …….. ……..		

NO.	QUESTION	ANSWER (TICK WHICH RESPONSE IS APPLICABLE)	
		YES	NO
3.	Has any contract been awarded to you by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract?		
3.1	If yes, provide details: …… …… …….		

NO.	QUESTION	ANSWER (TICK WHICH RESPONSE IS APPLICABLE)	
		YES	NO
4.	Will any portion of the goods of services be sourced from outside the Republic, and if so, what portion, and whether any portion of payment from the municipality is expected to be transferred outside of the Republic?		
4.1	If yes, provide details: …… …… ……		

CERTIFICATION

I, THE UNDERSIGNED (NAME) ……
CERIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT.

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

…… ……..

Signature Date

…… ……

Position Name of Bidder

MBD 8

DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

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

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

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

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

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

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

4.4.1	If so, furnish particulars:		
4.5	Was any contract between the bidder and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
4.7.1	If so, furnish particulars:		

CERTIFICATION

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

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

……..... ……..……..
Signature **Date**

…… ……..……..
Position **Name of Bidder**

MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

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

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

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

a. take all reasonable steps to prevent such abuse;

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

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

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

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

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

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

MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

PROJECT NO.: MIS 315 995 B: Regional Water Supply Scheme Phase 6: Mechanical and Electrical

in response to the invitation for the bid made by:

O. R. TAMBO DISTRICT MUNICIPALITY

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

I certify, on behalf of:_____that:

(Name of Bidder)

1. I have read and I understand the contents of this Certificate;
2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;
4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign, the bid, on behalf of the bidder;
5. For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:

    (a) has been requested to submit a bid in response to this bid invitation;
    (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and
    (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder

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

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

    (a) prices;

(b) geographical area where product or service will be rendered (market allocation)

(c) methods, factors or formulas used to calculate prices;

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

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

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

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

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

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

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

…… ……..

Signature Date

…… ……..

Position Name of Bidder

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

T2.3 RETURNABLE DOCUMENTS

RETURNABLE DOCUMENTS THAT WILL BE INCORPORATED INTO THE CONTRACT

Form 2.3.1 Record of Addenda to Tender Documents
Form 2.3.2 Procurement Form

FORM 2.3.1 RECORD OF ADDENDA TO TENDER DOCUMENTS

(Addenda received from Engineer for amendments on Tender Documentation)

	Date	**Title or Details**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Name of Tenderer: …… Date: ……

Signature : ……...

Full name of signatory: ……

FORM 2.3.2 PROCUREMENT FORM

Acceptable Tenders will be evaluated using a system that awards points on the basis of Tender price and the meeting of specific goals.

DEFINITIONS

"Acceptable Tender" means any Tender which, in all respects, complies with the conditions of Tender and specifications as set out in the Tender document, including conditions as specified in the Preferential Procurement Policy Framework Act (Act 5 of 2000) and the Supply Chain Management of Council.

"Council" refers to the O. R. TAMBO DISTRICT Municipality.

"Equity ownership" refers to the percentage ownership and control, exercised by individuals within an enterprise and they are involved in the day to day running of the Company.

"HDI equity ownership" refers to the percentage of an enterprise, which is owned by individuals, or in the case of a company, the percentage shares that are owned by individuals meeting the requirements of the definition of a HDI.

"**Historically disadvantaged individuals (HDIs)**" means all South African citizens –

(i) Who had no franchise in national elections prior to the introduction of the 1983 and 1993 constitutions (Referred to as Previously Disadvantaged Individuals (PDIs) in this document)
(ii) Women
(iii) Disabled persons.

"SMME's" (small, medium and micro enterprises) refers to separate and distinct business entities, including co-operative enterprises and NGOs, managed by one owner or more, as defined in the National Small Business (Act 102 of 1996). Refer to the attached addendum for a definition of SMME's for different economic sectors. Tenders are adjudicated in terms of NDM Procurement Policy, and the following framework is provided as a guideline in this regard.

1. Technical adjudication and General Criteria

- Tenders will be adjudicated in terms of inter alia:
- Compliance with Tender conditions
- Technical specifications

If the Tender does not comply with the Tender conditions, the Tender will be rejected. If technical specifications are not met, the Tender may also be rejected.

With regard to the above, certain actions or errors are unacceptable, and warrants **REJECTION OF THE TENDER**, for example:

- A Tax Verification Pin. (**Only valid tax verification pin** must be attached to the Tender document).
- Pages to be completed, removed from the Tender document, and have therefore not been submitted.
- Failure to complete the schedule of quantities as required
- Scratching out without initialling next to the amended rates or information.
- Writing over / painting out rates / the use of tippex or any erasable ink, eg. Pencil.
- Failure to attend compulsory site inspections
- The Tender has not been properly signed by a party having the authority to do so, according to the **Form 2.2.2 – "Authority for Signatory"**
- No authority for signatory submitted.
- Form of Offer not completed.
- Particulars required in respect of the Tender have not been provided – non-compliance of Tender requirements and/or specifications.
- The Tenderer's attempts to influence, or has in fact influenced the evaluation and/or awarding of the contract.
- The Tender has been submitted after the relevant closing date and time
- Each page of the Contract portion of this Tender document (Part C1 – C4) must be initialled by the authorised person in order for the document to constitute a proper Contract between the Employer (ORTDM) and the undersigned.
- If any municipal rates and taxes or municipal service charges owed by that Tenderer or any of its directors to the municipality, or to any other municipality or municipal entity, are in arrears for more than three months.
- If any Tenderer who during the last five years has failed to perform satisfactorily on a previous contract with the municipality or any other organ of state after written notice was given to that Tenderer that performance was unsatisfactory.

2. Size of enterprise and current workload

Evaluation of the Tenderer's position in terms of:

- Previous and expected current annual turnover
- Current contractual obligations
- Capacity to execute the contract

3. Staffing profile

Evaluation of the Tenderer's position in terms of:

- Staff available for this contract being Tendered for
- Qualifications and experience of key staff to be utilised on this contract

4. Financial ability to execute the contract:

Evaluation of the Tenderer's financial ability to execute the contract. Emphasis will be placed on the following:

- Contact the Tender's bank manager to assess the Tenderer's financial ability to execute the contract and the Tenderer hereby grants his consent for this purpose.

5. Good standing with SA Revenue Services

- Determine whether an original valid tax verification pin has been submitted.
- The Tenderer must affix an original valid Tax Verification Pin to page T2.2.9 of the Tender document.

6. Penalties

The O. R. Tambo District Municipality will if upon investigation it is found that a preference in terms of the Contract has been obtained on a fraudulent basis, or any specified goals are not attained in the performance of the contract, on discretion of the Municipal Manager, one or more of the following penalties will be imposed:

- Cancel the contract and recover all losses or damages incurred or sustained from the Tenderer.
- Impose a financial penalty of twice the theoretical financial preference associated with the claim, which was made in the Tender.
- Restrict the suppliers, its shareholders and directors on obtaining any business from the O. R. Tambo District Municipality for a period of 5 years.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

DECLARATION

I/We the undersigned, who warrants that he/she is duly authorised to do so on behalf of the firm, certifies that the items mentioned in part of the foregoing procurement form and returnable documents qualifies/qualify for the preference(s) shown and acknowledge(s) that:

The information furnished is true and correct.

The contractor may be required to furnish documentary proof to the satisfaction of the O. R. Tambo District Municipality that the claims are correct.

If the claims are found to be inflated, the O. R. Tambo District Municipality may, in addition to any other remedy it may have, recover from the contractor all cost, losses or damages incurred or sustained by the O. R. Tambo District Municipality as a result of the award of the contract and/or cancel the contract and claim any damages which the O. R. Tambo District Municipality may suffer by having to make less favourable arrangements after such cancellation.

Signature of Tenderer

Signed at _____ on _____ day of _____20____

_____
For the tenderer

WITNESSES:

1. _____

2. _____

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

C1 AGREEMENTS AND CONTRACT DATA

FORM C1.1 FORM OF OFFER AND ACCEPTANCE

FORM OF OFFER

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract in respect of the following works: **Project: MIS 315 995 B: PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6: SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS.**

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

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

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

……

……

……..…… 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 document to the Tenderer before the end of the period of validity stated in the Tender Data, whereupon the Tenderer becomes the party named as the Contractor in the Conditions of Contract identified in the Contract Data.

Signature(s) _____ _____

Name(s) _____ _____

Capacity _____ _____

For the tenderer _____
(Name and address of organisation)

Name & Signature
Of Witness _____ _____
Name Date

Contractor	*Witness 1*	*Witness 2*	*Employer*	*Witness 1*	*Witness 2*

ACCEPTANCE

By signing this part of this Form of Offer and Acceptance, the Employer identified below accepts the Tenderer's Offer. In consideration thereof, the Employer shall pay the Contractor the amount due in accordance with the Conditions of Contract identified in the Contract Data. Acceptance of the Tenderer's Offer shall form an agreement between the Employer and the Tenderer upon the terms and conditions contained in this Agreement and in the Contract that is the subject of this Agreement.

The terms of the contract are contained in:

Part 1 Agreements and Contract Data (which includes this Agreement)
Part 2 Pricing Data
Part 3 Scope of Work
Part 4 Site information
Part 5 Additional Relevant Documentation
Part 6 Contract Drawings

and drawings and documents or parts thereof, which may be incorporated by reference into Parts 1 to 6 above.

Deviations from and amendments to the documents listed in the Tender Data, including the proposed key personnel and any addenda thereto listed in the Tender Schedules as well as any changes to the terms of the Offer agreed by the Tenderer and the Employer during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Agreement. No amendments to or deviations from said documents are valid unless contained in this Schedule, which must be duly signed by the authorised representative(s) of both parties.

The Tenderer shall within two weeks after receiving a completed copy of this Agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the Conditions of Contract identified in the Contract Data at or just after the date this Agreement comes into effect. Failure to 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 fully completed original copy of this document, including the Schedule of Deviations (if any). Unless the Tenderer (now Contractor) within five days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this Agreement, this Agreement shall constitute a binding contract between the parties.

Signature(s) _____ _____

Name(s) _____ _____

Capacity _____ _____

For the tenderer: _____

(Name and address of organisation)

Name & Signature
Of Witness

_____ _____ _____

Name Date

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

SCHEDULE OF DEVIATIONS

Notes:

1. The extent of deviations from the tender documents issued by the Employer prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender.

2. A Tenderer's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid becomes the subject of agreements reached during the process of Offer and Acceptance; the outcome of such agreement shall be recorded here.

3. Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the Parties becomes an obligation of the contract, shall also be recorded here.

4. Any change or addition to the tender documents arising from the above agreements and recorded here shall also be incorporated into the final draft of the Contract.

1 **Subject** _____
Details _____

2 **Subject** _____
Details _____

3 **Subject** _____
Details _____

4 **Subject** _____
Details _____

5 **Subject** _____
Details _____

6 **Subject** _____
Details _____

By the duly authorised representatives signing this Schedule of Deviations, the Employer and the Tenderer agree to and accept the foregoing Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and addenda thereto as listed in the Tender Schedules, as well as any confirmation, clarification or change to the terms of the Offer agreed by the Tenderer and the Employer during this process of Offer and Acceptance. It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the Tenderer of a completed signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this Agreement.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

FOR THE TENDERER:

Signatures (s) _____ _____

Name(s) _____ _____

Capacity _____ _____

_____

(Name and address of Organisation)

Name & Signature
Of Witness _____ Date _____

FOR THE EMPLOYER

Signatures (s) _____ _____

Name(s) _____ _____

Capacity _____ _____

_____

(Name and address of Organisation)

Name & Signature
Of Witness _____ Date _____

FORM C1.2 CONTRACT DATA

PART 1: DATA PROVIDED BY THE EMPLOYER

The contract data of this contract are:
C1.2.1 Conditions of Contract
C1.2.2 Data provided by the Employer
C1.2.3 Data provided by the Contractor

C1.2.1 Conditions of Contract

The General Conditions of Contract for Construction Works 3rd Edition (2015) published by the South African Institution of Civil Engineering, is applicable to this contract. Copies of these conditions of contract may be obtained from the South African Institution of Civil Engineering www.saice.org.za

The General Conditions of Contract for Construction Works 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.

Contractor	*Witness 1*	*Witness 2*	*Employer*	*Witness 1*	*Witness 2*

C1.2.2 Data provided by the employer

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

The following contract specific data are applicable to this Contract:

CONTRACT SPECIFIC DATA

The following contract specific data, referring to the General Conditions of Contract for Construction Works, Third Edition, 2015, are applicable to this Contract:

Clause 1.1.1.13:
The Defects Liability Period is **12 months.**

Clause 1.1.1.14:
The time for achieving Practical Completion is **12 Months.**

Clause 1.1.1.15:
The name of the Employer is **O. R. Tambo District Municipality**

Clause 1.1.1.16:

The name of the Employer's Agent is Thuso Development Consultants.

Clause 1.1.1.26:
The Pricing Strategy is a Re-measurement

Clause 1.2.1.2:
The address of the Employer is: *Postal*: Private Bag x 6043, Mthatha 5100.

Physical: O. R. Tambo House, Nelson Mandela Drive, Mthatha 5100.

Tel: [047] 501 6400

Fax: [047] 532 4166

Clause 1.1.1.16:
The name of the client is **O. R. Tambo District Municipality-District Engineering Services**

Clause 1.2.1.2:
The address of the client is ***Postal*: Private Bag x 6043, Mthatha 5100**

Clause 3.2.3:

Special Approval of the Employer Required

The Employer's Agent is required to obtain the specific approval of the Employer before executing any of the following functions or duties:

1. Providing consent for subcontracting part of the contract in terms of Clause 4.4.
2. The issuing of instructions for dealing with fossils and the like in terms of Clause 4.7.
3. The reduction of a penalty for delay in terms of Clause 5.13.2.
4. The determination of additional or reduced costs arising from changes in legislation in terms of Clause 6.8.4.
5. The agreeing of the adjustment of the sums for general items in terms of Clause 6.11.
6. Authorizing the Contractor to repair and make good excepted risks in terms of Clause 8.2.2.2.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

7. The inclusion of credits in the next payment certificate in terms of Clause 10.1.5.2

Clause 4.4.2:
A successful tenderer shall subcontract (if applicable) at least **30% (minimum)** of the total contract value excluding VAT, to EME's or QSE's that are 51% owner by the following enterprises:

(i) Black people;
(ii) Black people who are youth;
(iii) Black people who are women;
(iv) Black people with disabilities;
(v) Black people living in rural or underdeveloped areas or townships;
(vi) Cooperatives which is at least 51% owned by black people;
(vii) Black people who are military veterans.

Clause 5.3.1:
The documentation required before commencement with Works execution are:

Approved Health and Safety Plan (Refer to Clause 4.3)

Initial programme (Refer to Clause 5.6)

Accepted security (Refer to Clause 6.2)

Insurance (Refer to Clause 8.6)

Clause 5.3.2:
The time to submit the documentation required before commencement with Works execution is **14 days**.

Clause 5.4:
Access to the Site
Add the following clause after Clause 5.4.3:

Clause 5.4.4:
The Contractor shall bear all costs and charges for special and temporary rights of way required by him in connection with access to the Site. The Contractor shall also provide at his/her own cost any additional facilities outside the Site required by him/her for the purposes of the Works.

Clause 5.7.1:
Where the Rate of Progress falls behind the approved Programme of Works by three months, the Employer may terminate the contract giving a five days' notice

Clause 5.8.1:
The non-working days are Sundays and Saturdays
The special non-working days are:

(1) public holidays

(2) The year-end break commencing on **14/12/2020 and ending on 05/01/2021**.

Clause 5.11.1
In the event that the performance of the services has to be suspended on the grounds of Force Majeure, the period of performance shall be extended by the extent of the delay at no extra cost.

Clause 5.11.2
During the period of his inability to perform services as a result of an event of Force Majeure, the service provider shall not be entitled to any payment in terms of the contract.

Clause 5.12.1 (5.12.2.2)
Extension of time for practical completion due to abnormal climatic conditions shall be calculated according to the requirements of the following equation.

$$V = (Nw - Nn) + \frac{(Rw - Rn)}{x}$$

The number of days per month on which work is expected not to be possible as a result of abnormal rainfall are as per the table below;

MONTH	**EXPECTED NUMBER OF WORKING DAYS LOST AS A RESULT OF ABNORMAL RAINFALL**
JANUARY	3
FEBRUARY	3
MARCH	3
APRIL	2
MAY	1
JUNE	1
JULY	1
AUGUST	1
SEPTEMBER	2
OCTOBER	2
NOVEMBER	3
DECEMBER	3
TOTAL	**25**

Clause 5.13.1:
The penalty for failing to complete the Works is **R 10 000.00** per calendar per day.

Clause 5.16.3:
The latent defect period is **10 years**.

Clause 6.8.2

There is no contract price adjustment

Clause 6.10.1.5:
The percentage advance on materials not yet built into the Permanent Works is **80%**

Clause 6.10.3:
The limit of retention money is **5%**

Clause 8.6.1.1.2:
The value of Plant and materials supplied by the Employer to be included in the insurance sum is **NIL**

Clause 8.6.1.1.3:
The amount to cover professional fees for repairing damage and loss to be included in the insurance sum is **15%** of the value.

Clause 8.6.1.3:
The limit of indemnity for liability insurance is **R10 million.**

Clause 9.2.1
The Employer may terminate the contract:

a) Where the services are no longer required
b) Where the funding for the services is no longer available
c) If the service provider does not remedy a failure in the performance of his obligations under the Contract within 7 days after having been notified thereof by the employer.
d) If the service provider becomes insolvent or liquidated; or
e) If as a result of Force Majeure, the Service Provider is unable to perform part or the whole service for a period of thirty (30) days.
f) Where the Rate of Progress falls behind the approved Programme of Works by three months, the Employer may terminate the contract giving a five days' notice.

Clause 10.5.3
The number of Adjudication Board Members to be appointed is **one.**

Contractor	*Witness 1*	*Witness 2*	*Employer*	*Witness 1*	*Witness 2*

C1.2.3 Data to be provided by the contractor

Clause 1.1.1.9 The name of the contractor is: (insert legal name)

_____

Clause 1.2.1.2 The address of the contractor is:

Physical address_____

_____

Postal Address_____

_____

Telephone
_____

Fax_____

Email_____

Clause 6.2.1 The security to be provided by the contractor shall be one of the following:

Type of security: Note VAT is included in the contract sum and Value of works for calculating percentages	Contractor's choice. Indicate "Yes" or "no"
(1) Cash deposit of 10% of the Contract Sum plus retention of 10% of the value of the works.	
(2) Performance guarantee (note A) of 10% of the Contract Sum plus retention of 10% of the value of the works.	

_____
Tenderer's signature

Note A

The Performance Guarantee shall be of an Insurance Company listed on the Johannesburg Stock Exchange or owned by such a company, a Registered South African Bank or a recognised government sponsored, provincial or national development agency.

C1.3 FORM OF GUARANTEE

PERFORMANCE GUARANTEE

For use with the General Conditions of Contract for Construction Works, Third Edition, 2015.

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means: …….

Physical Address: …….

"Employer" means: ……..

"Contractor" means: ……

"Engineer" means: ……..

"Works" means: ……..

"Site" means: ……

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

"Contract Sum" means: The accepted amount inclusive of tax of R……..

Amount in words: …….

"Guaranteed Sum" means: The maximum aggregate amount of R……

Amount in words:…….

"Expiry Date" means:……..

CONTRACT DETAILS

Engineer issues: Interim Payment Certificates, Final Payment Certificate, and the Certificate Completion of the Works as defined in the Contract.

PERFORMANCE GUARANTEE

1. The Guarantor's liability shall be limited to the amount of the Guaranteed Sum.

2. The Guarantor's period of liability shall be from and including the date of issue of this Performance Guarantee and up to and including the Expiry Date or the date of issue by the Engineer of the Certificate of Completion of the Works or the date of payment in full of the Guaranteed Sum, whichever occurs first. The Engineer and/or the Employer shall advise the Guarantor in writing of the date on which the Certificate of Completion of the Works has been issued.
3. The Guarantor hereby acknowledges that:

3.1 any reference in this Performance Guarantee to the Contract is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship;

3.2 its obligation under this Performance Guarantee is restricted to the payment of money.

4. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 4.1 to 4.3:

4.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Engineer in an Interim or Final Payment Certificate has not been made in terms of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of 4.2;

4.2 A first written demand issued by the Employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 4.1 and the sum certified has still not been paid;

4.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 4.

5. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor undertakes to pay to the Employer the Guaranteed Sum of the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:

5.1 the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or

5.2 a provisional or final sequestration of liquidation court order has been granted against the Contractor and that the Performance Guarantee is called up in terms of 5; and

5.3 the aforesaid written demand is accompanied by a copy of the notice of termination and/or the provisional/final sequestration and/or the provisional liquidation court order.

6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.

7. Where the Guarantor has made payment in terms of 5, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.

8. Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.

9. Payment by the Guarantor in terms of 5 will only be made against the return of the original Performance Guarantee by the Employer.

10. The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may deem fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.

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

12. This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 2, where after no claims will be considered by the Guarantor. The original of this Guarantee shall be returned to the Guarantor after it has expired.

13. This Performance Guarantee, with the required demand notices in terms of 4 or 5, shall be regarded as a liquid document for the purposes of obtaining a court order.

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

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

Signed at …….

Date …….

Guarantor's signatory (1) ……...

Capacity ……..

Guarantor's signatory (2) ……...

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

FORM C1.3 SPECIAL CONDITION

Payment for the labour-intensive component of the works

Payment for works identified in the Scope of Work as being labour-intensive shall only be made in accordance with the provisions of the Contract if the works are constructed strictly in accordance with the provisions of the Scope of Work. Any non-payment for such works shall not relieve the Contractor in any way from his obligations either in contract or in delict.

Applicable labour laws

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

1 Introduction

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

1.2 In this document –

(a) "**Department**" means any department of the State, implementing agent or contractor;

(b) "**Employer**" means any department, implementing agency or contractor that hires workers to work in elementary occupations on a SPWP;

(c) "**Worker**" means any person working in an elementary occupation on a SPWP;

(d) "**Elementary** occupation" means any occupation involving unskilled or semi-skilled work;

(e) "**Management**" means any person employed by a department or implementing agency to administer or execute an SPWP;

(f) "**Task**" means a fixed quantity of work;

(g) "**task-based work**" means work in which a worker is paid a fixed rate for performing a task;

(h) "**task-rated worker**" means a worker paid on the basis of the number of tasks completed;

(i) "**time-rated worker**" means a worker paid on the basis of the length of time worked.

(j) **"Task rate or daily rate**" = ***As per Government Gazette***

2 Terms of Work

2.1 Workers on a SPWP are employed on a temporary basis.
2.2 A worker may NOT be employed for longer than 24 months in any five-year cycle on a SPWP.
2.3 Employment on a SPWP does not qualify as employment as a contributor for the purposes of the Unemployment Insurance Act 30 of 1966.

3 Normal Hours of Work

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

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

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

3.2 An employer and worker may agree that a worker will work four days per week. The worker may then work up to ten hours per day.

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

4 Meal Breaks

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

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

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

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

5 Special Conditions for Security Guards

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

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

6 Daily Rest Period

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

7 Weekly Rest Period

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

8 Work on Sundays and Public Holidays

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

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

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

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

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

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

9 Sick Leave

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

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

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

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

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

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

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

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

(a) Absent from work for more than two consecutive days; or
(b) Absent from work on more than two occasions in any eight-week period.

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

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

10 Maternity Leave

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

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

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

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

10.5 A worker may begin maternity leave –

(a) four weeks before the expected date of birth; or
(b) On an earlier date –

(i) If a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or
(ii) if agreed to between employer and worker; or

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

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

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

11 Family responsibility leave

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

(a) When the employee's child is born;
(b) When the employee's child is sick;
(c) In the event of a death of –

(i) The employee's spouse or life partner;
(ii) The employee's parent, adoptive parent, grandparent, child, adopted child, grandchild, or sibling.

12 Statement of Conditions

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

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

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

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

13 Keeping Records

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

(a) The worker's name and position;
(b) In the case of a task-rated worker, the number of tasks completed by the worker;
(c) In the case of a time-rated worker, the time worked by the worker;
(d) Payments made to each worker.

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

14 Payment

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

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

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

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

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

14.6 Payment in cash or by cheque must take place –
(a) At the workplace or at a place agreed to by the worker;
(b) during the worker's working hours or within fifteen minutes of the start or finish of work;
(c) In a sealed envelope which becomes the property of the worker.

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

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

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

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

15 Deductions

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

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

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

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

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

16 Health and Safety

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

16.2 A worker must –

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

17 Compensation for Injuries and Diseases

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

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

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

17.4 An employer must pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months. The employer will be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

18 Termination

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

18.2 A worker will not receive severance pay on termination.

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

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

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

19 Certificate of Service

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

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

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

MONTHLY REPORTING

The successful bidder will be expected to assist with monthly reporting. These will include progress reports, labour reports, etc, submitted to the Project Manager on the dates to be stipulated.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATION

FORM C1.4 HEALTH AND SAFETY SPECIFICATION

HEALTH AND SAFETY SPECIFICATION
THE OCCUPATIONAL HEALTH AND SAFETY ACT 1993
CONSTRUCTION REGULATIONS 2014

SECTION 1

1. INTRODUCTION

This document was construed in order to comply with the provisions of the **OCCUPATIONAL HEALTH AND SAFETY ACT NO 85 OF 1993. CONSTRUCTION REGULATIONS 2014 and** COVID-19 Occupational Health And Safety Measures in Workplace 2020

Definitions of words are those described in the Act and the Construction Regulations of 2014. As well COVID-19 Occupational Health And Safety Measures in Workplace 2020

This document formulates the specification of the O. R. Tambo District Municipality in terms of the above act and forms part of the constitution of the organisation.

This document forms part of the employment contract of all employees and is as such accepted in writing by each employee. It also forms part of the agreement between the O. R. Tambo District Municipality and all service providers.

No clause in this document shall be amended in any contract document construed by agents, designers or anyone else except so ordered or sanctioned by the O. R. Tambo District Municipality in writing.

SCHEDULE

1.1 Definitions

1. In these Policy any word or expression to which a meaning has been assigned in the Act shall have the meaning so assigned and, unless the context otherwise indicates.

"Agent" means any person who acts as a representative for a client in the managing the overall construction work.

"**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 a surface, rather than sliding or crumbling away;

"*Batch 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 O. R. Tambo District Municipality***;**

"competent person" in relation to construction work, means any person having the knowledge, training and experience specific to the work or task being performed: Provided that where appropriate qualifications and training are registered in terms of the provisions of the South African Qualifications Authority Act, 1995 (Act No. 58 of 1995), these qualifications and training shall be deemed to be the required qualifications and training;

"Construction work" means any work in connection with—

(a) The erection, maintenance, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure;

(b) The installation, erection, dismantling or maintenance of a fixed plant where such work includes the risk of a person falling;

(c) the construction, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or

(d) the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work;

"*construction vehicle*" *means a vehicle used for means of conveyance for transporting persons or material or both such persons and material, as the case may be, both on and off the construction site for the purposes of performing construction work;*

"*Contractor*" *mean an employer, as defined in section 1 of the Act, who performs construction work and includes principal contractors;*

"*Design*" *in relation to any structure includes drawings, calculations, design details and specifications;*

"*Designer*" *means any person who—*

(a) prepares a design;

(b) checks and approves a design;

(c) arranges for any person at work under his control (including an employee of his, where he is the employer) to prepare a design, as well as;

(d) Architects and engineers contributing to, or having overall responsibility for the design;

(e) Build services engineers designing details for fixed plant;

(f) Surveyors specifying articles or drawing up specifications;

(g) Contractors carrying out design work as part of a design and build project;

(h) Temporary works engineer designing formwork and false work; and

(i) Interior designers, shop-fitters and landscape architects.

"*ergonomics*" *means the application of scientific information concerning humans to the design of objects, systems and the environment for human use in order to optimise human well-being and overall system performance;*

"Excavation work" means the making of any man-made cavity, trench, pit or depression formed by cutting, digging or scooping;

"**explosive powered tool**" 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 prevention equipment" means equipment used to prevent persons from falling from an elevated position, including personal equipment, body harness, body belts, lanyards, lifelines or physical equipment, guardrails, screens, barricades, anchorages or similar equipment;

"fall arrest equipment" means equipment used to arrest the person in a fall from an elevated position, including personal equipment, body harness, lanyards, deceleration devices, lifelines or similar equipment, but excludes body belts;

"**fall protection plan**" means a documented plan, of all risks relating to working from an elevated position, considering the nature of work undertaken, and setting out the procedures and methods to be applied in order to

eliminate the risk;

"Hazard identification" means the identification and documenting of existing or expected hazards to the health and safety of persons, which are normally associated with the type of construction work being executed or to be executed;

"Health and safety file" means a file, or other record in permanent form, containing the information required as contemplated in these regulations;

"Health and safety plan" means a documented plan which addresses hazards identified and includes safe work procedures to mitigate, reduce or control the hazards identified;

"Health and safety specification" means a documented specification of all health and safety requirements pertaining to the associated works on a construction site, so as to ensure the health and safety of persons;

"material hoist" means a hoist used to lower or raise material and equipment, and includes cantilevered platform hoists, mobile hoists, friction drive hoists, scaffold hoists, rack and pinion hoists and combination hoists;

"Medical certificate of fitness" means a certificate valid for one year issued by an occupational health practitioner, issued in terms of these regulations, whom shall be registered with the Health Professions Council of South Africa;

"**Method statement**" means a written document detailing the key activities to be performed in order to reduce as reasonably as practicable the hazards identified in any risk assessment;

"Mobile plant" *means machinery, appliances or other similar devices that is able to move independently, for the purpose of performing construction work on the construction site;*

"National Building Regulations" means the National Building Regulations made under section 17(1) of the National Building Regulations and Building Standards Act, 1977 (Act No.103 of 1977), and published under Government Notice No. R.1081 of 10 June 1988, as amended;

"Person day" means one individual carrying out construction work on a construction site for one normal working shift;

"**principal contractor**" means an employer, as defined in section 1 of the Act who performs construction work and is appointed by the client to be in overall control and management of a part of or the whole of a construction site**;**

"professional engineer or professional certificated engineer" means any person holding registration as either a Professional Engineer or Professional Certificated Engineer under the Engineering Profession Act, 2000 (Act No. 46 of 2000);

"Professional technologist" means any person holding registration as a Professional Technologist under the Engineering Profession Act, 2000 (Act No. 46 of 2000);

"Provincial director" means the provincial director as defined in regulation 1 of the General Administrative Regulations under the Act;

"risk assessment" means a programme to determine any risk associated with any hazard at a construction site , in order to identify the steps needed to be taken to remove, reduce or control such hazard;

"Roof apex height" means the dimensional height in metres measured from the lowest ground level abutting any part of a building to the highest point of the roof;

"SABS 085" means the South African Bureau of Standards' Code of Practice entitled "The Design, Erection, Use and Inspection of Access Scaffolding";

"SABS 0400" means the South African Bureau of Standards, Code of Practice for the application of the National Building Regulations;

"SABS EN 1808" means the South African Bureau of Standards' Standard Specification entitled: "Safety requirements on suspended access equipment – Design calculations, stability criteria, construction-tests";

"SABS 1903" means the South African Bureau of Standards' Standard Front-end Specification entitled: "Safety requirements on suspended access equipment – Design calculations, stability criteria, construction-tests";

"Scaffold" means any temporary elevated platform and supporting structure used for providing access to and supporting workmen or materials or both;

"shoring" means a structure such as a hydraulic, mechanical or timber/steel shoring system that supports the sides of an excavation and which is intended to prevent the cave-in or the collapse of the sides of an excavation, and "shoring system" has a corresponding meaning;

"Structure" means—

(a) 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, batching plants, pylon, surface and underground tanks, earth retaining structure or any structure designed to preserve or alter any natural feature, and any other similar structure;

(b) any formwork, false work, scaffold or other structure designed or used to provide support or means of access during construction work; or

(c) any fixed plant in respect of work which includes the installation, commissioning, decommissioning or dismantling and where any such work involves a risk of a person falling two metres or more;

"Suspended platform" means a working platform suspended from supports by means of one or more separate ropes from each support;

"The Act" means the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993);

"Tunnelling" 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

O. R. TAMBO DISTRICT MUNICIPALITY

HEALTH AND SAFETY SPECIFICATION
THE OCCUPATIONAL HEALTH AND SAFETY ACT 1993
CONSTRUCTION REGULATIONS 2014

SECTION 2: DESIGNERS

1. All wording shall have the meaning as defined by the H&S Regulations 2014.

2. This specification is in terms of the H&S act 1993 and the regulations of 2014.

3. All work performed and procedures followed by designers shall be done according to the H&S regulations of 2014.

4. The client is aware of the fact that the appointment of a designer does not implicate that the designer becomes the agent of the client for the particular project. The appointment of an agent is done separately in writing and should be accepted by the designer as such.

5. The client is ultimately responsible for all safety issues regarding the project for which a designer is appointed and cannot contract out of his obligations in terms of the law.

6. The client shall not employ a designer should he have reasonable doubts that the designer is not able to execute work in a safe manner.

7. All designers shall have adequate insurance cover to indemnify the client for their acts and omissions in terms of professional conduct the H&S act in particular to indemnify the client against penalties imposed for acts or omissions. The client is aware of the fact that additional insurance over and above PI insurance is necessary to have himself indemnified by the designers for acts and omissions in terms of the H&S regulations. The professional indemnity insurance has a "negligent acts and omissions" wording only and therefore additional insurance is necessary to cover the client against penalties imposed in terms of the regulations.

8. Designers shall not accept work from the client if they are not capable of executing such work professionally and if such work cannot be executed in a safe manner, according to the provisions of the H&S regulations.

9. Designers shall execute all designs in terms of the relevant SABS and other acceptable codes and procedures and shall place great emphasis on safety issues including the maintenance procedures after inaugurations of such systems or projects.

10. Ergonomic parameters shall have high priority in all designs.

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

O. R. TAMBO DISTRICT MUNICIPALITY

HEALTH AND SAFETY SPECIFICATION
THE OCCUPATIONAL HEALTH AND SAFETY ACT 1993
CONSTRUCTION REGULATIONS 2014

SECTION 3: PRINCIPAL CONTRACTORS (P C)

1. *All work by the P C shall be done in compliance with the provisions of the H&S regulations.*

2. The Employer recognises the right of each employee to work safely in a healthy environment under decent human conditions. Each employee has the right to return home safely and healthy to his home and family after each day's work.

3. Work shall not be done at the expense of human safety or health.

4. Work shall be executed under humane conditions, especially with reference to hours and H&S issues in mind.

5. The P C shall appoint a fulltime H&S Manager should he have more than 50 employees on site.

6. The PC shall conduct monthly safety meetings on site. All foremen, gang leaders and other employees shall participate and all incidents with relation to unsafe practices shall be discussed. Minutes of such meetings shall be kept in the H&S file.

7. Foremen and gang leaders shall, under the supervision of the H&S manager, conduct meetings with all staff and people under their direct supervision on a frequent basis. Minutes of such meetings shall be kept in the H&S file.

8. New personnel (temporary or full time employees) shall attend safety induction courses under the supervision of the H&S manager.

9. The P C shall install and maintain a box in which proposals for improvement of H&S procedures could be placed. All such proposals shall be considered, recorded and placed in the H&S file.

10. An adequate first aid facility shall be placed maintained on site and shall be adequately indicated by means of signs. All personnel shall be made aware of its existence and only trained first aid assistants shall be authorized to treat injuries.

11. The P C shall see that work is only executed by people trained for the particular task.

12. All safety equipment shall be SABS approved and under no circumstance shall any safety equipment be non-certified homemade equipment. Specifications and order details shall be kept in the H&S file.

13. Workers and personnel shall be attending safety courses on a regular basis and all information regarding such training shall be kept in the H&S file.

14. All employees shall be trained in safe working procedures and shall be trained on safety consciousness in particular. Employees in position of leadership shall be trained through accredited training processes in H&S matters.

15. The contractor shall prepare and maintain a safety plan for the particular project and shall train his personnel to work according to such plan.

16. Personnel and workers will be made aware of any natural hazards existing on site. They will also be made aware of items defined by the designer in his risk assessment.

17. No horseplay between employees will be tolerated on site. Neither will aggressive or threatening behaviour by anybody be allowed.

Contractor	*Witness 1*	*Witness 2*	*Employer*	*Witness 1*	*Witness 2*

18. Workers shall wear appropriate protective clothing for the applicable task which shall include special safety equipment like protective eyewear, gloves, boots, ear protection, etc. Workers shall be issued with these items and copy of such issuing shall be kept in the H&S file.

19. Workers shall not be allowed to wear loose clothes and footwear.

20. Workers shall have the opportunity and right to prescribed rest, eating and toilet breaks.

21. Workers on nightshift shall be protected against inclement weather and shall have access to adequate food and drinks.

22. In cases where work is executed in remote or in security restricted areas, the P C will make provision for food to be supplied to his employees.

23. Potable water shall be made available free of charge to all workers on site.

24. Adequate toilet and washing facilities shall be made available to workers.

25. In the event of chemicals being present or used on site, the P C will allow for adequate shower facilities on site. All chemicals shall be stored according to specification and shall be clearly identified and marked in prescribed containers.

26. Workers under instruction to execute inherently unsafe procedures shall report such incidences to the H&S manager, designer of client immediately.

27. Unauthorised or unlawful instructions from foremen, gang leaders or colleagues shall be reported by the H&S manager immediately.

28. The P C shall stop his contractors if they work unsafely.

29. All specialist work shall be executed by registered artisans only.

30. Workers shall not be required to lift equipment or material heavier than 25kg or carry a load of more than 50 kg for more than 10 metres.

31. Workers shall not be exposed to conditions of heat where the temperature is above 40° Celsius and the humidity more than 75%. Likewise will personnel not be exposed to temperatures lower than –5° Celsius? Should the designer and the P C decide that the work is urgent; workers will be issued with proper protective clothing.

32. All workers shall have access to a shaded eating and resting place on site.

33. Workers executing tasks in rivers, trenches and other natural or artificial water ways shall be made aware of the hazard of flash floods and special precautions shall be made by the P C to implement an effective flood warning system.

34. Workers executing tasks in manholes for sewer or storm water systems, shall be made aware of the existence of hazardous gasses in closed areas and shall be issued with gas masks in any event, even after tests conducted by the H&S manager has proven that no gasses are existent. Only specialists shall work in gas filled chambers.

35. Personnel executing work during rainy weather or under other wet conditions shall be equipped with proper gumboots and proper rain suits.

36. No personnel will be allowed to work in water unless gumboots are worn. Should the water be deeper than 300mm watertight suits shall be worn.

37. All ladders shall be fixed against scaffolding or other permanent structures.

38. Welding on site shall only be done by trained personnel behind adequate eye protecting shields and all welders shall wear proper protective gear.

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

39. Personnel operating grinders, saws or any other hand tools of similar description shall be equipped with the necessary eyewear and ear protection.

40. All personnel working under potentially dusty conditions shall wear nose and mouth filters.

41. Workers operating rock drilling equipment shall wear ear, nose and eye protection.

42. All scaffolding will comply with the H&S regulations.

43. Blasting will be done by specialists under the regulations of the Explosives Act.
44. Workers shall wear protective clothing when exposed to chemicals like cement, lime, detergents, tar, fumes, etc. Should work be executed in the presence of such material, adequate protective clothing and equipment shall be issued after permission is granted by the H&S manager.

45. Workers will not be allowed to make open fires on any part of the site unless it is made in designated areas approved by the H&S manager.

46. Fuel storage will only be allowed on certified areas on site.

47. Workers and other personnel will be trained for fire procedures and will practise such fire drill on a regular basis.

48. Assembly areas for emergency evacuations will be indicated by adequate signage.

49. The P C will have an attendance register for the purposes of identifying people before, during and after potential hazardous situations.

50. All transport supplied by the P C shall be on road worthy vehicles only and all transport shall be conducted in terms of the transport act.

51. Drivers of vehicles shall be responsible for the roadworthiness of vehicles and will report any dysfunctional vehicles to the P C.

52. All drivers will be responsible to handle vehicles in such a way to comply with the transport act.

53. Passengers of vehicles shall report any unsafe conduct to the P C immediately. Such report shall be forwarded to the H&S manager and shall be investigated. Copy of such procedure shall be entered into the H&S file.

54. Only trained personnel shall be permitted and required to operate construction machinery. All such machinery shall be maintained in a safe working condition.

55. All vehicles operating on site shall have audible warning signals if driven backwards.

56. No vehicle shall be kept on site if it is leaking oil or other substances.

57. No vehicle or equipment shall be operated on site if it produces noise above 90 decibel measured within a distance of 10,0 m from the unit.

58. Equipment producing serious dusty conditions shall only be operated under the supervision of the P C and the H&S manager with the necessary protection to workers.

59. All excavations on site shall be adequately protected and not only indicated.

60. Exploratory excavation to reveal services shall be done in a specific way.

All areas to be explored shall first be inspected by the landowner or local authority.
Position of services identified shall then be verified by opening by hand, not by machine.
Particular care shall be taken not to damage these services.
Electrical services are inherently dangerous and shall be opened by skilled people only.
These excavations shall not be left open without supervision. If necessary the excavation shall be backfilled temporarily with approved material until the specified modifications to the services can be made.

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

61. Access to excavations shall only be by means of ladders or stairs with handrails.

62. All refuse, unsafe material, potential hazardous material and rubbish shall be placed in designated areas to be removed on a regular basis.

63. Rainwater shall be contained in trenches or pipes in such a way that it will not cause contamination of material in these refuse areas.

64. All electrical sources or cables or overhead power lines should be regarded as live at all times and all workers on site shall be made aware of its existence during H&S meetings and as many times as necessary.

65. Adequate signage shall be used on site to indicate
- Non smoking areas on site
- Safety exits / Emergency exits from buildings under construction
- Stairs (temporary and permanent works)
- Toilets
- Fire fighting equipment
- Workmen busy with equipment overhead
- Fire assembly points
- Fire escapes
- Areas where members of the public are not allowed.
- First aid room

66. All visitors to the site shall be granted permission to the site only upon application through a predetermined procedure and records of these visitors shall be kept in the H&S file. Visitors shall attend safety induction training before entering the site. Areas out of bounds to all visitors shall be indicated clearly by means of adequate signs.

67. Work performed in public servitudes like the construction of streets or roads shall be done according to the specifications of the local or national authority and adequate signage shall be implemented.

68. People complaining about their health or people displaying symptoms of illness or disease, shall be allowed to go to the first aid facility or to visit a doctor or a clinic. Permission shall not be withheld unreasonably. In remote areas the P C is required to have reasonable ways of transporting people to a doctor or clinic whether the person is ill or injured on site.

69. Personnel must be informed about the location of the nearest doctor or clinic for casualty purposes and the P C shall provide such transport for injured workers and injured members of the public (within the limits of the site) free of charge.

70 A principal contractor who intends to carry out any construction work shall—

(a) before carrying out that work, notify the provincial director in writing of the construction work if it includes—

(i) The demolition of a structure exceeding a height of 3 metres; or

(ii) The use of explosives to perform construction work; or

(iii) The dismantling of fixed plant at a height greater than 3m.

*(b)*before carrying out that work, notify the provincial director in writing when the construction work—

(i) Exceeds 30 days or will involve more than 300 person days of construction work; and

(ii) Includes excavation work deeper than 1m; or

(iii) Includes working at a height greater than 3 metres above ground or a landing.

(2) The notification to the provincial director must be done on the form similar to Annexure A to this Policy.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

(3) A principal contractor shall ensure that a copy of the completed form is kept on site for inspection by an inspector, client, client's agent or employee.

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

O. R. TAMBO DISTRICT MUNICIPALITY

HEALTH AND SAFETY SPECIFICATION
THE OCCUPATIONAL HEALTH AND SAFETY ACT 1993
CONSTRUCTION REGULATIONS 2014

SECTION 4: CLIENT

(1) A client shall be responsible for the following in order to ensure compliance with the provisions of the Act—

(a) to prepare a documented health and safety specification for the construction work, and provide any principal contractor who is making a bid or appointed to perform construction work for the client with the same;

(b) To promptly provide the principal contractor and his or her agent with any information which might affect the health and safety of any person at work carrying out construction work;

(c) To appoint each principal contractor in writing for the project or part thereof on a construction site;

(d) To take reasonable steps to ensure that each principal contractor's health and safety plan is implemented and maintained on the construction site: Provided that the steps taken, shall include periodic audits at intervals mutually agreed upon between the client and principal contractor, but at least once every month;

(e) to stop any contractor from executing construction work which is not in accordance with the principal contractor's health and safety plan for the site or which poses to be a threat to the health and safety of persons;

(f) to ensure that where changes are brought about, sufficient health and safety information and appropriate resources are made available to the principal contractor to execute the work safely;

(g) to ensure that every principal contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer prior to work commencing on site; and

(h) To ensure that potential principal contractors submitting tenders, have made provision for the cost of health and safety measures during the construction process.

(2) A client shall discuss and negotiate with the principal contractor the contents of the health and safety plan and thereafter finally approve the health and safety plan for implementation.

(3) A client shall ensure that a copy of the principal contractor's health and safety plan is available on request to an employee, inspector or contractor.

(4) O. R. Tambo District Municipality shall not appoint a principal contractor to perform construction work, unless O. R. Tambo District Municipality is reasonably satisfied that the principal contractor that he or she intends to appoint has the necessary competencies and resources to carry out the work safely.

(5) A client may appoint an agent in writing to act as his or her representative and where such an appointment is made, the responsibilities as are imposed by these regulations upon a client, shall as far as reasonably practicable apply to the person so appointed.

(6) No client shall appoint any person as his agent, unless the client is reasonably satisfied that the person he or she intends to appoint has the necessary competencies and resources to perform the duties imposed on a client by these regulations.

Contractor	*Witness 1*	*Witness 2*	*Employer*	*Witness 1*	*Witness 2*

ANNEXURE A

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993
Regulation 3 of the Construction Regulations, 2014

NOTIFICATION OF CONSTRUCTION WORK

1.(a) Name and postal address of principal contractor:

_____

(b) Name and tel. no of principal contractor's contact person:

_____

2. Principal contractor's compensation registration number: _____

3.(a) Name and postal address of client:

_____

(b) Name and tel. no. of client's contact person or agent:

_____

4.(a) Name and postal address of designer(s) for the project:

_____

(b) Name and tel. no. of designer(s) contact person:

_____

5. Name and telephone number of principal contractor's construction supervisor on site appointed in terms of regulation 6.(1). _____

6. Name/s of principal contractor's sub-ordinate supervisors on site appointed in terms of regulation 6.(2).

_____

7. Exact physical address of the construction site or site office:

_____

8. Nature of the construction work:

_____

_____

9. Expected commencement date: _____

10. Expected completion date: _____

11. Estimated maximum number of persons on the construction site.

_____

12. Planned number of contractors on the construction site accountable to principal contractor:

_____

13. Name(s) of contractors already chosen.

_____

_____

_____

_____ _____

Principal Contractor Date

_____ _____

Client Date

- **THIS DOCUMENT IS TO BE FORWARDED TO THE OFFICE OF THE DEPARTMENT OF LABOUR** PRIOR TO COMMENCEMENT **OF WORK ON SITE.**

- ALL PRINCIPAL CONTRACTORS **THAT QUALIFY TO NOTIFY MUST DO SO EVEN IF ANOTHER PRINCIPAL CONTRACTOR ON THE SAME SITE HAD DONE SO PRIOR TO THE COMMENCEMENT OF WORK.**

GUIDELINES FOR CONTRACT ADMINISTRATION

O.R. TAMBO
DISTRICT MUNICIPALITY

O.R TAMBO DISTRICT MUNICIPALITY

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

O. R. TAMBO DISTRICT MUNICIPALITY

GUIDELINES FOR CONTRACT ADMINISTRATION
IN TERMS OF THE CONSTRUCTION REGULATIONS 2014
HEALTH & SAFETY ACT 1993

SECTION 1 AND 2

1. PURPOSE OF THIS DOCUMENT

This document describes the procedures to be followed in the execution of Engineering Projects for O. R. Tambo District Municipality.

The role of all parties to the development project is described.

The document is in terms of the Construction Regulation 2014 of the Health and Safety Act 1993.

2. BACKGROUND

The Minister of Labour has on 18 July 2014 under section 43 of the Occupational Health and Safety Act 1993 (Act No. 85 of 1993) published new regulations in the Government Gazette 7721, Vol. 456. They have immediate effect and are applicable to the Construction Environment.

These regulations inter alia identify the different role players and their responsibilities, particularly the role of the client, the contractor and that of the designer.

The Construction Regulations endeavour to ensure that:

i) Hazards or potential hazards to a healthy working environment are identified.

ii) These hazards or potential hazards are removed or minimised.

iii) Employers and Workers are made aware of the value of safe working procedures and train themselves to work safely in potential hazardous environments or under potentially unsafe conditions.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

O. R. TAMBO DISTRICT MUNICIPALITY

GUIDELINES FOR CONTRACT ADMINISTRATION
IN TERMS OF THE CONSTRUCTION REGULATIONS 2014
HEALTH & SAFETY ACT 1993

SECTION 3

3. **THE CLIENT**

In terms of the law the client is ultimately responsible for all acts and omissions as far as health and safety is concerned on site. It should be noted that the client will be held legally responsible for every trespass of the regulations, not the designer or the contractor. The law makes provision for fines to be levied and unless the client has been indemnified by the designer or the contractor, such fines will have to be paid by the client.

Clients cannot contract out of their statutory obligations except where the law allows for it. Therefore any liability imposed upon them for statutory non-compliance, cannot be passed on to designers (consultants) or contractors.

In particular the client's responsibilities are defined as follows:

.1	To prepare a health and safety (H&S) specification for the work. This should cover the spectrum of activities handled by the client as part of his normal duties.	Clause 4(1)(a)
.2	To provide a risk assessment to the principal contractor.	Clause 4(1)(b)
.3	To appoint the principal contractor in writing.	Clause 4(1)(c)
.4	To ensure that the H&S plan is implemented.	Clause 4(1)(d)
.5	To stop any contractor executing work in an unsafe manner.	Clause 4(1)(e)
.6	To provide additional H&S information to the contractor should changes be made to the work?	Clause 4(1)(f)
.7	To ensure that the principal contractor is registered and in good standing with the workmen's compensation fund.	Clause 4(1)(h)
.8	To make sure tenderers have made provision in their offers for H&S measures.	Clause 4(1)(h)
.9	To discuss and approve the H&S plan with the principal contractor.	Clause 4(2)
.10	To keep a copy of the H&S plan of the principal contractor.	Clause 4(3)
.11	To <u>not</u> employ a contractor unless the client is reasonably satisfied that the principal contractor who is earmarked for an appointment has the necessary skills, competencies and resources to carry out the work safely.	Clause 4(4)
.12	The client can appoint an agent to handle his duties. The client can obviously also delegate some of his duties but this does not make the person responsible for such particular responsibilities as agent. The client should make sure whether such responsibilities are not already part of the designer in terms of the regulations clause	Clause 4(5)

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

	9(2).	
.13	The client shall only appoint someone as his agent if he is reasonably satisfied that such person can handle such responsibilities.	Clause 4(6)

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GUIDELINES FOR CONTRACT ADMINISTRATION
IN TERMS OF THE CONSTRUCTION REGULATIONS 2014
HEALTH & SAFETY ACT 1993

SECTION 4

4. **THE DESIGNER**

The regulations do not use names like engineer, architect, etc. Instead the term designer has been introduced. The responsibilities of the designer are given in a sub-paragraph under the obligations of the Principal Contractor.

4.1	The regulations has a comprehensive definition of the designer and this includes:	Definitions "designer"
a)	A person preparing a design.	Definitions "structure"
b)	A person checking a design.	
c)	A firm preparing a design.	
d)	An architect or engineer contributing to or having responsibility for a design.	
e)	A building services engineer designing details of fixed plant (scaffolding or cranes).	
f)	A surveyor specifying articles or drawing up specification (Quantity Surveyor).	
g)	A contractor in design & build contract.	
h)	A contractor designing temporary work.	
i)	A interior designer, shop fitter and landscape architect.	
	The regulation also talks of "an engineer designing a structure". "Structure" is a wide concept and is given in paragraph 3.2.5.1(a) underneath.	
4.2	The designer does not automatically through an appointment become the agent of the client in terms of the regulations unless he is appointed in writing to that effect and he accepts such appointment in writing.	Clause 4(5)
4.3	The SAACE model agreement between the client and Engineer has a different meaning of the word "agent".	
	According to the model agreement of SAACE the Engineer acts as the "agent" of the client in a conventional contractual context. "Agent" in terms of the Health & Safety regulations has a totally different meaning.	

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

4.4	It can be derived from the regulations that the client can appoint a designer to perform certain tasks of the client on his behalf. This still does not mean that these designers become his agent in terms of clause 4(5).	Clause 4(5)
4.5	The regulations are fairly quiet regarding the functions and responsibilities of the designer except when designing of a structure. It is again assumed that the client will identify certain functions to be done by the designer on his behalf.	
4.5.1	"Structure" in terms of the regulations means:	Definitions
(a)	any building steel or reinforced concrete structure railway line railway siding bridge waterworks reservoir pipe or pipeline cable sewer sewage works fixed vessels road drainage works earthworks dam wall mast tower tower crane batching plants pylon surface and underground tanks earth retaining structure or any structure designed to preserve or alter any natural feature and any other similar structure.	
(b)	Any formwork, false work, scaffold or other structure designed or used to provide support or access during construction (structural engineering sector).	
(c)	Fixed plant to prevent people from falling 2 meters or more.	
4.5.2	The designer is in fact regarded as a person delivering designs only and unless his role is defined by the client, his role is quite limited.	Clause 9(2)
4.5.3	The designer should inform the client and the principal contractor about anticipated dangers relating to the construction work. <u>This is in fact a Risk Assessment.</u>	Clause 9(2)(b)
4.5.4	The designer (in the structural engineering context) shall further furnish to the contractor in writing:	Clause 9(2)
i)	A geo-technical report.	

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

ii)	The loading of the structure.	
iii)	The method and sequence of the construction process.	
iv)	He should exclude inherently dangerous methods of construction in his design.	
v)	The maintenance of the structure shall be through safe procedures.	
vi)	He should carry out inspections.	
vii)	And stop the contractor from executing work dangerously.	
viii)	A final inspection is necessary to ensure safety of the structure.	
ix)	Great emphasis should be given to the ergonomic design of the structure.	
x)	The engineer should also give input in the design of temporary work e.g. scaffolding.	Clause 10(c)

O. R. TAMBO DISTRICT MUNICIPALITY

GUIDELINES FOR CONTRACT ADMINISTRATION
IN TERMS OF THE CONSTRUCTION REGULATIONS 2014
HEALTH & SAFETY ACT 1993

SECTION 5

5. THE PRINCIPAL CONTRACTOR (P C) AND CONTRACTOR

The responsibilities of these parties are comprehensively stipulated in the regulations.

5.1	In general it can be seen that the responsibilities of the PC (Principal Contractor) towards his contractors is Mutatis Mutandis to the responsibilities of the Client towards the PC.	
5.2	The PC is responsible for the collecting of these contractors' safety plans and to hold them to it.	Clause 5(1) and (2)
i)	He should also stop his contractors should they work unsafely.	Clause 5(3)(d)
ii)	He should appoint safety officers should the size of the work warrant it.	Clause 6(6)
iii)	He should cause a risk assessment to be executed by a competent person.	Clause 7(1)
iv)	Visitors to his site should undergo induction pertaining to H&S issues.	Clause 7(8)
v)	He shall see to his employees induction and H&S training.	Clause 7(7)
vi)	The employees of the PC and his contractors shall wear visible proof of their induction training.	Clause 7(9)(a)
5.3	The regulations also covers the detail of:	
	Fall protection	Clause 8
	Structures (under this heading the responsibilities of the designer of a structure is found)	Clause 9
	Formwork and support work	Clause 10
	Excavation work	Clause 11
	Demolition work	Clause 12
	Tunnelling	Clause 13
	Scaffolding	Clause 14
	Suspended platforms	Clause 15
	Boatswain's chairs	Clause 16
	Material hoists	Clause 17

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Batch plants	Clause 18
Explosive powered tools	Clause 19
Cranes	Clause 20
Construction vehicles and mobile plant	Clause 21
Electrical installation and machinery on construction sites	
Use and storage of flammable liquids on construction sites	
Water environment	Clause 22
Housekeeping on construction sites	
Stacking and storage on construction sites	Clause 23
Fire precautions on construction sites	Clause 24
Construction welfare facilities	Clause 25
	Clause 26
	Clause 27

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GUIDELINES FOR CONTRACT ADMINISTRATION

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HEALTH & SAFETY ACT 1993

SECTION 6

6. APPOINTMENT OF THE DESIGNER — Clause 4(5)

6.1 The client appoints the consultant or designer as agent only for the particular project and also for the duration of the project.

6.2 It is further important to distinguish between "agent" in terms of the SAACE model agreement between client and engineer and "agent" in terms of the H&S regulations.

6.3 The responsibilities and duties of a designer in the H&S context are those that are dictated by law and/or those respectively given to him by the client, except when he is a structural engineer and designs a "structure" in which case clause 9(2) applies automatically.

6.4 The client should only add to the responsibilities of the designer those which is not automatically in his hand in terms of clause 9(1) of the regulations.

6.5 The following duties are not regarded as normal work of the designer of a "structure" and will therefore require an additional appointment.

.1	To ensure the H&S plan of the PC is implemented on site.	Clause 4(1)(d)
.2	To ensure that changes to the design are also incorporated in the H&S plan.	Clause 4(1)(e)
.3	To ensure that the principal contractor is registered and in good standing with the workmens' compensation fund.	Clause 4(1)(f)
.4	To see that the contractor registers the site as a construction site at the Department of Labour.	Clause 4(1)(g)
.5	To discuss with the contractor the H&S plan and then recommend to the client the approval thereof.	Clause 4(2)
.6	To keep a copy of the H&S plan of the contractor in his possession and see that a copy is forwarded to the client.	Clause 4(4)
.7	Control the following on site:	

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

To see that the principal contractor keeps the H&S file up to date and that it is given to the client upon completion of the contract.	Clause 5(7)
To see that the principal contractor keeps a data base of all contractors involved with the project.	Clause 5(9)
To see that the principal contractor appoints one or more construction supervisors.	
To see that this person is dedicated to the particular project only.	Clause 6(4)
To receive from the contractor his risk assessment and keep a copy of that for his and the clients records.	Clause 7(1)

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GUIDELINES FOR CONTRACT ADMINISTRATION
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SECTION 7

7. THE ROLE OF THE CLIENT

7.1	The client shall still prepare the H&S specification in terms of clause 4(1)(a) for its global activities. The H&S specification for the particular project is assigned to the designer.	Clause 4(1)(a)
7.2	The client shall approve of the H&S plan of the contractor, but on the recommendation of the consultant/ designer.	Clause 4(2)
7.3	The client employs the Principal Contractor.	Clause 4(1)(c)
7.4	The client can appoint an agent in which case all the responsibilities of the agent in the regulations are transferred to the agent.	Clause 4(5)
7.5	The client should only appoint an agent should he have made reasonably sure that the agent can handle the responsibility.	Clause 4(6)
7.6	The client shall not appoint a contractor if he is not reasonably sure that the contractor can execute such work in a safe manner.	Clause 4(4)

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GUIDELINES FOR CONTRACT ADMINISTRATION
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SECTION 8

8. THE ROLE OF THE PRINCIPAL CONTRACTOR

The principal contractor should execute the following duties:

.1	Provide a health and safety plan.	5(1)
.2	See that his contractors comply with the regulations.	5(2)
.3	He should discuss the particular H&S plan.	5(5)
.4	He should have his H&S plan available.	5(6)
.5	He should have an H&S file available on site and hand it over to the client upon completion.	5(7)
.6	He should not employ contractors who are not capable.	5(10)
.7	He should have full time supervision on site.	6(1) to 6(8)
.8	He should produce a risk assessment of the work.	7(1)
.9	He should train his employees.	7(4)
.10	He should introduce induction training on site.	7(7)/ 7(8)
.11	All physical aspects of the regulations as in terms of the regulations.	

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

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GUIDELINES FOR CONTRACT ADMINISTRATION
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SECTION 9

9. **THE PROCEDURE**

9.1	The Client decides to execute work and appoints a designer to administer the work.	
9.2	The scope of works and the exact duties of the designer are identified and given to him in writing. The designer should affect insurance by which the client is indemnified (by the designer) for acts and omissions of the designer. This type of insurance does not form part of the normal PI insurance provided by the designer. The designer prepares a contract document and ensures that this document states clearly the following:	
.1	A risk assessment of the project and the H&S specification of the client.	
.2	All relevant information to enable the pricing of the contract.	9(2)(a)
.3	Items in the bill to enable the tenderer to price for the risk including insurance indemnifying the client. The document should state whether a full time safety officer is required on site.	9(2)(b)
.4	Geotechnical information Loading of the structure – in other words all relevant technical data taking the definition of "structure" into account. The method and sequence of the process. This should identify the priorities of the client.	9(2)(c)(i) to (iii)
.5	Inherently dangerous procedures should be avoided in the design.	9(2)(d)
.6	The maintenance of the structure should be considered also so that this aspect would be safe and ergonomic too.	9(2)(e)
9.3	The tenderers then respond by each giving a H&S plan based on the risk assessment of the designer.	
9.4	The client then chooses the contractor according to his procurement policy (taking into account his ability to do the work safely) and appoints him in writing via the designer.	
9.5	The chosen principal contractor then affects a detailed risk assessment and a risk management plan, based on the H&S specification. Once on site the principal contractor should register the site	

by means of the prescribed form and have it approved by the client/designer.
He should open and then maintain his H&S file through the duration of the contract.

He should then further adhere to the provisions of the H&S regulations.

9.6 He should hand over the H&S file (recommend to do that with the designer's as-built drawings).

9.7 The designer should stop the work if he has reason to belief that the contractor is executing work in an unsafe manner.

9.8 Likewise should the principal contractor stop the work of his contractor(s) should he have reason to belief that such contractor is not working safely.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

O. R. TAMBO DISTRICT MUNICIPALITY

GUIDELINES FOR CONTRACT ADMINISTRATION
IN TERMS OF THE CONSTRUCTION REGULATIONS 2014
HEALTH & SAFETY ACT 1993

SECTION 10

10. CONTRACT DOCUMENTATION

The contract documentation needs to emphasize the following points in order to comply with the Health and Safety Act 1993 and the Construction Regulations 2014.

A. In the Specification section

1. Health and Safety Specification

The Client shall issue the Designer with his Health and Safety specification and it shall be included as such in the document.

Should the Designer be of the opinion that variations and additions be made to the specification, due to the nature of the particular project, he shall forward the proposed variation or addition to the NDM who will authorize this in writing.

2. Risk Assessment

This can form part of the contract specifications.

It is necessary to identify to the contractor:

i) The situation on site as it is with all the potential hazards and dangers involved.

ii) The nature of the work and the situations that the average contractor would encounter during the execution of the work. The nature of the work and the expected risks should be described in particular as well as the method and the sequence of the work.

iii) The basic safety precautions that he should take.

iv) The Safety and Health specification of the client.

v) To allow sufficient items in the bill of quantities for the tenderer to price for the specified H&S precautions.

3. Insurance

The contractor shall affect insurance indemnifying the client against penalties levied upon the client due to the acts or omissions of the contractor in failing to comply with the provisions of the H&S regulations 2014.

The contractor shall prove to the Engineer that such insurance has been affected and maintained during the construction.

B. The Tender Rules

The tender rules shall contain a clause requiring the contractor to submit a H&S plan based on the risk assessment given in the contract document. It should also state that the client is bound by law not to

appoint a contractor should he be reasonably sure that the contractor would not be able to execute the work safely should he be appointed.

The following example is recommended.

Compliance with the Regulations of the H&S Act 2014

Tenderers are required to study the published risk assessment and provide Annexure Y his Health and Safety Plan. Generic document will be disregarded. Such H&S plan should give details regarding the tenderers intention of dealing with the risks. Failure to submit such H&S plan will result in disqualification of the tender. Tenderers are informed that the client is bound by law not to accept a tender should he be reasonable sure that the tenderer will not be able to execute the work safely.

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

O. R. TAMBO DISTRICT MUNICIPALITY

GUIDELINES FOR CONTRACT ADMINISTRATION
IN TERMS OF THE CONSTRUCTION REGULATIONS 2014
HEALTH & SAFETY ACT 1993

SECTION 11

11. **CONCLUSION**

The Construction Regulations 2014 was long overdue in the South African Civil Engineering Construction Industry. Role players will now be forced to implement them and an awareness of safe working environments will be cultivated.

Clients might initially detect a contemptuous attitude particularly from contractors and even designers or consultants. This should not deter clients since acts and omissions from these parties will bring clients in confrontation with the law.

Contract cost will certainly escalate due to the additional specifications but this should be weighed against the value of human lives improved and saved.

The construction industry, particularly the Civil Engineering Sector, will have to accept and embrace these regulations and then seriously look at its productivity to kerb the cost of the implementation process.

1.0 SCOPE

This part of the specification has the objective to assist principal contractors entering into contracts with The Employer that they comply with the Occupational Health and Safety (OH&S) Act, No 85 of 1993.Compliance with this document does not absolve the principal contractor from complying with minimum legal requirements, and the principal contractor remains responsible for the health and safety of his employees and those of his Mandataries. Principal and other contractors should therefore insist that this part of the specification from part of any contract that he may have with other contractors and/or suppliers.

This section covers the development of a health and safety specification that addresses all aspects of occupational health and safety as affected by this contract. It provides the requirements that the principal contractors and other contractors shall comply with in order to reduce the risks associated with this contract that may lead to incidents causing injury and/or ill health.

2.0 GENERAL OCCUPATIONAL HEALTH AND SAFETY PROVISIONS

2.1 Hazard Identification and Risk Assessment (Construction Regulation 7)

2.1.1 Risk Assessments

Paragraph 4 contains a generic list of risk assessment headings that have been identified by The Employer as possibly applicable to this contract. It is, by no means, exhaustive and is offered as assistance to contractors intending to bid.

2.1.2 Development of Risk Assessment

Every principal contractor performing construction work shall, before the commencement of any construction work or work associated with the aforesaid construction work and during such work, cause a risk assessment to be performed by a competent person, appointed in writing, and the risk

assessment shall form part of the OH&S plan and be implemented and maintained as contemplated in Construction Regulation 5(1).

The risk assessment shall include at least:

- *the identification of the risks and hazards to which persons may be exposed*
- *the analysis and evaluation of the risks and hazards identifies*
- *a documented plan of safe work procedures to mitigate, reduce or control the risks and hazards that have been identified.*
- *a monitoring plan and*
- *a review plan*

Based on the risk assessment, the principal contractor shall develop set site-specific OH&S rules that shall be applied to regulate the OH&S aspects of the construction. The risk assessment, together with the site-specific OH&S rules shall be submitted to The Employer before construction on site commences.
Despite the risk assessment listed in paragraph4, the principal contractor shall conduct a baseline risk assessment and the aforesaid listed risk assessment shall be incorporated into the baseline risk assessment. The baseline assessment shall further include the standard working procedures and the applicable method statements based on the risk assessments.

All variations to the scope of work shall similarly be subjected to a risk assessment process.

2.1.3 Review of Risk Assessment

The principal contractor shall review the hazard identification, risk assessments and standard working procedures at each production planning and progress report meetings as the contract work develops and progresses and each time changes are made to the designs, plans and construction methods and processes. The principal contractor shall provide The Employer, other contractors and all other concerned parties with copies of any changes, alterations or amendments as contemplated in paragraph 2.1.3.

2.2 Legal Requirements

A principal contractor shall, as minimum, comply with:

The Occupational Health and Safety Act and Regulations (Act 85 of 1993), an up to date copy of which shall be available on site at all times.

The Compensation or Occupational Injuries and Diseases Act (Act 130 of 1993), an up to date copy of which shall be available on site at all times.

Where work is being carried out on a "mine", the contractor shall comply with the Mines Health and Safety Act and Regulations (Act 29 of 1960) and any other OH&S requirements that the mine may specify. An up-to-date copy of the Mine's Health and Safety Act and Regulations shall be available on site at all times.

2.3 Structure and Responsibilities

It is a requirement that the principal contractor, when he appoints contractors (Sub-contractors) in terms of Construction Regulations 5(3), 5(5), 5(10), and 5(12) includes in his agreement with such contractors the following:

- *OH& S Act (85 of 1993), Section 37(2) agreement: "Agreement with Mandatory"*

- *OH&S Act (85 of 1993), Section 16(2) appointee/s as detailed in his / her/ their respective appointment forms.*

2.2.3 Further (Specific) Supervision Responsibilities for OH & S

The contractor shall appoint designated competent employees and/or other competent persons as required by the Act and Regulations. Below is a generic list of identified appointments and may be used to select the appropriate appointments for this contract. The contractor shall note it is a generic list only and is intended for use as a guideline.

Ref. Section/ Regulation in OHS Act	
Batch Plant Supervisor	*(Construction Regulation 6(1)*
Construction Vehicles/ Mobile Plant/ Machinery Supervisor	*(Construction Regulation 21)*
Demolition Supervisor	*(Construction Regulation 12)*
Drivers/Operators of Construction Vehicles/ Plant	*(Construction Regulation 21)*
Electrical Installation and Appliances Inspector	*(Construction Regulation 22)*
Emergency/Security/Fire Control	*(Construction Regulation 27)*
Excavation Supervisor	*(Construction Regulation 11)*
Explosive powered Tool Supervisor	*(Construction Regulation 19)*
Fall Protection Supervisor	*(Construction Regulation 8)*
First Aider	*(Construction Regulation 3)*
Fire Equipment Inspector	*(Construction Regulation 27)*
Formwork & Support work Supervisor	*(Construction Regulation 10)*
Hazardous Chemical Substances Supervisor	*(HCS Regulations)*
Incident Investigator	*(General Admin Regulation 29)*
Ladder Inspector	*(General Safety Regulation 13A)*
Lifting Equipment Inspector	*(Construction Regulation 20)*
Material Hoist Inspector	*(Construction Regulation 17)*
OH&S Committee	*(OH&S Section 19)*
OH&S Officer	*(Construction Regulation 6(6)*
OH&S Representatives	*(OHS Act Section 17)*
Person Responsible for Machinery	*(General Machinery Regulation 2)*
Scaffolding Supervisor	*(Construction Regulation 14)*
Stacking & Storage Supervisor	*(Construction Regulation 26)*
Structures Supervisor	*(Construction Regulation 9)*
Suspended Platform Supervisor	*(Construction Regulation 15)*
Tunneling under Pressure Supervisor	*(Construction Regulation 13)*
Vessel under Pressure Supervisor	*(Vessel under Pressure Regulations)*
Working on/next to Water Supervisor	*(Construction Regulation 24)*
Welding Supervisor	*(General Safety Regulation 9)*

In addition The Employer requires that a Traffic Safety Officer be appointed (see COLTO Section 1500). The above appointments shall be in writing and the responsibilities clearly stated together with the period for which the appointment is made. This information shall be communicated and agreed with the appointees. Notice of appointments shall be submitted to The Employer. All changes shall also be communicated to the Employer.

The principal contractor or shall, furthermore, provide The Employer with an organogram of all contractors that he/she has appointed or intends to appoint and keep this list updated and prominently displayed on site.
Where necessary, or when instructed by an inspector of the Department of Labour, the principal contractor shall appoint a component safety officer.

2.3.3 Designation of OH&S Representatives (Section 17 of the OH&S Act)

Where the principal contractor employs more than 20 persons (including the employees of other contractors (sub-contractors) he has to appoint one OH&S representatives for every 5 employees or part thereof. General Administrative Regulation 6 requires that the appointment or election and subsequent designation of the OH&S representatives be conducted in consultation with employee representatives or employees. (Section 17 of the Act and General Administrative Regulation 6 & 7). OH&S representatives shall be designated in writing and the designation shall include the area of responsibility of the person and term of the designation.

2.3.4 Duties and Functions of the OH&S representatives (Section 18 of the OH&S Act)

The principal contractor shall ensure that the designated OH&S representatives conduct continuous monitoring and regular inspections of their respective areas of responsibility using a checklist and report thereon to the principal contractor. OH&S representatives shall be included in accident or incident investigations. OH&S representatives shall attend all OH&S committee meetings.

2.3.5 Appointment: of OH&S Committee (Section 19 and 20 of the OH&S Act)

The principal contractor shall establish an OH&S committee, which shall meet as specified in the Regulations.

2.4 Administrative Controls and the Occupational Health & Safety File

2.4.1 The OH&S File (Construction Regulation 5(7)

As required by the Construction Regulation 5(7), the principal contractor and other contractors shall each keep an OH&S file on site. The following list is not exhaustive and shall only be used as a guide:

- *Notification of construction work (Construction Regulation 3)*
- *Latest copy of OH&S Act (General Administrative Regulation 4)*
- *Proof of registration and good standing with COID Insurer (Construction Regulation 4(g)*
- *OH&S plan agreed with the client including the underpinning risk assessment/s and method statements(Construction Regulation 5(1)*
- *Copies of OH&S committee and other relevant minutes*
- *Designs/Drawings (Construction Regulation 5(8)*
- *A list of contractors (sub-contractors) including copies of the agreements between the parties and the type of work being done by each contractor (Construction Regulation 9)*
- *Appointment/designation forms as per paragraphs 2.1.1 and 2.1.2*
- *Registered as follows:*
    - *Accident/incident register (Annexure 1 of the General Administrative Regulations)*
    - *OH&S representatives' inspection register*
    - *Asbestos demolition and stripping register*
    - *Batch plant inspections*
    - *Construction vehicles and mobile plant inspections by controller*
    - *Daily inspection of vehicles, plant and other equipment by the operator/driver/user*
    - *Demolition inspection register*
    - *Designer's inspection of structures record*
    - *Electrical installations, equipment and appliances including portable electrical tools)*
    - *Excavations inspector*
    - *Explosive powered tool inspection, maintenance, issue and returns register (incl. Cartridges and nails*
    - *Fall protection inspection register*
    - *First aid box contents*
    - *Fine equipment inspection and maintenance*
    - *Formwork and support work inspections*

- *Hazardous chemical substances record*
- *Ladder inspections*
- *Lifting equipment register*
- *Materials hoist inspection register*
- *Machinery safety inspection register (incl. Machine guards, lock-outs etc.)*
- *Scaffolding inspections*
- *Stacking and storage inspection*
- *Inspection of structures*
- *Inspection of suspended platforms*
- *Inspection of tunnelling operations*
- *Inspection of vessels under pressure*
- *Welding equipment inspections*
- *Inspection of work conducted near water*
- *All other applicable records including traffic safety officer reports.*

The Employer will conduct an audit on the OH&S file of the principal constructor from time-to time.

2.5 Notification of Construction Work (Construction Regulation 3)

The principal constructor shall, where the contract meets the requirements laid down in Construction work and use the form (Annexure A in the Construction Regulations) for the purpose. A copy shall be kept on the OH&S file and a copy shall be forwarded to The Employer for record keeping purposes.

2.6 Training and Competence

The contents of all training required by the Act and Regulations shall be included in the principal contractor's OH&S plan. The principal contractor shall be responsible for ensuring that all relevant training is undertaken.

Only accredited service providers shall be used for OH&S training. The principal contractor shall ensure that his and other contractor's personnel appointed are competent and that all training required to do the work safely and without risk to health, has been completed before work commences. The principal contractor shall ensure that follow-up and refresher training is conducted as the contract progresses and the work situation changes. Records of all training must be kept on the OH&D file for auditing purposes.

2.7 Consultations, Communication and Liaison

OH&S liaison between the client, the principal contractor, the other contractors, the designer and other concerned parties will be through the OH&S committee as contemplated in paragraph 2.3.5.In addition to the above, communication may be directly to the client or his appointed agent, verbally or in writing, as and when the need arises.

Consultation with the workforce on OH&S matters will be through their supervisions, OH&S representatives and the OH&S committee. The principal contractor shall be responsible for the dissemination of all relevant OH&S information to the other contractors e.g. design changes agreed with the client and the designer, instructions by the client and/or/his/her agent, exchange of information between contractors, the reporting of hazardous/dangerous conditions/situations etc. The principal contractor's most senior manager on site shall be required to attend all OH&S meetings.

2.8 Checking Reporting and Corrective Actions

2.8.1 Monthly Audit by Client (Construction Regulation 4(1) (d)

The Employer will conduct monthly audits to comply with Construction Regulation 4(1)(d) to ensure that the principal contractor has implemented and is maintaining the agreed and approved OH&S plan.

2.8.2 Other Audits and Inspections by The Employer

The Employer reserves the right to conduct other hoc audits and inspections as deemed necessary. This will include site safety walks.

2.8.3 Contractor's Audits and Inspections

The principal contractor is to conduct his own monthly internal audits to verify compliances with his own OH&S management system as well as this specification.

2.8.4 Inspections by OH&S Representatives and other Appointees

OH&S representatives shall conduct weekly inspections of their areas of responsibility and report thereon to their foreman or supervisor whilst other appointees shall conduct inspections and report thereon as specified in their appointments e.g. vehicle and machinery drivers, operators and users must conduct daily inspections before start-up.

2.8.5 Recording and Review of Inspection Results

All the results of the above mentioned inspections shall be in writing at OH&S committee meetings, endorsed by the chairman of the meeting and placed on the OH&S File.

2.9 Accidents and Incident Investigation (General Administrative Regulation 9)

The principal contractor shall be responsible for the investigation of all accidents/incidents where employees and non-employees were injured to the extent that he/she/they had to be referred for medical treatment by a doctor, hospital or clinic. The results of the investigations shall be entered into an accident/incident register listed in paragraph2.4.1

The principal contractor shall be responsible for the investigation of all minor and non-injury incidents as described in Section24 (1) (b) & (c) of the Act and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

2.10 Reporting

The principal contractor shall provide the Employer with copies of all statutory reports required in terms of the Act within 7 days of the incident occurring.

3.0 OPERATIONAL CONTROL

3.1 Operational Procedures

Each construction activity shall be assessed by the principal contractor so as to identify operational procedures that will mitigate against the occurrence of an incident during the execution of each activity. This specification requires the principal contractor:

- *to be conversant with Regulations 8 to 29 (inclusive)*
- *to comply with their provisions*
- *to include them in his OH&S plan where relevant*

3.2 Emergency Procedure

Contractor	*Witness 1*	*Witness 2*	*Employer*	*Witness 1*	*Witness 2*

Simultaneous with the identification of operational procedures (per paragraph 3.1 above), the principal contractor shall similarly identify and formulate emergency procedures in the event an incident does occur. The emergency procedures thus identified shall also be included in the principal contractor's OH&S plan.

3.3 Personal & Other Protective Equipment (Section 8/ 15/ 23 of the OH&S Act)

The contractor shall identify the hazards in the workplace and deal with them. He must either remove them or, where impracticable, take steps to protect workers and make it possible for them to work safely and without risk to health under the hazardous conditions.

Personal protective equipment (PPE) should, however, be the last resort and there should always first be an attempt to apply engineering and other solutions to mitigating hazardous situations before the issuing of PPE is considered.

Where it is not possible to create an absolutely safe and healthy workplace the contractor shall inform employees regarding this and issue, free of charge, suitable equipment to protect them from any hazards being present and that allows them to work safely and without risk to health in the hazardous environment.

It is a further requirement that the contractor maintain the said equipment, that he instructs and trains the employees in the use of the equipment and ensures that the prescribed equipment is used by the employee/s.

Employees do not have the right to refuse to use/wear the equipment prescribed by the employer and, if it is impossible for an employee to use or wear prescribed protective equipment through health or any other reason, the employee cannot be allowed to continue working under the hazardous condition/s for which the equipment was prescribed but an alternative solution has to be found that may include relocating or discharging the employee.

The principal contractor shall include in his OH&S plan the PPE he intends issuing to his employees for use during construction and the sanctions he intends to apply in cases of non-conformance by his employees. Conformance to the wearing of PPE shall be discussed at the weekly inspection meetings.

3.4 Other Regulations

Wherever in the Construction Regulations or this specification there is reference to other regulations (e.g. Construction Regulation 22: Electrical and Machinery on Construction Sites) the principal contractor shall be conversant with and shall comply with these regulations.

3.5 Public Health and Safety (Section 9 of the OH&S Act)

The principal contractor shall be responsible for ensuring that non-employees affected by the construction work are aware of the dangers likely to arise from said construction work as well as the precautionary measures to be observed to avoid or minimize those dangers. This includes:

- *Non-employees entering the site for whatever reason*
- *The surrounding community*
- *Passers-by to the site*

4.0 PROJECT/S SPECIC REQUIREMENTS

4.1 List of Risk Assessments

- Clearing and Grubbing of the areas/site
  - Site establishment including:
    - Offices
    - Secure/safe storage to materials and equipment
    - Ablutions
    - Sheltered eating area
    - Maintenance workshop
    - Vehicle access to the site
- Dealing with existing structures
- Location of existing services
- Installation and maintenance of temporary construction electrical supply, lightning and equipment
- Adjacent land uses/surrounding property exposures
- Boundary and access control/public liability exposures (NB: the employer is also responsible for the OH&S of the non-employees affected by his/her work activities)
- Health risks arising from neighbouring as well as own activities and from the environment e.g. threats by dogs, bees, snakes and lightning etc.
- Exposure to noise
- Exposure to vibration
- Protection against dehydration and heat exhaustion
- Protection from wet and cold conditions
- Dealing with HIV/AIDS and other diseases
- Use of portable electrical equipment including
  - Angle grinder
  - Electrical drilling machine
  - Still saw
- Excavation including
  - Ground/soil conditions
  - Trenching
  - Shoring
  - Drainage of trench
- Welding including
  - Arc welding
  - Gas welding
  - Flame cutting
  - Flame cutting
  - Use of LP gas torches and appliances
- *Loading and offloading of truck*
- *Aggregate/sand and other materials delivery*
- *Manual and mechanical handling*
- *Lifting and powering operators*
- *Driving and operation of construction vehicles and mobile plant including.*
  - Trenching machine
- Use and storage of flammable liquids and other hazardous substances
- Layering and bedding
- Installation of pipes in pipelines
- Backfilling trenches
- Protection against flooding
- Gabion work
- Use of explosive
- Protection form overhead power lines
- As discovered by the principal contractor's hazard identification exercise
- As discovered from any inspection and audits conducted by the client of by the principal contractor or any other contractor on site
- As discovered from any accident/incident investigation

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

FORM C1.5 SUPPLY CHAIN MANAGEMENT POLICY

Please refer to O. R. Tambo Procurement Policy.

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

C2 PRICING DATA

C2.1 Pricing Instructions

1 The General Conditions of Contract, the Contract Data, the Specifications (including the Project Specifications) and the Drawings shall be read in conjunction with the Bill of Quantities.

2 The Bill comprises items covering the Contractor's profit and costs of general liabilities and of the construction of Temporary and Permanent Works.

Although the Bidder is at liberty to insert a rate of his own choosing for each item in the Bill, he should note the fact that the Contractor is entitled, under various circumstances, to payment for additional work carried out and that the Engineer is obliged to base his assessment of the rates to be paid for such additional work on the rates the Contractor inserted in the Bill.

Clause 8 of each Standardized Specification, and the measurement and payment clause of each Particular Specification, read together with the relevant clauses of the Project Specifications, all set out which ancillary or associated activities are included in the rates for the specified operations.

3 Descriptions in the Bill of Quantities are abbreviated and may differ from those in the Standardized and Project Specifications. No consideration will be given to any claim by the Contractor submitted on such a basis. The Bill has been drawn up generally in accordance with the latest issue of Civil Engineering Quantities [1]. Should any requirement of the measurement and payment clause of the appropriate Standardized or Project Specification(s) be contrary to the terms of the Bill or, when relevant, to the Civil Engineering Quantities, the requirement of the appropriate Standardized, Project, or Particular Specification as the case may be, shall prevail.

4 Unless stated to the contrary, items are measured net in accordance with the Drawings without any allowance having been made for waste.

5 The amounts and rates to be inserted in the Bill of Quantities shall be the full inclusive amounts to the Employer for the work described under the several items. Such amounts shall cover all the costs and expenses that may be required in and for the construction of the work described, and shall cover the costs of all general risks, profits, taxes (but excluding value-added tax), liabilities and obligations set forth or implied in the documents on which the Bid is based.

6 The quantities set out in the schedule of quantities are only approximate quantities. The quantities of work finally accepted and certified for payment, and not the quantities given in the schedule of quantities, will be used to determine payments to the contractor.

7 An amount or rate shall be entered against each item in the Bill of Quantities, whether or not quantities are stated. An item against which no amount or rate is entered will be considered to be covered by the other amounts or rates in the Bill.

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

Should the Bidder group a number of items together and bid one sum for such group of items, the single bidded sum shall apply to that group of items and not to each individual item, or should he indicate against any item that full compensation for such item has been included in another item, the rate for the item included in another item shall be deemed to be nil.
The bidded rates, prices and sums shall, subject only to the provisions of the Conditions of Contract, remain valid irrespective of any change in the quantities during the execution of the Contract.

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

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

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

Unit : The unit of measurement for each item of work as defined in the Standardized, Project or Particular Specifications

Quantity : The number of units of work for each item

Rate : The payment per unit of work at which the Bidder bids to do the work

Amount : The quantity of an item multiplied by the bidded rate of the (same) item

Sum : An amount bidded for an item, the extent of which is described in the Bill of Quantities, the Specifications or elsewhere, but of which the quantity of work is not measured in units

Quantities and Rates Reflected in the Schedule

The quantities given in the schedule of quantities are estimates only, and are subject to re-measure during the execution of the work. The quantities finally accepted and certified for payment, and not the quantities given in the Schedule of Quantities, shall be used to determine payments to the Contractor. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it. The quantities of material or work stated in the Schedule of Quantities shall not be regarded as authorisation for the Contractor to order material or to execute work.

The rates in the schedule of quantities shall include for all labour, plant and materials required to complete the item as specified in the General and Special Conditions of Contract, the SANS1200 standardised specifications, the variations to the standardised specifications, the project specifications and the drawings and shall be fixed throughout the period of the Works irrespective of the quantity of work executed under the contract.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Schedule of Quantities and in accordance with the General and Special Conditions of Contract, the SAnS1200 standardised specifications, the variations to the standardised specifications, the project specifications and the drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste. The validity of the contract will in no way be affected by differences between the quantities in the schedule of quantities and the quantities finally certified for payment.

Provisional Sums

Where Provisional sums or Prime Cost sums are provided for items in the Schedule of Quantities, payment for the work done under such items will be made in accordance with clause 6.6 of the General Conditions of Contract 2015. The Employer reserves the right, during the execution of the works, to adjust the stated amounts upwards or downwards according to the work actually done under the item, or the item may be omitted altogether, without affecting the validity of the Contract.

The Tenderer shall not under any circumstances whatsoever delete or amend any of the sums inserted by the Employer in the "Amount" column of the Schedule of Quantities and in the Summary of the Schedule of Quantities unless ordered or authorised in writing by the Employer before closure of tenders. Any unauthorised changes made by the Tenderer to provisional items in the schedule, or to the provisional percentages and sums in the Summary of the Schedule of Quantities, will be treated as arithmetical errors.

Pricing of the Schedule of Quantities

The prices and rates to be inserted by the Tenderer in the Schedule of Quantities shall be the full inclusive prices to be paid by the Employer for the work described under the several items, and shall include full compensation for all costs and expenses that may be required in and for the completion and maintenance during the defects liability period of all the work described and as shown on the drawings as well as all overheads, profits, incidentals and the cost of all general risks, liabilities and obligations set forth or implied in the documents on which the Tender is based.

Each item shall be priced and extended to the "Amount" column by the Tenderer, with the exception of the items for which only rates are required, or items which already have Prime Cost or Provisional Sums affixed thereto. If the Tenderer omits to price any items in the Schedule of Quantities, then these items will be considered to have a Nil rate or price.

All items for which terminology such as "inclusive" or "not applicable" have been added by the Tenderer will be regarded as having a nil rate which shall be valid irrespective of any change in quantities during the execution of the Contract.

Should the Tenderer group a number of items together and tender one lump sum for such group of items, this single lump sum shall apply to that group of items and not to each individual item.

The tendered lump sums and rates shall be valid irrespective of any change in the quantities during the execution of the contract.

The Tenderer shall fill in rates for all items where the words "rate only" appears in the "Amount" column. "Rate Only" items have been included where:

- an alternative item or material is contemplated;
- variations of specified components in the make-up of a pay item may be expected; and
- no work under the item is foreseen at tender stage but the possibility that such work may be required is not excluded.

For “Rate Only” items, no quantities are given in the "Quantity" column but the quoted rate shall apply in the event of work under this item being required. The Tenderer shall, however, note that in terms of the Tender Data the Tenderer may be asked to reconsider any such rates which the Employer may regard as unbalanced.

Reasonable compensation will be received where no payment item appears in respect of work required in terms of the Contract which is not covered in any other pay item.

All rates and amounts quoted in the Schedule of Quantities shall be in Rand and cents and shall include all levies and taxes (other than VAT). VAT will be added in the summary of the Schedule of Quantities. Note that fractions of a cent in all rates shall be discounted.

Correction of Entries

Incorrect entries shall not be erased or obliterated with correction fluid but must be crossed out neatly. The correct figures must be entered above or adjacent to the deleted entry, and the alteration must be initialled by the Tenderer.

Interim Payments

Unless otherwise specified, progress payments in Interim Certificates, referred to in Clause 6.10 of the General Conditions of Contract 2010, in respect of "sum" items in the Schedule of Quantities shall be by means of interim progress instalments assessed by the Engineer and based on the measure in which the work actually carried out relates to the extent of the work to be done by the Contractor. Notwithstanding any custom to the contrary, the work as executed will be measured for payment in accordance with the methods described in the contract documents under the various items of payment.

Units of Measurement

The units of measurement described in the Schedule of Quantities are metric units.
The following abbreviations are used in the Schedule of Quantities:

mm	=	millimetre	m3-km	=	cubic metre-kilometre	Prov sum	=	provisional sum
m	=	metre				kPa	=	kilopascal
km	=	kilometre	l	=	litre	MPa	=	megapascal
km-pass	=	kilometre-pass	kl	=	kilolitre	MN	=	meganewton
m2	=	square metre	kg	=	kilogram	t-km	=	tonne-kilometre
m2-pass	=	square metre-pass	t	=	tonne (1 000 kg)	hr	=	hour
ha	=	hectare	No.	=	number	dia	=	diameter
m3	=	cubic metre	%	=	percent	Sum	=	lump sum
kW	=	kilowatt	PC sum	=	prime cost sum			
			MN-m	=	meganewton-metre			

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

FORM C2.2 BILL OF QUANTITIES

C2.2 Bill of Quantities

TOTAL FOR SECTION A: GENERAL ITEMS	R.....
TOTAL FOR SECTION B: RIVER PUMP STATION	R.....
TOTAL FOR SECTION C: ELECTRICAL INSTALLATION	R.....
TOTAL FOR SECTION D: FLOW METERS	R.....
TOTAL FOR SECTION E: BOOSTER PUMP STATIONS	R.....
TOTAL FOR SECTION F: COMMISSION OF EXISTING WATER WORKS	R.....
TOTAL FOR SECTION G: CONTROL VALVES	R.....

NOTICE TO TENDERERS:

No. 1	R.....
No. 2	R.....
No. 3	R.....
NET TOTAL OF TENDER:	R.....
ADD CONTINGENCIES (10% OF NETT TOTAL OF TENDER):	R.....
PLUS ESCALATION OF 7.5% (OF NETT TOTAL OF TENDER):	R.....
TENDER AMOUNT:	R.....
ALLOWANCE FOR VAT @ 15%	R.....
GROSS TENDER PRICE (Carried to Form of Offer and Acceptance):	**R**_____

SIGNATURE OF TENDERER: .....

ON BEHALF OF:…….. .....

DATE:…….. .....

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT OF PUMP STATIONS

C3 SCOPE OF WORK

C 3.1 DESCRIPTIONS OF WORKS

PS1 GENERAL DESCRIPTION

This contract is for the supply and installation of Mechanical and Electrical equipment for the Phase 6 of the project which consist out of Raw Water abstraction pump stations and Booster pump stations.

PS2 SCOPE OF THE CONTRACT

This contract covers the supply, delivery, installation testing and commissioning of the following mechanical and electrical equipment for the Port St John's Regional Scheme
Phase 5.

a) Supply and installation of three multistage pump sets for the Port St John's dam pump station.
b) Supply and installation of three multi stage pump sets for the Booster pump station No 1.
c) Supply and installation of submersible pumps at the Mzimvubu River pump station.
d) Supply and installation of all pipe work and valves for all pump stations.
e) Supply and installation of all Electrical equipment for all pump stations and motor control centres.
f) Commissioning and testing of all equipment supplied and installed.
g) Domestic electrical Installation for pump station buildings.
h) Refurbishment of existing water treatment works as directed by the Engineer.
i) Supply and install Jet Dredge pumps at the Mzimvubu River pump station including all pipe work. Pipe work to be connected to submersible pump pipework as directed by the Engineer.
j) Electrical connections to all pump stations and water treatment plant from the Eskom supply network.
k) Construction of brick manholes for pipe work outside pump stations.
l) The tenderers are responsible for the design of all motor control centres and electrical equipment necessary to enable the works to operate effectively. The assistance of an Electrical Engineer will be

required to assist the tenderer with the design, all cost for the electrical designs works shall be included in the rates tendered.

m) The tenderer will be responsible to design the pump station pipework together with the Project Engineer, all cost for the design of the pipework for the three pump station shall be included in the rates as tendered.

PS3 DESCRIPTION OF SITE AND ACCESS

The project area is geographically located in the Port St John's Local Municipality area approximately 18 km from the town of Port St John's. The project site co-ordinates is 31°33'25,35"S and 29°27'51,84E.

PS4 PROGRAMME

PS4-1 Instruction to commence

The instruction to commence will be given by the Engineer only after a satisfactory guarantee and satisfactory insurances have been received from the Contractor and approved by the Employer.

PS4-2 Contractor's programme and progress reports

Within two weeks after the award of the Contract, the Contractor shall submit a detailed programme, in bar chart form, of all operations necessary for the completion of the Contract.

In addition to the requirements of Sub-Clause 14(1) of the General Conditions of Contract, the Contractors' programme shall show:

a) The various activities, related to a time scale, for each element of the Works, including those of Subcontractors, in sufficient detail to be assess construction progress,
b) Critical path activities and their dependencies,
c) Key dates in respect of work to be carried out by other, and
d) Key dates in respect of information to be provided by the Engineer and/or others.

In addition to the requirements of Sub-Clause 15 (2) of the General Conditions
of Contract, the Contractor shall submit with his programme, a copy of any network diagram used in producing the programme.

If any change to the critical path occurs, the Contractor shall as soon as practicable notify the Engineer in writing.

The Contractor's programme and method statement will not be accepted as the basis for claims for additional compensation without due reference to all relevant associated factors.

During the construction period, the Contractor shall submit bi-weekly progress reports to the Engineer, outlining the current situation in respect of fabrication, deliveries and installation in relation to the programme referred to above.

PS4-3 General Allowance

When drawing up his programme, the Contractor shall, take into consideration and make allowance for, inter alia:

a) Expected weather conditions and their effects,

b) Known physical conditions or artificial obstructions (eg. Road crossings,
fences, trees, pavements and existing lines and cables),
c) Cooperation with the civil contractor (laying of certain off site signal cabling),
d) The accommodation and safeguarding of public access and traffic.

PS5 SITE FACILITIES AVAILABLE

No office and store facilities are available on site and the Contractor shall provide his own facilities. The Contractor shall make his own arrangements for the supply of potable water, power, telephone, toilet facilities and temporary works (i.e. scaffolding, etc).

PS6 POWER SUPPLY AND LIGHTNING

Power supply (400 V) from the onsite transformers (supplied and installed by others) up to the motor control centres in the pump stations and treatment works' shall form part of this Contract.
Each motor control centre shall include a metering panel which has to be approved by the Engineer. All electrical work shall be in accordance with the local and provincial regulations.
Each motor control centre shall be fitted with a 220 V, 75A outlet, complete with an isolator switch, for local lightning and power points.

PS7 POSITION AND LAYOUT OF WORKS

The following is a list of Drawings indicating the layouts of the three pump stations and Dam:

- 1415-0-1202-A Raw water Abstraction pump station
- 1415-0010 Schematic layout of scheme
- 1415-0-1240-A Dam and Booster pump station Pipe work
- 1415-0-0 Locality Plan
- 1415-0-1241 Booster 1 and 2, Building layout

PS8 FEATURES REQUIRING SPECIAL ATTENTION

PS8-1 Labour intensive construction methods

PS8-1.1 General

The Contractor's attention is specifically drawn to the fact that certain aspects of the Works shall be carried out using labour intensive construction methods,

if applicable.

Although certain aspects of the work will therefore be carried out by means of manual labour, this will not in any way limit or detract from the Contractor's contractual responsibilities in respect of quality or correctness, nor will it imply that the prescribed quality specified in this document will be waived.

PS8-1.2 Labour intensive aspects of the Works

PS8-1.2.1 General

Labour intensive means that, all work associated with the construction of the following works, shall be carried out by hand :

Excavation and backfilling of all pipe trenches (800 mm deep)

All required tools needed must be provided by the contractor.

PS8-1.3 Training courses

No formal training courses will be provided for. The Contractor must provide in-house training for labour intensive method construction and the personnel of the Municipality to operate the water works. No extra cost will be provided for and the contractor must include for all

PS8-1.4 Measurement and payment

The labour intensive tasks and production rates shall be determined by the Contractor and must conform to the Gazetted rates for the region.

The rates for labour intensive items shall cover all overheads and the Contractor's profit, additional supervision and training costs, all setting out and the cost of any other operation necessary to complete the work in accordance with the specification. In addition, the rates for labour intensive items shall cover the tariff paid directly to the labourers in respect of the relevant task.

PS8-2 Continuance of operation of existing services

All existing services shall be maintained in operation, unless prior arrangements have been made with the relevant authority and written permission for an interruption of the service has been granted and adequate notice has been given to the affected residents.

The Contractor shall take steps to protect existing services against damage.

PS8-3 Work in restricted areas

The Contractor shall make sure of the physical conditions of the site and shall allow for this in his tender price. No additional payment will be paid for any problems which arise from the restrictions which the Contractor may experience.

PS8-4 Sanitary conditions

Unhygienic habits and other behaviour that may cause contamination of any part of the Works or the surrounding areas are strictly prohibited. The Contractor shall ensure that sanitary conditions prevail throughout the Site and that all his workmen are aware of, and comply with, this rule.

PS8-5 Temporary fences

The Contractor shall erect temporary fences where required for the execution of the Works.

All fences shall be maintained during construction.

Temporary fences shall be suitable for preventing live stock on adjacent properties from wandering.

The cost of the erection, maintenance and removal of temporary fencing will be deemed to be covered by the rates for the establishment of facilities for the Contractor (Section A of the Schedule of Quantities).

PS8-6 Preservation of flora and fauna and soil conservation

The Contractor shall:

(a) take all precautions to prevent:

i) the erosion of soils and/or

ii) loss of or injury to domestic and other animals on any properties used or occupied by the Contractor;

(b) refrain from destroying, removing or clearing trees, timber and scrub to any extent greater than is necessary for the execution of the Contract;

(c) take care to cause the minimum of disturbance to the fauna and flora;

(d) erect temporary fences on the servitude lines during the construction period to prevent loss of fauna and shall remove the fences as soon as construction and testing are complete;

(e) take precautions to keep the risk of fire to a minimum;

(f) arrange that timber for firewood be obtained only from such places as may be approved by the Engineer;

(g) take such measures as to ensure that his employees are aware of all laws and restrictions governing the hunting, disturbing, capturing or destroying of animals and birds in the vicinity of the camp or the Works or the taking of fish from any water ; and

(h) prohibit all firearms from the site and temporary camps.

PS8-7 Work outside normal working hours

Where the Contractor is permitted, in terms of Sub-Clause 44(1) of the General Conditions of Contract, to work outside the working hours stipulated in Clause 44(2) of the Special Conditions of Contract, he shall give the Engineer two days notice to arrange for supervision of the Works and shall be responsible for paying the additional costs of such supervising incurred by the Engineer.

PS8-8 Notification of night work and lighting

If the Contractor is given permission, in terms of Clause 44(2)of the Special Conditions of Contract, to work outside the working hours as stipulated, he shall arrange with the Engineer, in good time, for watching and supervision of the Works, he shall be responsible for paying the additional costs of watching

and supervising incurred by the Engineer and he shall provide adequate lighting for the construction area and access(es) as necessary.

Should the Contractor wish to work when the natural daylight is inadequate for the type of work to be undertaken he shall, at his own expense, provide and maintain in good condition, adequate high powered flood lighting for all portions of the work over which he is operating.

If, in the opinion of the Engineer, the resulting illumination is not adequate for the safe and efficient execution of the work, additional lighting plant shall be provided at the Contractor's expense. Failing this, night work will be prohibited.

PS8-9 Dealing with water

The Contractor shall take special care to protect his works against possible flooding.

PS8-10 Cooperation with other contractors

The contractor must liaise with the civil and electrical power line contractors to complete his works. No claim for extension of time will be considered due to poor liaison between parties.

PS9 ABNORMAL WEATHER CONDITIONS

PS9-1 Rain gauge

The Contractor shall provide a rain gauge close to the site and precautions shall be taken to restrict admission to the rain gauge.

Rainfall figures shall be taken by the Contractor under the supervision of the Engineer or his representative. This data will be used when calculating extension of time in accordance with PS 9-2.

PS9-2 Extension of time resulting from abnormal rainfall

Extension of time will not be considered for normal adverse weather conditions but only for abnormal rainfall calculated in accordance with the following method:(a) The Contractor shall, in his programme, allow for the expected number of working days on which work could be delayed - as given in the Schedule below.

(b) Extension of time will be calculated for each calendar month or part thereof over the full period for the completion of the Work, plus any approved extension thereof, as follows:

(i) A delay caused by abnormal weather conditions will only be accepted for extension of time if, in the opinion of the Engineer, it delays an item or items which lie on the critical path determined by the Contractor's programme. Only delays on working days will be considered.

(ii) An extension of time will be granted for the number of days, as approved, on which 10 mm of rain or more have fallen, less the anticipated number of days given in the Schedule below.

(iii) The net extension of time determined for each month, which may be negative, shall accumulate algebraically to determine the net number days for extension of time due to abnormal rainy conditions, but a negative total at the end of the Completion Period will not be taken into account.

(iv) Where a portion of a month is involved, a pro rata number of days shall be calculated.

SCHEDULE

Anticipated number of working days on which work could be delayed as a result of adverse weather conditions in the Port St John's region (rainfall of 10 mm or more per day).

Month	Days	Avg Rainfall	Month	Days	Avg Rainfall
January	3	103	July	0	27
February	3	100	August	0	27
March	3	115	September	2	60
April	2	57	October	2	82
May	1	34	November	3	106
June	1	21	December	3	100
				TOTAL	**832**

PS10 GENERAL PAYMENT CLAUSE

Any payment item referring to this clause will be paid for as per the description and units as per the Schedule of Quantities. All cost such as supply, deliver and installation to be included in the rate.

The following Standard and Particular Specifications, as bound in this document, and as amended in Portion 2 of the Project Specification, shall apply:

C3.2 APPLICABLE STANDARDISED SPECIFICATION

C3.2.1 WORKS SPECIFICATIONS

Applicable Spec T standardised specifications

The following applicable standardized and particular specifications are relevant to this contract:

- Specification AT : General
- Specification HT : General Metal Work
- Specification LM : Medium Pressure Pipe work, valves
- Specification MV : Measuring and recording instruments
- Specification PA : Water Pumps Medium Pressure
- Specification ST : Electrical Work: Medium Voltage
- Specification SU : Electrical Motors (1kw to 450 kw)
- Specification HP : Corrosion Protection of Steel and cast iron for water and wastewater facilities

C3.2.1. SITE ESTABLISHMENT

C3.2.1.1. Facilities provided by the Contractor

(i) The Contractor's camp site shall be fenced off and shall contain all offices, stores workshop, testing laboratories, toilet facilities, etc. The location of the camp shall be subject to approval by the Employer.

The Contractor may, if he prefers to have a site camp and storage yard location other than that identified by the Employer, suggest an alternative location to the Employer, subject to approval by the Employer

(ii) Accommodation of Employees

The Contractor shall make his own arrangements to accommodate his employees but not within the camp site area. Chemical toilets only will be allowed where temporary facilities have to be provided.

(iii) Power Supply, Water, and Other Services

The Contractor shall make his own arrangements concerning the supply of electricity power, water and all other services. No direct payment will be made for the provision of these services. The cost thereof shall be deemed included in the rates and amount tendered for the various items of work for which these services are required or in the Contractors Preliminary and General items.

(iv) Excrement disposal

The Contractor shall, at his own expense, be responsible for safely and hygienically dealing with and disposing of all human excrement and similar matter generated on the Site during the course of the Contract, to the satisfaction of the Engineer and the responsible health authorities in the area of the Site.

The Contractor shall further comply with any other requirements in this regard as may be stated in the Contract.

No separate payment will be made to the Contractor in respect of discharging his obligations in terms of this sub clause and the costs thereof shall be deemed to be included within the Contractor's bidded Preliminary and General Items.

C3.2.1.2. Facilities provided by the Contractor for the Engineer

The Contractor shall provide on the Site, for the duration of the Contract and for the exclusive use of the Engineer and/or his Representative (as applicable), the various facilities described hereunder. All such facilities shall be provided promptly on the commencement of the Contract and failure on the part of the Contractor to provide any facility required in terms of this specification shall constitute grounds for the Engineer to withhold payment of the Contractor's bidded Preliminary and General items until the facility has been provided or restored as the case may be.

(a) Office accommodation

The Contractor shall provide on the Site an office for the exclusive use of the Engineer. Such office(s) shall comply with and be furnished in accordance with the requirements of subclause 3.2 of SABS 1200 AB. The Contractor shall maintain the office(s) in accordance with the requirements of subclause 5.2 of SABS 1200 AB.

Such office accommodation shall be provided within the Contractor's site establishment facilities.

(b) Site meeting venue

The Contractor shall provide within his own site establishment facilities, a suitably furnished office or other venue capable of comfortably accommodating a minimum of eight (8) persons at site meetings. The Engineer shall be allowed free use of such venue for conducting any other meetings concerning the Contract at all reasonable times.

(c) Contractor nameboard

The Contractor shall provide, erect and maintain one contract nameboard at the commencement of the contract and at such position and location as directed by the Engineer, which nameboard shall, unless otherwise specified elsewhere in the Contract, comply with the recommendations for the standard board of the South African Association of Consulting Engineers, with regard to size, painting, decorating and detail, and the requirements described hereunder.

Each nameboard shall be made of tempered hardboard with a thickness of at least 12 mm, so braced on the reverse side as to prevent warping and shall be mounted on two or more, as necessary, firmly planted poles. The painting of the board shall comply with the relevant requirements of CKS 193 and the colours of the paints shall be an acceptable match to the applicable colours given in SABS 1091.

The Contractor shall keep the contract name board in good state of repair for the duration of the Contract and shall remove them on completion of the Contract.

(d) Survey equipment and assistants

- Survey equipment

The Contractor shall, in accordance with the requirements of SABS 1200 AB (as amended) provide the following survey equipment for the exclusive use of the Engineer or his representative:

One engineer's automatic level and legs (with current calibration certificate)
One engineer's measuring wheel
One engineer's metric staff
One engineer's plastic tape 30m long
One pocket steel tape 5m long

The Contractor shall keep the equipment insured throughout the Contract period against any loss, damage or breakage and shall indemnify the Engineer and the Employer against any claims in this regard.

Upon completion of the Works, the ownership of the equipment shall revert back to the Contractor.

The Contractor shall maintain the equipment in good working order and keep it clean throughout the Contract.

- Survey assistants

The Contractor shall, in accordance with the requirements of subclause 5.5 of SABS 1200 AB, make available to the Engineer or his representative, two (2) survey assistants.

(e) Electricity supply for the Engineer

All electricity supply to the Engineer's office(s) and laboratory (if applicable), whether provided by the Contractor by way of a reticulated supply from a local authority or other authorised electricity supply, or by way of on-site generators, shall be regulated by the Contractor to within limits such as to prevent damage due to fluctuations in the electrical current supply that may occur to any electrical plant and equipment provided by the Contractor or the Engineer.

The Contractor shall be liable for and pay to the Engineer on demand, all costs that the Engineer may incur in the repair or replacement of any electrical equipment provided by the Engineer on the Site. Reliance by the Contractor on the regulation of the electrical supply by the supplier or on current regulators fitted to generators shall not absolve the Contractor of his liabilities in terms of this Subclause and, where appropriate, the Contractor shall provide and install at his own cost, all such electrical current-regulating equipment as is necessary to prevent damage to the said equipment.

(f) Site instruction book

The Contractor shall keep a triplicate book for site instructions on the Site at all times.

(g) Accommodation for the Engineer

The Engineer will locate suitable hotel accommodation for the Engineer and his Assistant which shall be leased in the name of the Contractor. Monthly payments to the hotel will be made through the provisional sum allowed.

(h) Temporary Work

The Contractor shall carry out such temporary work, including necessary access, shoring of trenches and excavation etc. as he may require enabling the permanent work to be constructed. He shall allow for the cost of all temporary works, including their removal, in his rates.

(i) Barricading of Excavation

All excavations in road reserve and in any other areas in close proximity to vehicular traffic are to be barricaded to the satisfaction of the Engineer.
All costs arising from these requirements are to be included in the tender rates

(v) Permits and wayleaves

The Engineer on behalf of the Client will be responsible to obtain wayleaves required for this Contract.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

The Environmental officer on behalf of the Client will be responsible to obtain permits required for this contract.

C3.2.2. Plant and materials

The Employer shall not supply any plant or materials

All materials shall comply with the requirements of the South African Bureau of Standards, and shall bear the official standardization mark. Where SABS standard does not exist for a certain material, or a material does not bear the official standardization mark, the Engineers approval of such material must be gained before use thereof.

C3.2.3. Construction Equipment

All equipment on site shall be in a good working order, and is to be in such a condition that it can achieve production rates which are typical of the industry standards.

Should any equipment, in the opinion of the Engineer, be substandard or breaks down frequently to such an
extent that it affects the progress on the project, the Engineer may instruct the Contractor to replace such equipment.

C3.2.4. Permits and Wayleaves

The Employer shall be responsible to obtain all the wayleave required for this contract.

C3.2.5. Features Requiring Special Attention

(a) Site maintenance

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

(b) Testing and quality control

(i) CONTRACTOR TO ENGAGE SERVICES OF AN INDEPENDENT LABORATORY

Notwithstanding the requirements of the Specifications pertaining to testing and quality control, the Contractor shall engage the services of an approved independent laboratory to undertake all testing of materials, the results of which are specified in, or may reasonably be inferred from, the Contract. These results will be taken into consideration by the Engineer in deciding whether the quality of materials utilised and workmanship achieved by the Contractor comply with the requirements of the Specifications. The aforegoing shall apply irrespective of whether the specifications indicate that the said testing is to be carried out by the Engineer or by the Contractor.

The Contractor shall be responsible for arranging with the independent testing laboratory for the timeous carrying out of all such testing specified in the Contract, at not less than the frequencies and in the manner specified. The Contractor shall

promptly provide the Engineer with copies of the results of all such testing carried out by the independent laboratory.

For the purposes of this clause, an "independent laboratory" shall mean an "approved laboratory" (as defined in subclause PSA 7.2) which is not under the management or control of the Contractor and in which the Contractor has no financial interest, nor which has any control or financial interest in the Contractor.

(II) ADDITIONAL TESTING REQUIRED BY THE ENGINEER

In addition to the provisions of subclause C3.3.2.5(b)(i): Contractor to engage services of an independent laboratory, the Engineer shall be entitled at times during the Contract to require that the Contractor arrange with the independent laboratory to carry out any such tests, additional to those described in subclause C3.3.2.5(b)(i), at such times and at such locations in the Works as the Engineer shall prescribe. The Contractor shall promptly and without delay arrange with the independent laboratory for carrying out all such additional testing as required by the Engineer, and copies of the test results shall be promptly submitted to the Engineer.

(III) COSTS OF TESTING

(a) Tests in terms of subclause C3.3.2.4(c)(i)

The costs of all testing carried out by the independent laboratory in accordance with the requirements of subclause C3.3.2.4(c)(i), above shall be borne by the Contractor and shall be deemed to be included in the bidded rates and prices for the respective items of work as listed in the Schedule of Quantities and which require testing in terms of the Specifications. No separate payments will be made by the Employer to the Contractor in respect of any testing carried out in terms of subclause C3.3.2.4(c)(i).

Where, as a result of the consistency of the materials varying or as a result of failure to meet the required specifications for the work, it becomes necessary to carry out additional tests (eg re-tests on rectified work and/or replacement materials), the costs of such additional testing shall be for the Contractor's account.

(c) Subcontractors

All matters pertaining to subcontractors (including Nominated Subcontractors) and the work executed by them shall be dealt with directly between the Engineer and the Contractor in the context of all subcontract work being an integral part of the Works for which the Contractor is responsible.

The Engineer will not liaise directly with any subcontractors nor will he issue instructions concerning the subcontract works directly to any subcontractor.

All matters arising from the subcontract agreements shall be dealt with directly between the Contractor and the subcontractors and the Engineer will not become involved.

(d) Access to properties

The Contractor shall organise the work to cause the least possible inconvenience to the public and to the property owners adjacent to or affected by the work, and except as hereunder provided, shall at all times provide and allow pedestrian and vehicular access to properties within or adjoining or affected by the area in which he is working. In this respect the Contractor's attention is drawn to Clause 8.1.2 of the Conditions of Contract.

If, as a result of restricted road reserve widths and the nature of the work, the construction of bypasses is not feasible, construction shall be carried out under traffic conditions to provide access to erven and properties.

Notwithstanding the aforegoing, the Contractor may, with the prior approval of the Engineer (which approval shall not be unreasonably withheld), make arrangements with and obtain the acceptance of the occupiers of erven and properties to close off part of a street, road, footpath or entrance temporarily, provided that the Contractor duly notifies the occupiers of the intended closure and its probable duration, and reopens the route as punctually as possible. Where possible, such streets, roads, footpaths and entrances shall be made safe and reopened to traffic overnight. Such closure shall not absolve the Contractor from his obligations under the Contract to provide access at all times. Barricades, traffic signs, drums and other safety measures appropriate to the circumstances shall be provided by the Contractor to suit the specific conditions

(e) Existing residential areas

Electricity and water supply interruptions in existing residential areas shall be kept to a minimum. The Engineer's approval shall be obtained prior to such interruptions and residents shall be notified in writing at least 24 hours but not more than 48 hours in advance. Supplies shall be normalised by 16:00 on the same day.

(f) Labour-intensive competencies of supervisory and management staff

Contractor having a CIDB contractor grading designation of 5CE and higher shall only engage supervisory and management staff in labour intensive works who have either completed, or are registered for training towards, the skills programme outlined in Table 1.

The managing principal of the contractor, namely, a sole proprietor, the senior partner, the managing director or managing member of a close corporation, as relevant, having a contractor grading designation of 1CE, 2CE, 3CE and 4CE shall have personally completed and be registered on a skills programme for the NQF level 2. All other site supervisory staff in the employ of such contractors must have completed, or be registered on a skills programme, for the NQF level 2unit standards or NQF level 4unit standards.

Table 1: Skills programme for supervisory and management staff

Personnel	NQF level	Unit standard titles	Skills programme description
Team leader / supervisor	2	Apply Labour-intensive Construction systems and Techniques to Work Activities	This unit standard must be completed, **and**
		Use Labour-intensive Construction Methods to Construct and Maintain roads and Stormwater Drainage	one of these 3 unit standards be used
		Use Labour -intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour-intensive Construction methods to Construct, Repair and Maintain Structures	
Foreman / supervisor	4	Implement Labour-	This unit standard

Personnel	NQF level	Unit standard titles	Skills programme description
		intensive Construction systems and Techniques	must be completed, **and**
		Use Labour-intensive Construction Methods to Construct and Maintain Roads and Stormwater Drainage	any one of these 3 unit standards be used
		Use Labour-intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour-Intensive Construction Methods to Construct, Repair and Maintain Structures	
Site Agent / Manager (ie the contractor's most senior representative who is resident on the site)	5	Manage Labour-intensive Construction Processes	Skills Programme against this single unit standard

(g) Employment of unskilled and semi-skilled workers in labour-intensive works

(i) REQUIREMENTS FOR THE SOURCING AND ENGAGEMENT OF LABOUR

(1) Unskilled and semi-skilled labour required for the execution of all labour-intensive works shall be engaged strictly in accordance with prevailing legislation and SANS 1914-5, Participation of Targeted Labour.

(2) The rate of pay set for the SPWP is R 230.00 per task or per day.

"In accordance with the Code of Good Practice for Employment and Conditions of Work for Special Public Works Programmes (clause 10.4), the public body must set a rate of pay (task-rate) for workers to be employed on the labour-intensive projects.

Clause 10.4 requires that the following should be considered when setting rates of pay for workers:

10.4.1 The rate set should take into account wages paid for comparable unskilled work in the local area per sector, if necessary.
10.4.2 The rate should be an appropriate wage to offer an incentive for work, to reward effort provided and to ensure a reasonable quality of work. It should not be more than the average local rate to ensure people are not recruited away from other employment and jobs with longer-term prospects.

10.4.3 Men, women, disabled persons and the aged must receive the same pay for work of equal value."

(3) Tasks established by the contractor must be such that:

(aa) the average worker completes 5 tasks per week in 40 hours or less; and
(bb) the weakest worker completes 5 tasks per week in 55 hours or less.

(4) The Contractor must revise the time taken to complete a task whenever it is established that the time taken to complete a weekly task is not within the requirements of 1.1.3.

(5) The Contractor shall, through all available community structures, inform the local community of the labour-intensive works and the employment opportunities presented thereby. Preference must be given to people with previous practical experience in construction and/or who come from households:

(aa) where the head of the household has less than a primary school education;
(bb) that have less than one full-time person earning an income;
(cc) where subsistence agriculture is the source of income;
(dd) those who are not in receipt of any social security pension income.

(II) SPECIFIC PROVISIONS PERTAINING TO SANS 1914-5

(1) Definition

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

(2) Contract participation goals

(aa) There is no specified contract participation goal for the contract. The contract participation goal shall be measured in the performance of the contract to enable the employment provided to targeted labour to be quantified.
(bb) The wages and allowances used to calculate the contract participation goal shall, with respect to both time-rated and task-rated workers, comprise all wages paid and any training allowance paid in respect of agreed training programmes.

(3) Terms and conditions for the engagement of targeted labour

Further to the provisions of clause 3.3.2 of SANS 1914-5, written contracts shall be entered into with targeted labour.

(4) Variations to SANS 1914-5

(aa) The definition for net amount shall be amended as follows:
Financial value of the contract upon completion, exclusive of any value-added tax or sales tax which the law requires the employer to pay the contractor.
(bb) The schedule referred to in 5.2 shall in addition reflect the status of targeted labour as women, youth and persons with disabilities and the number of days of formal training provided to targeted labour.

TRAINING OF TARGETED LABOUR

(1) The Contractor shall provide all the necessary on-the-job training to targeted labour to enable such labour to master the basic work techniques required to undertake the work in accordance with the requirements of the contract in a manner that does not compromise worker health and safety.

(2) The cost of the formal training of targeted labour, will be funded by the provincial office of the Department of Labour. This training will take place as close to the project site as practically possible. The Contractor must access this training by informing the relevant provincial office of the Department of Labour in writing, within 14 days of being awarded the contract, of the likely number of persons that will undergo training and when such training is required. The Employer must be furnished with a copy of this request.

(3) A copy of this training request made by the contractor to the DOL provincial office must also be faxed to the EPWP Training Director in the Department of Public Works – Cinderella Makunike, Fax: 012 328 6820 or email cinderella.makunike@dpw.gov.za, Tel: 083 677 4026.

(4) The contractor shall be responsible for scheduling the training of workers and shall take all reasonable steps to ensure that each beneficiary is provided with a minimum of six (6) days of formal training if he/she is employed for 3 months or less and a minimum of ten (10) days if he/she is employed for 4 months or more.

(5) The Contractor shall do nothing to dissuade targeted labour from participating in training programmes.

(6) An allowance equal to 100% of the task rate or daily rate shall be paid by the Contractor to workers who attend formal training, in terms of 1.3.4 above.

(7) Proof of compliance with the requirements of 1.3.1 to 1.3.3 must be provided by the Contractor to the Employer prior to submission of the final payment certificate.

(h) **Employment of local labour**

(8) It is a specific criterion of this project that should as far as possible adheres to RDP principles, and to meet these principles the following procedures will be followed:

(9) All labour is to be sourced from the O. R. Tambo District Municipality area of jurisdiction and the Contractor may only bring in key personnel from outside this area.

The bidders shall make maximum use of the human resources existing in the local community. The bidders shall apply to the employment labour desk, conveyed by the steering committee for details of those labours who are available in the area of work and shall provide preference to those labours identified by steering committee.

The employment of casual labour will be done in co-operation with community leaders and local structures. The bidder shall ensure that all remuneration paid to employees is in line with the relevant sectorial determination in terms of the Basic Conditions of Employment Act, No 75 of 1997, as determined by the Department of Labour.

(i) **Monthly statements and payment certificates**

The statement to be submitted by the Contractor in terms of Clause 6 of the Conditions of Contract shall be prepared by the Contractor at his own cost, strictly in accordance with the standard payment certificate prescribed by the Engineer, in digital electronic computer format. The Contractor shall, together with a copy of the digital electronic computer file of the statement, submit two (2) A4 size paper copies of the statement.

For the purposes of the Engineer's payment certificate, the Contractor shall subsequently be responsible, at his own cost, for making such adjustments to his statement as may be required by the Engineer for the purposes of accurately reflecting the actual quantities and amounts which the Engineer deems to be due and payable to the Contractor in the payment certificate.

The Contractor shall, at his own cost, make the said adjustments to the statement and return it to the Engineer within three (3) normal workings days from the date on which the Engineer communicated to the Contractor the adjustments required. The Contractor shall submit to the Engineer five (5) sets of A4

size paper copies of such adjusted statement, together with a copy of the electronic digital computer file thereof.

Any delay by the Contractor in making the said adjustments and submitting to the Engineer the requisite copies of the adjusted statement for the purposes of the Engineer's payment certificate will be added to the times allowed to the Engineer in terms of Subclause 6.10.4 of the Conditions of Contract to submit the signed payment certificate to the Employer and the Contractor. Any such delay will also be added to the period in which the Employer is required to make payment to the Contractor.

(j) Construction in restricted areas

Working space is sometimes 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 bidded will be deemed to include full compensation for any difficulties encountered by the Contractor while working in restricted areas. No extra payment nor any claim for payment due to these difficulties will be considered.

(k) Notices, signs, barricades and advertisements

All notices, signs and barricades, as well as advertisements, 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 bidded rates.

The Engineer shall have the right to instruct the Contractor to move any sign, notice or advertisement to another position, or to remove it from the Site of the Works if in his opinion it is unsatisfactory, inconvenient or dangerous.

(l) Workmanship and quality control

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

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

The Contractor's attention is drawn to the provisions of the various Standardized Specifications regarding the minimum frequency of testing required. The Contractor shall, at his own discretion, increase this frequency where necessary to ensure adequate control.

On completion and submission of every part of the work to the Engineer for examination and measurement, the Contractor shall furnish the Engineer with the results of the relevant tests, measurements and levels to demonstrate the achievement of compliance with the Specifications.

(m) Inspection by Engineer

No stage of construction shall be proceeded with until the Engineer or his representative has examined and approved the previous stage. If any work is covered or hidden from view before the Engineer has inspected same, the Contractor shall at his own cost open the covered work for inspection. The Contractor shall also be responsible for making good any work damaged by such uncovering.

C3.2.6. Extension of time due to abnormal rainfall

No extension of time will be granted in respect of any delays attributed to normal climatic conditions. Normal climatic conditions shall be deemed to include normal rainfall and associated wet conditions and materials, strong winds and extremes of temperature. However , in the event that delays to critical activities exceed the number of working days listed below for each month, then abnormal climatic conditions shall be deemed to exist and an extension of time be claimed in accordance with the provisions of Clause 5.12.

If abnormal rainfall or wet conditions occur during the course of the Contract, the Employer may grant an extension of time in accordance with Clause 5.12. of the General Conditions of Contract, calculated in accordance with the formula given below for each calendar month or part thereof:

$V = (Nw - Nn) + (Rw - Rn)/X$

If V is negative and its absolute value exceeds Nn, then V shall be taken as equal to minus Nn.

The symbols shall have the following meanings:

V = Extension of time in calendar days for the calendar month under consideration. When the value of V for any month exceeds the number of days in the particular month, V will be the number of days in the month.

Nw = Actual number of days in the calendar month on which a rainfall of Y mm or more were recorded.

Nn = Average number of days, derived from existing rainfall records, on which a rainfall of Y mm or more were recorded for the calendar month.

Rw = Actual rainfall in mm recorded on the Site in an approved rain gauge for the calendar month under consideration.

Rn = Average rainfall in mm for the calendar month, derived from existing rainfall records.

The total extension of time is the algebraic sum of all the monthly totals for the period under consideration, but if the total is negative, the time for completion will not be reduced on account of subnormal rainfall. Extensions of time for part of a month will be calculated by using pro rata values for Nn and Rn.

The factor (Nw - Nn) is considered a fair allowance for variations from the average number of days during which the rainfall exceeds Y mm.

The factor (Rw - Rn)/X is considered a fair allowance for variations from the average number of days during which the rainfall did not exceed Y mm but wet conditions prevented or disrupted work.

For purposes to determine abnormal climatic conditions according to Clause 5.12. of the General Conditions of Contract, normal rainfall will be considered to be the historic average number of days with a rainfall of 10 mm or more per day.

The following values for the Mthatha region will be applicable:

Month	N_n (days)	Rn (mm)

January	3	103
February	3	100
March	3	115
April	2	57
May	1	34
June	1	21
July	1	27
August	0	27
September	2	60
October	2	82
November	3	100
December	3	100
Total	24	826

C3.2.7. Accommodation of traffic

It is expected of the Contractor to ensure that the free flow of traffic is possible throughout the construction period.
The Contractor is to provide all necessary barricades, signs and lighting in accordance with the stipulations of the South African Road Signs Traffic Manual, and the Protective Services of the O. R. Tambo District Municipality. All work is to be to the satisfaction of the Engineer.

C3.2.8. As-Built Data and Record Drawings

The Contractor shall submit the following "As Built" data to the Engineer's Representative to enable the Engineer's Representative to complete the required Record Drawings before a Certificate of Completion will be issued:

- Marked Up General Arrangement drawings showing the following:
  - Invert levels
  - Top concrete levels
  - Any deviations from the original design
  - The positions of all manholes and collection / distribution chambers
  - The invert level, diameters and material of construction of all inlet and outlet pipe-work.

The above information is to be given to an accuracy of three decimal places and is to be surveyed by a suitably qualified person. The survey shall be provided in both dxf and dwg *.csv & tot format.
Suitable checks on the accuracy of the information provided may be carried out by the Engineer's Representative and should any of the information provided be found to be inaccurate or untrue, the Employer reserves the right to withhold payment or to employ the services of an engineering surveyor to re-survey all the works listed above, at the Contractor's expense.
The Employer shall request a minimum of three quotations from three independent engineering surveyors of his choice, and the lowest quotation will be appointed and the cost thereof will be deducted from monies owing to the Contractor.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

C3.2.9 CPG APPLICABILITY

The Contract Participation Goals (CPG) target is applicable to all WSIG contracts to be adjudicated through the O. R. Tambo District Municipality procurement process and shall be achieved through the following mechanisms:

- Main Service Provider may propose a suitable targeted enterprise or CPG partner/s but O. R. Tambo District Municipality reserves the right to provide or arrange a targeted enterprise or CPG partner/s to work with the successful company.
- In cases where CPG works has been already identified, the successful tenderer will be allocated a CPG partner/s as deemed necessary by the Engineer.
- This clause will only be applicable if it is feasible to use targeted enterprise or CPG partner.

Professional Service Providers						
Type Of Enterprise		**Annual Turnover**	**Black Ownership**	**Tax Clearance Certificate**	**Minimum Full Time Technical Employees**	**CPG Target**
Targeted Enterprise (TE)	Qualifying Small Enterprise	R5 m ≤ TE ≤R15 m	> 50%	Required	>6	30% Min.
	Emerging Micro Enterprise	TE < R5 m	> 50%	Required	>3	

For each monthly invoice submitted by the Service Provider, the Targeted Enterprise(s) hours and costs per function must be clearly articulated to enable the CPG targets to be easily and regularly monitored.

The Service Provider must withhold 10% retention of the Targeted Enterprise(s) fees until the acceptance of the project.

The Service Provider must pay the amount due to the Targeted Enterprise(s) within 14 days of receiving payment from the Employer.

C3.3 VARIATIONS AND ADDITIONS TO THE STANDARDIZED SPECIFICATIONS AND PARTICULAR SPECIFICATIONS FOR THIS CONTRACT

PSAT **General (SPEC AT)**

PSAT 1 Design, materials and manufacture

PSAT1-1 Delivery of goods (Subclause 3.7)

PSAT1-1.1 Point of delivery

The point of delivery of goods shall be the Site of the Works.

PSAT1-1.2 Delayed delivery and point of storage of goods

Should manufacture of the goods be completed before completion of the structure(s) to accommodate the equipment, delayed delivery in terms of Subclause 3.7.3.1 (b) in the form given in this document. Payment for goods placed in storage will not be certified by the Engineer until the Certificate of Ownership is received.

PSAT1-1.3 Schedule of goods

When the Contractor gives notice to the Engineer in terms of Subclause 3.7.2 that goods are ready, or are about to be ready, for delivery, the Contractor shall submit to the Engineer a Schedule of the goods to be delivered.

PSAT2 Installation and operating requirements

PSAT2-1 Contractor's drawings and instructions. (Subclause 5.2)

The drawings called for in terms of Subclause 5.2.1 and 5.2.3 shall be submitted within two weeks of the Engineer's letter confirming the award of the Contract.

PSAT2-3 Pipes through walls (Subclause 5.5.4)

Notwithstanding the provision of Subclause 5.5.4 (b) the removal of formwork and alterations to the positions and shape of holes will be carried out by the civil engineering contractor.

PSAT3 Testing and commissioning

PSAT3-1 Commissioning and instructing plant operator. (Subclauce 5.6)

After the plant has been commissioned, the Contractor shall instruct the plant operators in all aspects of the operation and maintenance of the equipment supplied.

PSAT4 Measurement and payment

PSAT4-1 Payment for supply items. (Subclause 8.3)

Payment will be made as follows:

(i) 80% on receipt of the Engineer's certificate that the goods have been received in good order or satisfactorily stored in terms of PSAT1-1.2.

The Contractor shall, if so ordered by the engineer, open all packing cases for inspection to prove that the goods are in good order, and re-crate at his own cost.

(ii) 5% on receipt of the draft copies of documents required in terms of Subclause 5.2.4.

(iii) 5% on approval of the amended documents required in terms of Subclause 5.2.4.

(iv) 5% when the Works has been successfully commissioned.

(v) 5 on the expiration of the 12months Defects Liability Period.

Note that (iv) and (v) represent the retention money held in terms of the GCC.

PSHP CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTE WATER FACILITIES. (SPEC HP)

PSHP1 Application/requirements

PSHP1-1 Corrosion protection

The following corrosion protection specifications shall apply to this Contract:

(i) Pipe work (if not of any non-corrodible material such as SS or uPVC)

Pipe work internal (pump stations)	-	Subclause 5.5.3 or 5.5.4(i) as applicable
Pipe word external (above water)	-	Subclause 5.5.3 or 5.5.2(i) as applicable
Pipe work external (below water)	-	Subclause 5.5.3 or 5.5.1 (b)

(ii) General metal work

Above water	-	Subclause 5.5.2(i)
Below water	-	Subclause 5.5.4(ii)

(iii) Pumps, motors, gearboxes - Subclause 5.5.6.2(b)

(iv) Submersible pumps/mixers - Subclause 5.5.6.2(b)

(v) Cast iron valve, fittings - Subclause 5.5.5.2(a) or (b)

(vi) Pipe brackets, supports etc - Subclause 5.5.2(i)

(vii) External uPVC pipe work - Two coats of UV resistant paint.

External and internal pipe work at the water works may be manufactured of uPVC.

PSHP2 Testing

PSHP2-1 Independent Inspectorate

The Engineer will nominate an Independent Inspectorate to carry out any tests to verify compliance with the paintwork specification.

The Inspectorate will inspect the work to verify that at least the following are in accordance with the specifications:

a) surface preparation prior to painting;

b) coating thickness;

c) holiday testing, and

d) paint quality, type and method of application.

The Contractor shall give his full co-operation to the Independent Inspectorate to enable it to carry out the above tests at intervals during manufacture of the equipment.

PSHP3 Measurement and payment

PSHP3-1 Independent Inspectorate

Provisional sums are scheduled to cover the costs of the Independent Inspectorate.

PSLM MEDIUM PRESSURE PIPE WORK, VALVES, ETC. (SPEC LM)

PSLM1 Design, materials and manufacture

PSLM1-1 General

The Contractor shall be responsible for the design and layout or the pipe work of the pump stations and the water treatment works and shall submit these to the Engineer for approval. The Contractors' attention is drawn to the fact that details of pipe work and fittings, where shown on the Engineer's drawings are for guidance only.

The design of the pipe work shall be such that it allows for flexibility and the easy removal of specials. The Contractor shall be entirely responsible for the suitability and adequacy of the pipe work, valves, check valves and for the associated fittings such as supports. The extent of the pipe work is shown on the relevant drawings.

PSLM1-2 Pump stations

PSLM 1-2.1 Pipe work General

The pipe work for the two pump stations shall be Galvanised mild steel pipe work, designed with a maximum pressure rating of 3500 KPa.

Distance pieces which are to be cast in concrete shall be galvanized steel.

Pipe work shall be complete with gate valves, check valves, gauges and supports all suitable for design.

Flanges shall be manufactured to SABS 1123 Table 30 (working pressure of 3500 KPa) for the pump stations.

Each pump-set shall have one check valve and one gate valve per pump on the delivery branches. An E-flex flexible coupling or a restrained Viking Johnson coupling or similar shall be provided at the intake and delivery of each pump, except at the submersible pump stations.

PSLM1-2.2 Gate valves. (Subclause 3.7.1)

All gate valves shall be resilient seal valves (RSV) with cast iron bodies, clockwise closing with rising spindles and of an approved make. The design pressure for all valves shall be 3500 KPa or PN 25.

The design pressure is a follows:

PSLM1-2.3 Check valves. (Subclause 3.7.3)

Check valves shall be PN 30A flanged with lever arm and counter weight and shall be the standard version with valcanized disk, hinge of duck tile iron with a stainless steel shaft as manufactured by AVK or similar approved by the Engineer.

PSLM1-2.4 Butterfly valves. (Subclause 3.7.2)

A butterfly valve is required on the delivery pipeline to the clarifiers (to control the flow rate of raw water). The working pressure will not exceed 1,6 MPa and must comply to subclause 3.7.2 (a) to (p).

PSLM1-2.5 Pressure gauges. (Subclause 3.7.6)

One gauge on the delivery manifold of the pump station. Pipe work must be installed with a pressure rating of 3500 kPa.

The gauges shall have a face diameter of a least 100 mm and be glycerine filled. They shall be provided with 3-way isolating cocks which shall allow the bleeding of air and the isolation of the gauges.

Positive and negative surges up to 50% of the maximum operating pressures can be expected to occur during the starting and the stopping of the pumps.

PSLM1-3 Corrosion protection

The provisions of PSHP shall apply.

PSLM1-4 Flexible couplings

The internal and external corrosion protection of "Viking Johnson" flexible couplings and flange adaptor couplings shall receive the same corrosion protection as the protection applied to the pipe work adjacent to each coupling. The bolts, nuts and washers of the couplings shall be protected in

accordance with Subclause 5.5.8 of spec. HP.

PSLM1-5 Pipe work to and from all elements

The inter connecting pipe work will be supplied and installed by the Civil Contractor, allowance has to be made to connect to this pipe work.

PSMV MEASURING AND RECORDING INSTRUMENTS. (SPEC MV)

PSMV1 Design, materials and manufacture

PSMV1-1 General

Two RAW water flow meters shall be supplied and installed within the pipe work of the pump stations.

PSMV1-2 Detailed requirements

PSMV1-2.1 Clear water flow meter

The clear water flow meter shall be installed on the delivery pipe work of the pump stations and shall be equipped with an inline strainer. The meter shall be the Elser Kent Helix H4000 type or similar approved meter.

PSPA WATER PUMPS. (SPEC PA)

PSPA1 Design, materials and manufacture

PSPA1-1 General

a) The pumps for the permanent raw water abstraction pump station in the Mzimvubu River will be submersible pumps. Two pumps will be supplied one duty and one standby pump. Each pump must deliver raw water at a rate of 180 l/s to the new off-channel storage dam at a maximum head of 85m.

b) The dam pump station will have three multi stage raw water pumps which deliver raw water at a rate of 40 l/s to a buffer tank at Booster Pump Station No 1 at a maximum head of 240m.

c) The Booster Pump Station No 1 will deliver raw water at a rate of 40 l/s to the buffer tank at the water treatment plant at a maximum head of 226m.

PSPA1-2 Raw Water pump station in Mzimvubu River

Description	Available Information
Type of pump required	Submersible
No of pumps and motors	2 (1 duty and 1 standby unit)
Capacity of each pump	180l/s
Capacity of two pumps	N/A
Diameter of rising main	400mm ø PVC
Length of Rising main	1000 m
Suction head (static)	+0.9m

	+2,5m
Manometric Head including losses	85m
Altitude above MSL	15

PSPA 1-3 Dam Pump station

Description	**Available Information**
Type of pumps required	Multi stage
No of pumps and motors required	3 (two duty and one standby unit)
Capacity of two pump	40l/s
Capacity of two units	N/A
Diameter of Rising Main	250 mm ø UPVC
Length of Rising Main	3223.62 m
Suction head (static)	+2.5m +3,5m
Manometric Head including losses	240m
Altitude above MSL	31,006 m

PSPA 1-5 Booster Pump station No 1

Description	**Available Information**
Type of pumps required	Multi Stage
No of pumps and motors required	3 (two duty and one standby unit)
Capacity of each pump	40l/s
Capacity of two units	N/A
Diameter of Rising Main	250 mm ø UPVC
Length of Rising Main	3272,211 m
Suction head (static)	+2,5 m +2,5 m
Manometric Head including losses	226m
Altitude above MSL	259,6 m

PSST ELECTRICAL EQUIPMENT (MEDIUM VOLTAGE PLANT-200-600 VOLTS)

PSST1 Electrical installation (Subclause 2.4)

All motor control centres, complete with all necessary switchgear, starters etc. cabling to the centres, cabling between the centres and the motors, automatic and manual switching facilities, siren/visible alarms for low/high level or no-flow faults, ammeters, on/off indication, start/stop push buttons, control selector switch and hour meters are to be supplied under this Contract. All cost shall be included in the rates for the design by Electrical Engineer.

Each motor control centre shall have a volt meter on the incoming supply (testing of each phase).

All motors shall be suitable for a 400 V, three phase supply. Signal circuits

shall use a single phase current. The starters for electrical motors shall be soft starter for all pump stations.

PSST2 Design, materials and manufacture

PSST2-1 Motor control equipment (Sub clause 3.7.5)

PSST2-1.1 Booster Pump Stations and and River Pump Station

The motor control centres for the Dam and Booster Pump Stations shall be situated within the pump buildings and as indicated on the relevant Drawings attached. The motor control centres for the permanent submersible pumps will be situated in a Control Building approximately 50 m from the River Pump Station.

The Pumps be automatically controlled by water level control switches at the different reservoir.

PSST2-1.7 Water level control probes

The water level control probes in the reservoirs shall be manufactured from stainless steel. These probes shall be attached to the internal reservoir wall by means of stainless steel grade 316 clamps. The interconnecting cables shall be passed through 2 x 50 mm diameter ducts (sealed off with foam) installed under this Contract.

The four control probes (one stop, three different levels for start) for the pumps in the Mzintlava river pump stations shall be located inside the pump station sumps. The control probes at the raw water dam will be housed in a porous 110 mm pipe at FWL.

All probes shall be protected from the effects of surface waves by means of appropriate shields.

PSSU ELECTRIC MOTORS (SPEC : SU)

PSSU1 Design, material and manufacture

PSSU1-1 Rating (subclause 3.1.2)

Pump motors shall be sized to drive the pump when fitted with the maximum sized impeller, operating in the piping system shown, plus 10% excess or under maximum delivery with the impeller supplied plus 15% excess, whichever is the lesser.

Pump motors shall be suitable for a maximum of 15 starts per hour.

PSSU1-2 Corrosion protection

Motors shall be corrosion protected in accordance with PSHP.

PSSU1-3 Motor fan covers

All motors, except submersible pump motors, shall be provided with fan covers manufactured from cast iron, stainless steel, fibreglass or

polypropylene. Mild steel covers will not be accepted.

PSSU1-4 Power supply

The electricity supply to the motors will be a 400 Volt, 3 phase, 50 Hertz supply.
The electrical motors shall have a soft starter and a soft stop function must also be included in the switchgear of each motor control centre.

PSST2-2 CABLING

The following cabling (including supply, trench, excavation and backfilling), is included in this Contract.

a) 400 volt power cables;

   i) From Eskom transformers to the pump stations.

b) Signal Cables

   Signal Cables (including supply, trench excavation and backfilling) is included in this contract.
   i) For the two pump stations.

c) Telemetry System

   The Telemetry system must link in with the Phase 1 system. A provisional sum has been allowed to connect the two pump stations to the existing system.

PSST2-3 Domestic Installation to Booster Pump station

The domestic electrical supply must include flood lights at the water purification works. The following must have adequate lighting when the plant must operate during the night.

The booster pump station must be equipped with adequate lighting inside of the pump station. Flood lights are required at the main access doors and at the suction side, back of the pump station.

END OF SECTION

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT:MIS 315 995 B

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT OF PUMP STATIONS

SPECIFICATION T SERIES

SPECIFICATION HP : CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES

Clause

SPECIFICATION HP : CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES

1. SCOPE

This specification covers the requirements for corrosion protection and painting of metal surfaces in pump stations, sumps, water and wastewater treatment works and similar situations. This Specification shall be read in conjunction with SABS 1200 HC. Where conflicts between this Specification and SABS 1200 HC occur, the provisions of this specification shall apply.

2. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specifications

Where this specification is required for a project, the following specifications shall, inter alia, form part of the Contract document:

1. Project Specification;
2. SPEC : AT : GENERAL
3. SABS 1200 HC

2.2 Application

This specification contains clauses that are generally applicable to mechanical engineering construction. Interpretations of and modifications to this specification are set out in Portion 2 of the project specifications which precedes this specification in a Contract document.

2.3 Definitions and abbreviations

For the purpose of this specification the definitions and abbreviations given in 2.1.1 (b) (as well as those given below) shall apply.

Cathodic disbondment. Progressive breakdown of the protection coatings bond to the metal surface.
Grit blast cleaning. The process of directing small particles of abrasive steel shot or other approved grit against the surface to be coated. The grade of cleanliness (as Sa2) shall mean in accordance with Swedish Standards SIS 05/50/00.
Holiday. A defect in a coating where the coating has been damaged, or is so thin or the coating material has been so degraded or contaminated that its properties are seriously impaired.
Holiday detector. An electrical device usually consisting f a ring of multiple wires mounted on a frame and electrically charged so that as the device passes along the coated surface an electrical discharge can be observed (audible alarm) at holidays or at points where the coating has failed to cover the protected surface completely.
Organic coatings. Organic pipe coatings and linings may be divided into the following categories:

(a) Coal-tar and asphaltic bitumen based coatings.
(b) Paint and allied coatings including those based on epoxy, polyurethane, vinyl, chlorinated rubber and alkyd resins.
(c) Works applied thermoplastic and thermo set coatings such as polyethylene (extruded and sintered), nylon and fusion bonded epoxy.
(d) Tape wrap coatings including cold applied petrolatum-based tapes, polymer backed tapes, hot applied bituminous tapes and shrink-wrap coatings.
(e) Film type temporary protective's.
(f) Miscellaneous organic materials such as polyurethane foam.

Significant surface. The part of the article covered or to be covered by the coating and for which the coating is essential for serviceability and/or appearance.

2.4 Abbreviations

FBE	:	Fusion bonded epoxies
GRC	:	Glass reinforced cement
HDPE	:	High density polyethylene
MS	:	Mild steel
PVC	:	Polyvinyl chloride
Sa	:	Followed by a number refers to the relevant part of Swedish Standard SIS 05/59/00
UV	:	Ultra-violet radiation

3. DESIGN, MATERIALS AND MANUFACTURE

3.1 Blast cleaning

Grit for blast cleaning shall be in accordance with SABS 064 and/or BS 2451 as applicable. Air used for blast cleaning shall be free of all traces of oil and water.

3.2 Hot-dip galvanizing

The zinc content of the bath contents shall be in accordance with SABS 763.

3.3 Paints

3.3.1 All paints used for a particular coating system shall be obtained from the same supplier and they shall be mutually compatible.

The paints supplied shall be in accordance with SABS specification for their respective types or the BS or ISO where no SABS specification exists and shall be of the best quality of their

respective kinds.

Unless otherwise stated in the project specification, or approved, the final coat of all paintwork shall be in accordance with those given in Appendix B hereof.

3.3.2 Organic Coating for Pipelines.

Basic requirements (performance specification)

i Durability

The coating shall be chemically inert, i.e. it shall as far as practicable be free of constituents subject to further oxidation, polymerization or saponification and maintain its properties for an indefinite period. Coatings shall be resistant to biological degradation.

ii Moisture permeability

The coating shall act as a virtually impermeable barrier to water and aggressive ions.

ii Resistance to mechanical damage

Impact resistance shall be at least 4 joules at 20ºC (in accordance with ASTM G14).

iv Conformability

The coating shall conform to the metal surface profile without leaving voids, gaps, laminations or pinholes.

v Ease of application

Site application. Requirements of surface preparation, primer, applications, temperature limits, etc., shall be reasonable and easily understood. Furthermore, the coating shall be capable of being applied under normal site conditions as generally known or as described in the project specifications.

vi Ease of repair

Damage to works and site applied coatings shall be capable of effective repair, and conform to the requirements of (v) above.

vii Adhesion to pipe surface

The coating shall offer a resistance high enough to maintain the protection current demand within reasonable limits. If perforation of the coating should occur, allowing electrolyte to penetrate to the pipe surface, the coating shall resist cathodic disbondment.

viii Adhesion to pipe surface

The coating shall have a high peel resistance. This shall be demonstrated by preparing samples 50 mm wide and stating the force required to achieve peel. Adhesion shall be at least 6N per sq. millimeter of steel. Where vinyl or other finish coats are specified, suitable priming and surface preparation shall be carried out to improve peel resistance.

ix Flexibility

The coating shall be flexible (Elongation: 3% strain at 20ºC. 1% strain at - 18ºC).

x Solvent free

Where practicable solvent free paints shall be applied.

xi Internal linings for potable water shall be non-toxic, non-tasting and non-tainting.

3.4 Thinners

Only the paint manufacturer's recommended thinners shall be used.

3.5 Degreasing agent

The degreasing agent shall be water soluble.

3.6 Primers

The correct primer shall be selected for the surface being coated and the paint coating being used, in accordance with the manufacturer's recommendation.

3.7 Vinyl copolymer paint

Vinyl copolymer (PVC) paints shall have a solids content of 50% by mass and 32% by volume with a viscosity of 4,5 poise ± 0,5 poise. The paint shall be stabilized against UV radiation.

3.8 Polyamide cured epoxy

These paints shall be a two pack polyamide cured high build epoxy having a red oxide color.

3.9 Fusion bonded epoxies (FBE)

Only the best quality of raw materials shall be used. The components of the FBE shall consist of:

(a) Epoxy resin to determine fundamental characteristics.
(b) Curing agents to determine rate of cure.
(c) Fillers/pigments to improve impact resistance and toughness.
(d) Flow agents/stabilizers.

Strict quality control shall be maintained throughout the manufacturing process.

The FBE shall comply with Clause 3.1 (b) of SABS 1217.

3.10 Chlorinated rubber

Paints shall consist of a base containing natural rubber plus a polymer of isoprene. Plasticizers shall be inert and without deleterious effect on the coating properties. A stabilizer against UV radiation consisting of organo-tin, epoxy, a lead compound, or other approved material shall be added to the paint. The coating shall be low build, quick drying.

3.11 Coal tar enamels

The paint shall be manufactured in accordance with BS 4164 or AWWA C.203.

3.12 Asphaltic enamels

The paint shall be manufactured in accordance with BS 4147.

3.13 Bituminous paints

The paint shall be manufactured in accordance with BS 4147 or BS 3416 and shall, where applied to valves or specials, be sufficiently hard not to flow on exposure to a temperature of 75ºC.

3.14 Coal tar epoxy

The coating shall consist of an approved high build, type 2 paint conforming to SABS 801.

3.15 Inorganic zinc silicate paints

Zinc-dust paints bound with a silicate binder shall have zinc content of not less than 93% and not more than 95%. The balance shall consist of the binder which shall be either alkali silicate in water or an alkyl silicate in an organic solvent.

3.16 Red iron oxide

Red oxide based on alkyd media and containing an adequate percentage of anti-corrosive pigment such as zinc chromate may be used where low cost primers are permitted.

4. PLANT

4.1 Handling

The plant and equipment used by the Contractor for handling of pipes, valves, pumps and their equipment, during the painting operation shall be such that no pipe shell, valve or pump casings and other pieces of equipment is overstressed during any operations covered by the specification.

4.2 Surface preparation

The Contractor shall provide all the equipment required for grit blasting, preparing and cleaning all surfaces to be painted.

4.3 Painting

The Contractor shall provide all the equipment required for airless spray painting, applying epoxy "hot coats" sintered epoxy powder paint, or any other approved method of applying the paint in the shop, or required for Site painting and repairs to shop applied coats. All facilities and equipment required for inspecting and testing the specified corrosion protection measures shall be supplied by the Contractor.

5. APPLICATION/REQUIREMENTS

5.1 General

a) Workmanship (See Clause 3 of SPEC : AT)

b) All paints applied in the shop shall be applied by means of airless spray machines (with solvent or hot solvent less as applicable), as FBE or as approved. Paintwork carried out on Site shall be to the Engineer's approval. Significant surfaces to be painted shall be those specified in the project specification or shown on the drawings.

c) Colour

Successive undercoats shall have distinctive shades to facilitate full paint coverage of each coat. Unless otherwise specified in the project specification or directed by the Engineer, the final paint coat shall be as given in Appendix B hereof.

d) Bi-metallic corrosion

The use of dissimilar metals in contact shall be avoided where possible but where unavoidable these materials shall be selected so that the natural potential differences between them do not exceed 250 mill volts.

Electroplating or other treatment of contacting surfaces shall be employed as necessary to reduce the potential differences to the specified limits.

All materials and material finishes shall be selected for long life under the site conditions specified.

e) Finishing and painting

Finishing and painting and cleaning up the Site are regarded as inherent parts of the installation. On completion of erection, all pipe work, control gear and indicating gear within the pump house shall be thoroughly cleaned.

After erection paintwork shall be washed down, using nylon brushes and detergent to remove all adhering coating and dirt. It shall then be washed with clean water to remove all traces of detergent and the finishing coat applied as specified.

All surfaces which cannot be painted after erection shall be painted as specified herein before erection. Where two or more coats are specified, the first shall be applied in the shop and the final coat after erection. Prior to application of subsequent coats, the surface shall be roughened and washed in accordance with the manufacturer's instruction.

5.2 Surface preparation

5.2.1 Parent metal to be painted or hot metallic sprayed

5.2.1.1 General

a) All pipes, fittings and specials shall be tested and inspected for compliance with the applicable specifications before any cleaning of the surface

is commenced.

b) All surfaces to be corrosion protected shall have all protrusions, weld spatter, laminations and tool marks ground smooth and all sharp edges and corners radiuses to a minimum of 2 mm.

c) All surfaces to be corrosion protected shall be degreased. (See SPEC LR 5.2.1.1 (c).)

d) All surfaces shall be grit blast cleaned in accordance with Swedish Standard SIS 05/59/00 to at least grade Sa 2½ and shall have a surface anchor profile as follows:

a) All surfaces to be painted or where hot metallic sprays not exceeding 100 micrometers in thickness are to be applied. The anchor profile shall be at least 45 micrometers and shall not exceed 75 micrometers. (Referred to as Class 60 anchor profile - 60 micrometers ± 15 micrometers)

b) All surfaces where hot metallic sprays 150 micrometers and over in thickness are to be applied.
The anchor profile shall be at least 75 micrometers and shall not exceed 125 micrometers. (Referred to as Class 100 anchor profile - 100 micrometers ± 25 micrometers)

5.2.1.2 High quality protection

All steel surfaces to be painted shall be blast cleaned to at least grade Sa 3.

Cast iron surfaces shall be degreased washed and blast cleaned to at least Sa 2½.

All surfaces in the vicinity of machined surfaces which may be damaged by blast cleaning, shall be hand cleaned using appropriate tools such as files, wire brushes, emery cloth, etc. The machined surfaces shall them be protected using suitable metal masks, before proceeding with blast cleaning

as specified above.

After cleaning, all surfaces shall be inspected and all defects shall be filled in by either using approved epoxy filler or by welding as appropriate. The surface shall then be ground smooth where necessary. The entire surface shall be feather blasted and all traces of dirt removed before the protective coating is applied.

5.2.1.3 Manufacturer's standard paint coat on CI

Surfaces shall be cleaned by mechanical means (scraping and wire brushing) to at least grade Sa 2 or blast cleaned to at least grade Sa 1.

5.2.2 Previously painted surfaces within specified over coating time

No specific surface preparation is required other than to ensure that the surface is clean and dry and complies with the conditions of Sub clause 5.4.1.1. hereof. The paint surface to be over coated shall be completely dry before over coating.

5.2.3 Previously painted surfaces outside specified over coating time

Painting shall be done n accordance with the manufacturer's specification but where none exists the following shall apply:

The surface shall be degreased and cleaned. The paintwork shall then be sanded using emery paper and the surface washed with clean water and a bristle brush. All damaged paintwork shall be repaired in accordance with 5.4.5 Subsequent paint coats shall then be applied.

5.2.4 Hot-dip galvanized surfaces

The surface shall be degreased and cleaned using an approved degreasing agent (Oakite 31 or equal) and painted as specified in 5.5.7. Where the surface is to receive an epoxy coating, it shall be feather blasted.

5.2.5 Repairs to previously painted surfaces

All damaged paint areas (if any) shall be treated as specified in 5.4.5.

5.3 Application of coatings.

5.3.1 Metallic general

All surfaces to be metal sprayed, electro plated, and sherardized or painted shall be prepared as specified in 5.2.1.

Surfaces to be hot-dip galvanized shall be prepared in accordance with SABS 763.

Where insufficient cleaning is achieved to ensure an entirely satisfactory coating the procedure specified in 5.2.1.1 (c) shall be adopted.

All materials to be metal coated shall be of the full dimensions shown on the approved drawings or specified and all punching, cutting, drilling, screw tapping and the removal of burrs shall be completed before the metal coating process begins.

5.3.2 Galvanizing

5.3.2.1 Hot-dipping shall be done in accordance with the requirements of SABS 763.

(b) For sections not less than 5 mm in thickness the minimum zinc application rate shall be 610 g/m² (about 85 micrometers thick).
(c) Where blast cleaning of the surface is specified and the steel contains less than 0,3 % of silicon the application rate shall be increased to 1 000 g/m² (about 145 micrometers thick).
(d) For steels containing more than 0,3 % silicon, the application rate shall be further increased to 1 500 g/m² (about 210 micrometers thick).
(e) For pipes of 150 mm ND or less see 5.5.3.
(f) Control panels and other sheet metal components. Parts to be galvanized shall be grit-blasted to at least Sa 2½. Such parts shall be galvanized not more than four hours after commencement of grit-blasting.

All galvanizing shall be done by the hot-dip process in accordance with SABS 763. No alternative process may be used without the approval of the Engineer. No components shall be galvanized which are likely to come into subsequent contact with oil.

All galvanized parts shall be protected from injury to the zinc coating during the periods

of transit, storage and erection. Damaged areas of the coating shall be touched up with an approved zinc-dust paint, as specified in 3.15, or other approved flake metallic compound.

5.3.2.2 Metallic zinc spray coatings shall be a minimum of 100 micrometers thick and up to 350 micrometers thick depending on the service requirements and shall be in accordance with BS 2569. (See 5.2.1.1 (c) for anchor profiles, and 5.3.4 for resin filler coat).

5.3.3 Metallic aluminum spray coatings shall have a coating thickness of between 75 micrometers and shall be in accordance with BS 2569. Apply resin filler cat in accordance with 5.3.4.

5.3.4 Resin fillers.

All metallic sprays are porous and shall therefore be filled with approved resin filler as soon after application of the primary coat as practicable. The filler shall be compatible with the finish coat to be applied.

5.3.5 Inorganic zinc-rich paint (See 3.15)

The paint shall be applied to a thickness of at least 75 micrometers per coat. One or two coats (150 micrometers min) shall be applied depending on the degree of protection specified in the project specification. The surface shall then be treated as specified in 5.3.4.

5.3.6 Electroplating or sherardizing shall be used to coat small parts only. Coating thickness shall be 20 micrometers to 30 micrometers. Sherardized coatings shall be in accordance with BS 4921.

5.3.7 Noble metals. (Nickel and chromium)

The coating thickness shall vary between 25 micrometers and 250 micrometers depending on the service requirements specified in the project specification. These surfaces shall be 100% pinhole-free to prevent local corrosion acceleration of the metal to be protected. Porous surfaces may require an undercoat of copper plate or other approved surface treatment before the noble metal is applied.

Chromium plated parts. Where chromium plating is specified or offered by the manufacturer it shall comply with the requirements of BS 1224 including the following provisions:

a) No blistering of any surfaces will be tolerated.
b) The finished appearance shall be bright.
c) Where the base metal is steel, plating shall be applied in accordance with Table 2.
d) Other base metals shall be plated in accordance with Table 3,4 and 5 as appropriate.
e) For all base metals the service condition number 2 shall be used.

5.4 General requirements for corrosion protection coatings.

5.4.1 Surface condition

5.4.1.1Contamination

All surfaces to be corrosion protected shall be moisture dry and
shall be free of soluble salts and airborne contaminants.
Surfaces shall have received the surface preparation specified herein.

5.4.1.2 Preparation

Refer to 5.2.1.

5.4.2 Primers

Where recommended by the paint manufacturer the first paint coating shall be a primer with the type and dry film thickness as specified by the manufacturer for the paint system being used.

5.4.3 Time period for first paint application and over coating time

The first coat of paint shall be applied within 4 hours of blast cleaning if applied further than 20 km from the sea when the paint is applied within 20km from the sea. When the paint is applied within 20 km of the sea the first coat shall be applied within 2 hours of blast cleaning. The time period between subsequent coats shall be in accordance with the paint manufacturer's recommendations.

Subsequent coats of paint shall not be applied until the last applied coat has dried completely.

Paint surfaces which become streaky because paint has run, will be rejected.

After application of the final cost the paint shall be allowed to harden for at least two weeks.

5.4.4 Surfaces which will become inaccessible

Surfaces which rest on concrete or other floors and areas which will be inaccessible after erection and mating surfaces shall receive the full paint system prior to erection.

5.4.5 Repairs to damaged or defective paintwork

Paintwork damaged in transit or during erection shall be repaired as follows: Should more than 10% of the area of paintwork of any component be damaged the component shall be blast cleaned in accordance with 5.2.1 and the full paint system re-applied. If less than 10% of the area of paintwork of a component is damaged the damaged areas shall be cleaned by grinding, rubbing down with emery cloth and wire brushes to remove all rust. The surrounding paintwork shall be feathered for a distance of at least 25 mm from the damaged area and shall be softened by applying the recommended thinner. All the paint coats shall then be applied to the thicknesses specified and shall overlap the damaged area by at least 25 mm, all strictly in accordance with the manufacturer's instructions.

Touching up of damage to the final paint coat will not be permitted. After repairs to the damage as specified above, the whole component shall be treated as specified in 5.2.3 and then completely repainted in accordance with the specification.

5.4.6 General

In addition to the above all pipe work, specials and fittings shall comply with the relevant Clauses of SABS 1217.

5.5 Requirements for corrosion protection coatings to specific items.

5.5.1 Mild steel items permanently under water

The metal surfaces shall be blast cleaned in accordance with 5.2.1 and in accordance with the project specification shall be painted with one of the following protective coatings:

a) A two pack polyamide cured high build epoxy in accordance with Clause 3.1 (a) type 1A of SABS 1217 shall be applied to a minimum dry film thickness of 250 micrometers. The maximum dry film thickness shall be 350 micrometers.

b) Either a two pack solvent free epoxy "hot-coat" in accordance with Clause 3.1 (a) type 1C of SABS 1217 applied by means of a hot airless machine or FBE as specified in 3.9 to a dry film thickness of 450 micrometers

± 50 micrometers shall be applied. FBE shall be used wherever practicable.

Where pipes are to be joined by means of field welding, the paint coat shall end 50 mm from the pipe end. The uncoated pipe end shall be wrapped with an approved self-adhesive masking tape which shall overlap the paint by at least 50 mm as soon as practicable after the coating process has been completed.

c) Two coats of two-pack zinc silicate based primer applied to a total thickness of not less than 75 micrometers. The first coat shall be of the inorganic type and applied within four hours of blast cleaning. The second coat shall be of the organic type. Touching up of inorganic zinc silicate shall be with a single pack zinc-rich epoxy primer.

It shall then be painted with an approved high build, non-toxic, non-tainting, coal tar/epoxy coating Type 2 conforming to SABS 801, laid on in three coats to a total dry film thickness of not less than 250 micrometers.

Where a period longer than 48 hours has elapsed after application of the second coat, the surface shall be solvent wiped and then lightly abraded with emery cloth before the third coat is applied.
All coats shall be applied in the paint shop.

Painted surfaces shall be protected from exposure to direct sunlight at all times.

5.5.2 Mild steel exposed to various conditions

i) Items above water level, decorative finish.

Except for galvanized items (see 5.5.7) the items shall be blast cleaned in accordance with 5.2.1. The first two paint coats shall be applied in the manufacturer's works as follows:

First coat. Within the period specified in 5.4.3 of blast cleaning, a coat of a vinyl copolymer high-build primer to a minimum dry film thickness of 65 micrometers shall be applied. The maximum dry film thickness shall be 85 micrometers.

Second coat. The minimum time period between the first and second coat shall be 48 hours. The second coat shall be vinyl copolymer high-build intermediate coat to the thickness specified above.

The minimum time period between the application of the second coat and subsequent handling shall be 48 hours. Upon delivery to the Site the paintwork shall be inspected and repaired in accordance with the requirements of this specification.

Third coat. After the steelwork has been erected and other building operations which are likely to damage the paintwork have been completed, the paintwork shall be repaired in accordance with 5.4.5. The coat shall be vinyl copolymer enamel to a minimum and maximum dry film thickness of 40 micrometers and 50 micrometers respectively. Touching up of the final coat will not be permitted. Should damage occur, the paintwork shall be repaired as specified in 5.2.3 and the whole item repainted?

ii MS above ground exposed to normal atmosphere conditions or inside underground chambers

a) The items shall be blast cleaned in accordance with 5.2.1 and two coats of zinc-rich paint as specified in 5.3.5 shall be applied to a dry film thickness of at least 150 micrometers.

b) The item shall then be painted with an approved epoxy tar paint applied in at least two coats to a dry film thickness of at least 200 micrometers, to give a total paint thickness of at least 350 micrometers.

c) Alternatively the item shall be treated as in (a) above and chlorinated rubber as specified in 3.10 applied to the thicknesses specified in (b) above.

d) After the installation and hydraulic testing of the pipe work and after the repair to the painting, if necessary, have been completed, and the paintwork has been washed down in accordance with 5.2.3, one coat of single pack pure acrylic or other approved paint shall be applied with a minimum dry film thickness of 50 micrometers.

iii MS above ground exposed to severe atmospheric conditions.

(a) The pipe shall be treated as specified in (ii) above and then given a double outer wrap of tape as

specified in the project specification.

(b) Alternatively the pipe shall be treated as specified in 5.3.1 and coated with 150 micrometers of metallic zinc spray as specified in 5.3.2.2 and then painted as specified in (ii)(b) or (c) above. Thereafter the pipe shall be tape wrapped as specified in the project specification.

iv MS below ground in non-aggressive soils with adequate bedding material available.

The surface shall be treated as specified in 5.2.1 and painted as follows:

(a) 300 micrometers polyamide as specified in 5.5.1 (a)
(b) 150 micrometers of zinc-rich paint as specified in 5.3.5 followed by at least two coats of coal-tar epoxy as specified in 3.14 to a minimum dry coat thickness of
2 000 micrometers.
(c) 100 micrometers metallic zinc spray as specified in 5.3.2.2 followed by at least three coats of coal-tar epoxy as specified in 5.5.1 (c) to a minimum dry coat thickness of 250 micrometers.

v MS buried in aggressive soils with adequate bedding material available.

(a) The pipe surface shall be treated as specified in 5.2.1 and FBE applied as specified in 5.5.1 (b) to a minimum coat thickness of 450 micrometers.

(b) Alternatively a metallic zinc coat as specified in 5.3.2.2 shall be applied to at least 150 micrometers or as specified in the project specification up to a maximum of 350 micrometers, depending on the degree of protection required. A coal-tar epoxy of enamel (as specified in 3.11) shall thereafter be applied as in iv(c) above.

vi MS buried in areas where suitable bedding material is not available.

The pipe shall be treated as in (v) above and a rock shield shall be added as specified in the project specification.

vii CI buried in aggressive soils.

a) The pipe surface shall be cleaned as specified in 5.2.1 and at least 85 micrometers of metallic zinc spray shall be applied as specified in 5.3.2.2. The overcoat shall consist of either coal-tar epoxy or enamel applied as specified in (iv) (c) above.

5.5.3 Steel pipe work with nominal diameters up to 150 mm.

After cleaning and degreasing as specified in 5.2.4, pipe work shall be galvanized with a heavy duty application of 700 g zinc per square meter, in accordance with SABS 763. In addition, pipe work above ground level shall receive a decorative vinyl copolymer paint coating as specified in 5.5.2.

5.5.4 Internal linings to MS or CI pipes and specials having a ND of 200 mm or larger.

After cleaning as specified in 5.2.1.1, the pipe work shall receive one of the following coatings in accordance with the project specification:

i Polyamide cured epoxy paint with a dry film thickness of 300 micrometers ± 50 micrometers as specified in 5.5.1 (a).

ii Solvent free epoxy "hot coat" to a dry film thickness of 450 micrometers ± 50 micrometers as specified in 5.5.1 (b).

5.5.5 Cast iron valves, fittings and specials.

5.5.5.1 Minimum protection. (Item below ground level).

The metal surface shall e cleaned in accordance with 5.2.1.3 and painted i accordance with the manufacturer's standard protection system.

5.5.5.2 Medium protection.

a) Item below ground level. All surfaces (internal and external) shall be degreased and cleaned in accordance with 5.2.1.1. One coat of self-etch vinyl wash primer to SABS 723 shall be applied and then painted with a two pack polyamide cured high build epoxy to minimum and maximum dry film thicknesses of 200 micrometers and 300

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

micrometers respectively.

b) External faces under cover above ground: Items shall be cleaned as specified in (a) above and painted with a prime coat in accordance with the paint manufacturer's recommendation for a vinyl copolymer paint system. After delivery to site, the prime coating shall be repaired and after erection the item shall be cleaned in accordance with 5.2.3 and painted with one coat of vinyl copolymer paint to a minimum dry film thickness of 65 micrometers. Upon completion of the installation the second coat shall be applied as specified in 5.5.2 (third coat).

5.5.5.3 High degree of protection.

All inside and outside surfaces to be protected shall be cleaned in accordance with 5.2.1.2. Where practicable, all surfaces (except for the flange faces) shall then be given a coat of FBE in accordance with 5.5.1 (b). Where a danger of distortion to machined surfaces exists, a "hot-coat" shall be applied instead of the FBE coat.

Where either of the above systems cannot for one or another reason be applied, the Contractor may with the Engineer's approval apply the system described in 5.5.1 (a).

The paint thickness inside bolt holes shall be reduced to ensure that bolt clearances are not seriously impaired.

The seating area of the flanges shall be given a single coat of an approved zinc-rich primer as specified in 5.3.5.

The above specified painting shall be applied only after the equipment (valve, pump, etc.) Has passed its hydraulic test.

All paintwork that may have been damaged during transit shall be repaired in accordance with 5.4.5.

5.5.6 Pumps, motors and gearboxes.

5.5.6.1 Minimum protection: External coat - Equipment installed

under cover in the dry

The equipment shall be delivered to Site with the manufacturer's standard paint coating, provided that the coatings are compatible with a vinyl copolymer paint system which shall be applied on Site.

On Site, the paint surface shall be cleaned in accordance with 5.2.3 and painted as specified in 5.5.5.2 (b).

5.5.6.2 Pumps.

a) Low degree of protection. This shall be in accordance with the manufacturer's standard paint system.

b) High degree of protection. All surfaces to be protected shall be cleaned in accordance with 5.2.1.2.

Depending on the replacement cost of the pump, paint in accordance with either 5.5.1 (a) or (b) shall be applied. FBE or "hot-coat" as specified in 5.5.1 (b) shall be applied internally to all pumps with a delivery branch of 200 mm dia and larger. Where practicable FBE shall be used.

5.5.7 Hot-dip galvanized items.

When painting of galvanized items is specified, this shall be carried out on site as follows:

a) Surfaces shall be degreased in accordance with 5.2.4.
b) The surface shall be self-etch primed with a primer which is suitable for galvanized surfaces and which is compatible with a vinyl copolymer paint or other paint system specified and/or approved.
c) The surface shall be painted with one coat of vinyl copolymer or other approved paint which shall have a dry film thickness of at least 75 micrometers.

5.5.8 Nuts, bolts and washers.

Carbon steel nuts, bolts and washers shall be galvanized in accordance with 5.3.2.1 with a minimum zinc thickness of 55 micrometers. Nuts shall be tapped after galvanizing and bolts and nuts painted with a self-etching primer after installation.

Thereafter they shall e painted together with the pipe work item.

Where approved, cadmium electroplated or sherardized coatings as specified in 5.3.6 may be used.

In order not to damage the paintwork, washers shall be fitted to both the bolt head and the nut.

5.5.9 Electrical and other control panels inside works.

5.5.9.1 Painting and finishing at place manufacture

All painting material shall be applied in accordance with the paint manufacturer's instructions.

Before any steelwork is painted, the steel shall be thoroughly grit-blasted to at least Sa 3, as specified in 5.2.1.2, and an approved zinc chromate epoxy priming coat applied to a dry film thickness of 35 to 50 micrometers, so that the possibility of rusting or corrosion taking place is minimized. The inside surfaces of any cubicles, cabinets, etc., where condensation is liable to occur, shall be coated with an approved anti-condensation composition. After the priming coat has completely dried (see 5.4.3) the item to be painted shall be given one of the following protective coatings:

a) One epoxy polyester powder coat in accordance with SABS 1274 shall be applied to a dry film thickness of 75 micrometers ± 25 micrometers.

b) Two coats of alkyd baking enamel shall be applied, each coat to a dry film thickness of at lest 35 micrometers to give a total dry film thickness of 70 to 100 micrometers.

The Contractor shall ensure that all component sections of a switchboard wherever manufactured shall have a finish of uniform texture and an exact colour match.

6. TOLERANCES

The maximum and minimum coatings and paint film thicknesses specified are absolute values. No deviation above or below these values will be permitted. Alternatively, the allowable tolerances have been indicated in the relevant paragraph.

7. TESTING AND INSPECTION

7.1 General

The paintwork shall be tested and inspected by an approved independent inspectorate at the relevant stages of the Contract and as specified in Clauses 7 and 8 of SABS 1217.

These stages shall include the following:

a) Grit blasting and surface preparation. Cleanliness not less than Sa 3 and Sa 2½ for steel and CI respectively when tested by SABS test method 767. Surface profile. Use SABS method 772.
b) Application of primers, intermediate and top coats. Surface profile between 45 and 75 or 75 and 125 micrometers when tested by SABS test method 772.
c) Freedom from dust and debris not less than 0,2 % when tested by SABS test method 769.
d) Application of primer.
e) Application of remaining coats at works, holiday and thickness tests. (Use SABS 141).
f) Final finish after installation on Site. Holiday tests.
The Contractor shall make the necessary arrangements for testing with the approved inspection agency, and shall submit all their reports to the Engineer for approval. The Engineer shall be informed when such inspections are to be done and may elect to be present. Final approval of the paintwork will only be given by the Engineer when the works are commissioned.

Testing and inspection agency shall comprise the following minimum recordings:

(a) Inspection of fabrication for sharp edges, etc.,
(b) blast cleaning for compliance with Sa 3 and Sa 2½ for steel and CI respectively,
(c) surface anchor profile,
(d) cleanliness,
(e) paint manufacturer and type of paint applied,
(f) overcoat times,
(g) humidity and temperature,
(h) coat thickness, and
(i) 100 % holiday detection.
(j) Buchholz Indentation Test (Use ISO 2815)
(k) Adhesion (Use SABS 0159)
(l) Impact resistance (Use ASTM G 14)

7.2 Approval/inspection certificate

A copy of the approval/inspection certificate shall be submitted to the Engineer before payment will be certified.

7.3 Independent inspectorate

The Engineer, at his sole discretion, will appoint an independent inspectorate to carry out any tests to verify compliance with the specifications. The independent inspectorate shall have access to all testing facilities and records shall have the same powers as the Engineer for this purpose.

8. MEASUREMENT AND PAYMENT

Payment for corrosion protection and painting will be held to have been included in the tendered rate for the items protected or painted unless a separate item is scheduled, in which case measurement and payment will be by the sum. The tendered sum shall cover the cost of the supply and application of the corrosion protection material and/or paint and for the cost of inspection by an approved independent inspectorate. The Contractor shall provide, at his own cost, all facilities and equipment required for inspecting and testing the specified corrosion protection measures of all items supplied under this Contract, and shall carry out all inspections and tests at his own expense. No separate payment will be made for the site repairs to paintwork, which will be held to be included in the rate for supplying and installing the equipment.

APPENDIX A: APPLICABLE STANDARDS

Reference is made to the latest issues of the following standards:

ASTM G 14	Test method for impact resistance of pipeline coatings
AWWA C 203	Coal-tar enamel protective coatings for steel water pipe
BS 729	Hot-dip galvanized coatings on iron and steel articles
BS 1224	Electroplated coatings of nickel and chromium
BS 2451	Chilled iron shot and grit
BS 2569	Sprayed metal coatings
BS 3416	Black bitumen coating solutions for cold application
BS 4147	Bitumen based hot applied coating material for protecting iron and steel including suitable primers where required
BS 4146	Coal tar based hot applied coating materials for protecting iron and steel, including suitable primers where required
BS 4197	A precision sound level meter
BS 4772	Specification for ductile iron pipes and fittings
BS 4921	Sherardized coatings on iron and steel articles
ISO 2815	Paints and Varnishes - Buchholz Indentation Test
SABS 064	Preparation of steel surfaces for coating
SABS 0129	Plastics tape wrapping of steel pipelines
SABS 141	Glass-reinforced polyester (GRP) laminated products
SABS 0159	Calibration systems
SABS 723	Wash primer (metal etch primer)
SABS 763	Hot-dip (galvanized) zinc coatings (other than on continuously zinc-coated sheet and wire)
SABS 801	Epoxy-tar paints
SABS 926	Two pack zinc-rich epoxy primer
SABS 1091	National colour standards for paint
SABS 1117	Plastics wrapping for the protection of steel pipelines
SABS 1130	Glass fibre reinforcing material for pipe wrapping
SABS 1137	Hot-applied bitumen for steel pipeline protection
SABS 1217	The production of painted and powder-coated steel pipes
SABS 1274	Coatings applied by the powder-coatings process

SABS Test Method 767
SABS Test Method 769
SABS Test Method 772

SIS 05/59/00 Pictorial surface preparation standards for painting steel surfaces

APPENDIX B : RECOMMENDED COLOUR SCHEME

(Code numbers shown in brackets BS 3810 and SABS 1091)

ELECTRICAL ITEMS	COLOUR
Delay and tap change panels	Grey (SABS G29)
Eskom equipment	Grey
Essential supply sections of boards	Orange (BS537)
Temperature monitoring and equipment panels	External: Semi-matt Light orange (SABS B26) Internal: White
Fire CO2 piping	Red (BS 557)
Generator	As supplied by manufacturer
Generator board	Orange (BS 557)
H.V. Switchgear and boards	Grey (SABS G29)
Lift motor room	Grey, as supplied
L.V. switchgear	Light stone (SABS C37)
Name tags	White lettering on black
Outdoor kiosks	Avocado green
Power factor capacitors	As supplied
Transformers	Dark admiralty grey (BS 632)
Transformers yard equipment	As supplied by manufacturer
HAND RAILS	Lemon yellow (or stainless steel) (SABS C54)
MECHANICAL EQUIPMENT	
Couplings and other moving parts)	International orange (SABS A15)
Grease nipples	Fire orange (SABS

	A46)
Guards	Chevron black and fire orange (SABS A46)
Pumps and motors	Arctic blue (BS 112)
Pump and motor bases	Dark admiralty grey (BS 632)
OVERHEAD GANTRY CRANES	
Crane hooks	Chevron black and fire orange (SABS A46)
Crawl beams	International orange (SABS A15)
Gantry cranes	International orange (SABS A15)
Rails	Black
PIPEWORK	
Air mains	White
Aluminum sulphate	Grass green (SABS D14)
Backwash recycle	Cloud grey (SABS F48)
Backwash	Wedgewood (SABS F59)
Chemical mix water	Cornflower (SABS F29)
Chlorine	Yellow (SABS C61)
Cooling water	Green (SABS D2)
Dewatering	Green (SABS D2)
Lime	Light green (SABS C37)
Polyelectrolyte	Pastel green (SABS D65)
Potable water	Blue (BS 166) (SABS F11)

Raw water	Green (SABS D2)
Scour valves	Deep buff (SABS B24)
Service water	Dark blue (SABS F11)
Small bore tubing not listed above	Lemon yellow (SABS C54)
Valves	As for the pipeline
Valve hand wheels: Delivery	Black
Suction	Orange (BS 557)

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SPECIFICATION HT : GENERAL METALWORK.

Clause

11. **TOLERANCES**

12. **TESTING/COMMISSIONING**

7.1 Mild steel

13. **MEASUREMENT AND PAYMENT**

8.1 General
8.2 Steelwork general
8.3 Hand railing
8.4 Ladders
8.5 Prefabricated open and chequer plate covers and flooring

Appendix A: Applicable Standards

SPECIFICATION HT : GENERAL METALWORK.

3. SCOPE

This specification covers the requirements for the supply, detailing, fabrication, delivery, erection, testing and maintenance of all structural steelwork and aluminum in the Contract.

4. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specification

Where this specification is required for a project, the following specifications shall, inter alia, form part of the contract document:

(g)	Project Specification;	
(h)	SPEC AT	: GENERAL
(i)	SPEC HP	: CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES
(a)	SPEC LM	: MEDIUM-PRESSURE PIPEWORK, VALVES, ETC.

2.2 Application

This specification contains clauses that are generally applicable to mechanical engineering construction. Interpretation of and modifications to this specifications are set out in Portion 2 of the project specification which precedes this specification in a contract document.

2.3 Definitions and abbreviations

For the purpose of this specification, the definitions and abbreviations given in the specifications listed in 2.1.1 (b) and (c) shall apply.

4. DESIGN, MATERIALS AND MANUFACTURE.

3.1 Materials

3.1.1 General

Unless otherwise shown on the drawings or scheduled, all structural steelwork shall be fabricated from mild steel sections, and all jointing and fixing bolts shall be supplied by the Contractor.

3.1.2 Mild steel

All structural steelwork shall comply with the requirements of BS 4360, and shall be legibly marked with the maker's name or trade mark and identification marks. The grade of steel used for trusses, bridges and ancillary structures shall be 43A.

The country of origin of the steel and the maker's name shall be stated in tendering if the steel offered is not produced in the Republic of South Africa.

3.1.3 Aluminum

All aluminum sheeting shall be Grade M57S material anodized for coastal areas. Structural sections, bolts and nuts, shall be Grade D65S.

3.1.4 Stainless steel

All stainless steel items shall be Grade 316 material.

3.1.5 Electrodes

Electrodes shall comply with the requirements of BS 639.

3.1.6 Bolts and nuts

Bolts and nuts in their respective sizes shall comply with BS 4190. Bolts shall be of Grade 4.6 and nuts of Grade 4 with threads of the "coarse pitch series".

All nuts and bolts shall be coated in accordance with BS 729 "Hot-dip galvanized coatings" or BS 4921 "Sherardized coatings".

Washers shall be provided at each nut and generally shall comply with BS 4320 of "normal" diameter, and shall be coated to match the bolt and nut. Single coil square section spring washers - Metric series (Type A) complying with BS 4464 shall be fitted to all nuts subject to vibration.

High strength friction grip bolts, if used, 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.

3.2 Manufacture

3.2.1 General

The steelwork shall be constructed, fabricated and erected in accordance with SABS Standard Building Regulations, Chap.6, "Structural Steelwork", and with Part 2 of BS 449 and in accordance with details shown on the drawings.

The Contractor shall prepare his own shop details and other necessary drawings which shall be submitted in duplicate to the Engineer for approval. The Contractor shall include with his shop detail drawings full details as to which of the welding procedures, outlined in Clause 23 of BS 5135 he proposes to adopt. Should these details, in the opinion of the Engineer, be insufficient or unsatisfactory, revised details shall be prepared and submitted for approval. One copy of the drawing will be retained by the Engineer's comments or written approval as the case may be.

Details are to be submitted at least one month before approval is required and no work is to be put in hand before such approval is obtained.

The Contractor shall be responsible for all dimensions and details in his working drawings and for the perfect fitting of all material supplied, and he shall replace at his own cost any material which does not fit properly into position.

The checking of detail and working drawings by the Engineer shall not absolve the Contractor in any way from inaccuracies of fitting.

3.2.2 Handrails, ladders, prefabricated flooring and the like

3.2.2.1Handrails

Handrails shall be manufactured from steel tubing not less than
34 mm outside diameter for the two rails, and from tube 2,65 mm thick and not less than 42 mm outside diameter for the performed one piece stanchions. The bases of the stanchions shall be performed for platform or side and for horizontal op sloped mounting on concrete or steel. The stanchion spheres shall be performed to suit right angled or other angled intersections all as indicated on the general arrangement drawings. Stanchions shall be spaced at intervals not exceeding 2,0 m and all handrails shall be supplied complete with fixing
bolts, nuts, etc.

Where "heavy duty" stanchions are scheduled, they shall be manufactured from tube 3,24 mm thick and be not less than 48 mm in outside diameter.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

All tubing and stanchions shall be galvanized before erection and all joints shall be welded after erection of handrails. Welded joints shall be repaired with "Metalgalv" or equal as specified in Sub clause 5.3.2 of SPEC HP.

The Contractor shall set and grout in fixing bolts.

3.2.2.2 Ladders

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

The galvanizing at site welds and/or joints shall be repaired with "Metalgalv" or equal as specified in Sub clause 5.3.2 of SPEC HP.

All ladders shall be supplied complete with all necessary bolts, nuts and washers for fixing.

3.2.2.3 Prefabricated open and chequer plate covers

Open grid steel covers and floor panels shall be pressure locked and welded as "Maclock" type "Eggcrate" or similar approved, and together with frames shall be hot-dip galvanized to SABS 763 after manufacture. All span bars shall have a depth of 40 mm and be of such a width and at such spacing that the maximum deflection of any bar under a 10 kN/m² uniformly distributed load shall not exceed 1:360 of the clear span.

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

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

The galvanized steel flooring shall be fully washed and cleaned as specified in Sub clause 5.2.4 of SPEC HP and when dry shall receive one coat of epoxy tar compound to a dry film thickness of 100 micrometers.

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

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

3.2.3 Welding

All welding of steelwork shall be carried out in accordance with BS 5135. The Contractor shall submit with his shop drawings full details of welding procedures as outlined in Clause 23 of BS 5135. Unless otherwise approved, no longitudinal or overhead welding shall be carried out on Site. Site welding must be the minimum possible. Welders undertaking manual welding of permanent steelwork shall be experienced competent artisans meeting the requirements of BS 4872.

3.2.4 Painting/Protection coating

3.2.4.1General and surface preparation

The provisions of Sub clause 5.4.1 and 5.4.2 of SPEC HP shall apply.

3.2.4.2Painting of mild steel un-galvanized items

The provisions of Sub clause 5.4.2, 5.4.3 and 5.5.2 of SPEC HP shall apply.

3.2.4.3Painting of galvanized mild steel items

The provisions of Sub clause 5.2.4 and 5.5.7 of SPEC HP shall apply.
All galvanized items which are intermittently or permanently in contact with sewage shall be feather blasted after galvanizing.
The surface shall be moisture-free and free of soluble salts and airborne contaminants, and shall be painted with a twin pack
polyamide-cured high build epoxy coating, as specified in Sub clause 5.5.1 of SPEC HP.

3.2.4.4Cast iron items

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

Cast iron items to be cast into concrete shall be degreased using "Oakite 31" and nylon brushes.

Cast iron items which are intermittently or permanently in

contact with sewage shall be blast cleaned and painted with a twin pack polyamide-cured high build epoxy coating, all as specified in Sub clause 5.5.5.2 of SPEC HP.

Cast iron items which are exposed, but not in contact with sewage, shall be wire bush cleaned and degreased. The surface shall be painted with one coat of aluminum barrier coating and finished with universal enamel to give a dry coat thickness of at least 110 micrometers.

3.2.4.5 Testing and inspection of corrosion protection

The provision of Clause 7 of SPEC HP shall apply.

3.2.4.6 Repairs to paint

The provision of Sub clause 5.4.5 of SPEC HP shall apply.

5. PLANT

5.1 General

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

6. INSTALLATION AND OPERATING REQUIREMENTS

The general requirements of Sub clause 5.5 of SPEC AT, where relevant, shall apply.

7. TOLERANCES

Unless otherwise specified in the Project Specification, the terms of Clause 6 of SPEC LM shall apply, where relevant.

8. TESTING/COMMISSIONING

7.1 Mild steel

The steel shall be tested in accordance with the relevant clauses of BS 4360 Part 1, at the Contractor's expense.

9. MEASUREMENT AND PAYMENT

8.1 General

The prices tendered for the steel items will be held to include for the cost of protective coatings as specified, unless a separate item is provided in the Schedule of Quantities.

8.2 Steelwork general

Unless otherwise scheduled, steelwork will be measured by mass of the steelwork as erected, excluding wastage and fastenings.

The rate shall cover the cost of the supply, testing, fabrication, delivery and erection of the steelwork, together with all operations specified in all sub clauses of 3.2 and also for the supply and fixing of all anchor/holding down bolts, bolts, nuts, washers and plates.

Where erection of steelwork on Site is measured separately as a lump sum, the sum shall cover the cost of taking delivery on Site, erection, making good and site paintwork and fixing anchor/holding down bolts, etc.

8.3 Hand railing

Hand railings will be measured by the length of the complete balustrading including top rail, middle rail and stanchions. The rate shall cover the cost of all materials and fastening supplied, for welding, erection and protective coatings.

8.4 Ladders

Ladders will be measured by number of specified length. The rate shall cover the cost of all materials and fastening supplied, for welding, erection and protective coatings.

8.5 Prefabricated open and chequer plate covers and flooring

The open grid or chequer-plate flooring covers or panels will be measured by area. The rates shall cover the cost of all cutting and welding, etc., at the factory - prior to galvanizing if applicable - and the cost of any protective coatings.

The framing will be measured by length of the edge. The rate shall cover the cost of the supply and fixing complete including all cement mortar and bolts which may be required to secure the frame.

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APPENDIX A: APPLICABLE STANDARDS

BS 449 Specification for the use of structural steel in building.
BS 639 Covered electrodes for the manual metal-arc welding of carbon and carbon-manganese steels.
BS 729 Specification for hot-dip galvanized coatings on iron and steel articles.
BS 3139 High strength friction grip bolts for structural engineering.
BS 3294 The use of high strength friction grip bolts in structural steelwork: Part 1: General grade bolts.
BS 4190 Specification for ISO metric black hexagon bolts, screws and nuts.
BS 4320 Specification for metal washers for general engineering purposes. Metric series.
BS 4360 Specification for weldable structural steels.
BS 4464 Specification for spring washers for general engineering and automobile purposes. Metric series.
BS 4604 The use of high strength friction grip bolts in structural steelwork (metric series).
BS 4872 TIG or MIG welding of aluminum and its alloys.
BS 4921 Specification for Sheradized coatings on iron and steel articles.
BS 5135 Specification for arc welding of carbon and carbon manganese steels.

SABS 763 Hop-dip (galvanized) zinc coatings (other than continuously zinc-coated sheet and wire).

SPECIFICATION LM : MEDIUM-PRESSURE PIPEWORK, VALVES, ETC.

CONTENTS

Clause

3.7 Valves
- 3.7.1 Gate valves
- 3.7.2 Butterfly valves
- 3.7.3 Check valves
- 3.7.4 Air valves for water
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3.8 Corrosion protection

- 3.8.1 Pipework, specials, valves and pumps
- 3.8.2 Against damage during transit to the work site
- 3.8.3 Protection against electrolytic corrosion
- 3.8.4 Flexible couplings
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- 3.8.7 welded joints

14. **PLANT**

4.1 Setting out
4.2 Temporary supports
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5.1 Installation and lying

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- 5.1.3 Damage
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- 5.2.1 Flanges (steel pipelines)
- 5.2.2 Welding (steel pipelines)
- 5.2.3 Detachable couplings (AC, PVC and steel pipelines)
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18. **MEASUREMENT AND PAYMENT**

8.1 Scheduled items

8.1.1 Supply and install complete suction and delivery pipework, valves, etc.
8.1.2 Extra-over 8.1.1 for excavation for bell-holes in rock
8.1.3 Extra-over 8.1.1 for encasing joints
8.1.4 Temporary valves, etc.
8.1.5 Special wrapping in corrosive soil
8.1.6 Cold bending of pipes

SPECIFICATION LM : MEDIUM-PRESSURE PIPEWORK, VALVES, ETC.

5. SCOPE

This specification covers the supply and installation of pipe work of diameter up to 1500 mm, for transporting water and sewage under working pressures of up to 2,5 MPa inside pump stations, treatment works and the like.

6. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specification

Where this specification is required for a project, the following specifications shall, inter alia, form part of the contract document :

(j)	Project Specification;	
(k)	SPEC AT	:GENERAL
(l)	SPEC HP	:CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES
(a)	SPEC MV	:MEASURING AND RECORDING INSTRUMENTS (if applicable)

In addition, SABS 1200 DB, SABS 1200 G or SABS 1200 GA and SABS 1200 LB may be required for the project.

2.2 Application

This specification contains clauses that are generally applicable to mechanical engineering construction. Interpretation of and modifications to this specifications are set out in Portion 2 of the project specification which precedes this specification in a contract document.

2.3 Definitions

For the purpose of this specification, the definitions and abbreviations given in the specifications listed in 2.1.1 (b) and (c) and 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 are process welding. (MSEAP) Electric are 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 lint 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 more commonly mean devices for cleaning the pipeline after operations are in progress, primarily 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 the weld.

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).

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.

2.4 Additional abbreviations

The following abbreviations (additional to those referred to in 2.3 shall have the meanings given:

AC	:	Asbestos cement
CI	:	Cast iron
FC	:	Fibre cement
Sa	:	Followed by a number refers to the relevant parts of Swedish Standards SIS 05 59 00.
pe	:	Plain-ended.
CID	:	Constant internal diameter
COD	:	Constant outside diameter
IRHD	:	International rubber hardness degrees
ND	:	Nominal diameter, which shall mean minimum inside diameter of the pipe as scheduled for all pipes over 150 mm ND.
NP	:	Nominal working pressure
OD	:	Outside diameter, which shall mean ND + 2 (lining thickness + pipe wall thickness) or as specified in the project specification
PTFE	:	Polytetrafluoro ethylene
PVC	:	Polyvinyl chloride
uPVC	:	Unplasticized polyvinyl chloride

3. DESIGN, MATERIALS AND MANUFACTURE

3.1 General

Pipes and fittings shall be of the types shown on drawings or scheduled and, unless otherwise required in terms of the project specification, they and their couplings shall be capable of withstanding the applicable test pressure specified in 7.3.1. All pipes and fittings shall be supplied complete with couplings and jointing material.

Satisfactory temporary end covers shall be provided for the protection of flanges, prepared ends of plain-ended pipes and fittings, and threads, and to prevent damage to the internal lining during transportation and during handling on Site.

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 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.

The 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 manifold 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.

3.2 Steel pipes, fittings and specials

3.2.1 General

Unless otherwise scheduled or shown on the drawings, pipes, etc., shall be manufactured from grade A steel plate complying with SABS 719. The manufacturer shall submit to the Engineer the steel maker's certificate covering all steel used in the manufacture f the pipes, etc., as required in Clause 34 of SABS 719.

Welding shall be in accordance with API Std. 1104. (See 5.2.2) or SABS 044 Part V as applicable.

3.2.2 Qualified welders

Only qualified welders, certified as having passes the qualification tests as specified in Clause 3.0 to 3.7 inclusive, of API Std. 1104, shall be used to do all welding required. Copies of the certificates shall be made available to the Engineer.

3.2.3 Welding and inspection

Welding and inspection of welds shall be in accordance with Clauses

4.0 to 7.4 inclusive of API Std. 1104. Where radiographic inspection is specified in the project specification, the procedure followed shall be in accordance with Clause 8.0 of API Std. 1104. Only qualified radiographers as specified in 8.2.2 of API Std. 1104 shall be employed to do the radiography.

3.2.4 Pipes of nominal diameter up to 150 mm unless otherwise scheduled or shown on the drawings, steel pipes and fittings of ND up to 150 mm shall be of medium class and screwed, and shall comply with the applicable requirements of SABS 62.

3.2.5 Pipes of ND over 150 mm 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**	
mm	**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	5,9	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	812,2	845,0
900	8,0	10,0	914,4	945,0
1 000	10,0	12,0	1 016,0	1 050,0
1 200	10,0	12,0	1 220,0	1 255,0
1 400	12,0	12,0	1 420,0	1 460,0
1 600	14,0	14,0	1 620,0	1 665,0

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.

3.2.6 Specials

Specials 150 mm nominal diameter and smaller shall comply with BS 1387.

Specials larger than 150 mm nominal diameter shall be manufactured from pipes complying with 3.2.5 above, except that helically welded pipes shall not be used. 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.

The ends of plain ended specials shall be fitted with 150 mm wide mild steel collars and, unless otherwise specified in the project specification, machined to the OD of Class 18 AC pipes of the ND specified, after application of the specified protective coating.

3.2.7 Pipe ends

The ends of p.e. pipes without collars as specified in 3.2.6 shall be rounded to within the tolerances specified in CL. 15 of BS 534. The external weld shall be ground flush with the pipe surface for a minimum distance of 250 mm from the pipe end.

3.3 AC (FC) pipes and specials

AC pipes shall comply with the requirements of SABS 1223. COD pipes shall be used for all sizes up to and including 200 mm diameter unless otherwise scheduled or shown on the drawings. AC pipes shall be bitumen-dipped if so required in terms of the project specification (see 3.6.1 for jointing).

Specials for use with an AC pipeline, whether of AC, CI, or steel, shall be rated at not less than the pressure rating of the pipeline.

3.4 CI pipes, fittings and specials

CI pipes and flanged fittings shall comply with the applicable requirements of
BS 2035.
CI fittings, and special fittings for use with AC pipes, shall comply with the applicable requirements of SABS 546.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

3.5 uPVC pipes

uPVC pipes and fittings shall be fitted with spigot and socket rubber ring joints and shall comply with the relevant requirements of SABS 966.

3.6 Jointing

3.6.1 Flexible couplings

Except where otherwise scheduled, flexible couplings for plain-ended steel pipe and adaptor couplings shall be of the slip-on type complying with the relevant requirements of BS 534 or of the slip-on type without centre register conforming to Drawing 2014 CT 124.

A coupling shall be able to withstand, without any sign of failure, 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, without any sign of damage, all stresses caused by proper tightening of the bolts. Rubber rings shall comply with the relevant requirements of SABS 974: Part I shall have a hardness of 66-75 IRHD.

All grinding off of welds shall conform accurately with the profile of the rolled section, and so that no flats occur on surfaces that are supposed to be curved. The centre register (where present) shall be ground off on either side of the weld in such a manner that all sharp edges which would result in weakening of the protective coating are removed. Flexible couplings shall be supplied complete with all necessary bolts, nuts and rubber jointing rings.

3.6.2 Flanges

The drilling of steel and Ci flanges shall conform to the requirements of SABS 1123 or BS 4504 : Part 1, as applicable, appropriate to the class of pipe specified, except that

1. in the case of flanges for hydrant and air valve matching tees, the drilling shall conform to the drilling of the valve supplied, and
2. in the case of flanges, where M27 and M33 bolts are specified in BS 4504 : Part 1, M24 and M30 bolts respectively shall be used as specified in SABS 1123.

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 SABS 1123, or as specified in 3.6.4.

Flanges for nominal pipe diameters greater than 1 000 mm shall have raised faces.

Where the working pressure exceeds 1,6 MPa, and for all diameters of 400 mm 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.

3.6.3 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 SABS 1123 (see also 3.6.4). Any item of pipe work that is found to have flanges that are incorrectly drilled will be rejected.

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

3.6.4 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 1,5 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.

Where flanges have not been machined in accordance with DIN 2514 spiral wound gaskets, style CG to BS 3381 shall be used. The external ring shall be made of carbon steel and electro plated. The metal windings shall consist of 316 L stainless steel with asbestos filler.

3.6.5 Bolts and nuts

Bolts and nuts shall comply with the relevant requirements of SABS 135 or SABS 136, or where high strength friction grips are specified in the project specification, or are considered necessary by the Contractor, 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 in accordance with Sub clause 5.5.8 of SPEC HP.

3.6.6 Screw-ended pipes

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

3.6.7 AC pipes

AC pipes shall be jointed to each other by means of AC 3-ring sleeve-type couplings complying with the relevant requirements of BS 486. Unless otherwise scheduled or shown on the drawings, AC pipes shall be jointed to valves with standard CI short collar or "Reef" detachable couplings.

3.6.8 Spigot specials

Each spigot 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.

3.6.9 Spigot and socket pipes

Spigot and socket pipes shall be provided with rubber or neoprene sealing rings for forming flexible couplings or, where so scheduled or shown on the drawings, caulking materials shall be provided.

3.6.10 Welding electrodes

The Contractor shall supply all the necessary welding electrodes, which shall be of the shielded type. Electrodes that show signs of deterioration or damage shall be removed from Site and replaced at the Contractor's expense. Electrodes shall comply with the requirements of BS 639.

3.7 Valves

All valves shall be hydraulically tested in accordance with 7.3.1.6.

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

3.7.1 Gate valves

Gate valves shall comply with the following as applicable:

(a) for working pressures up to 1,6 MPa and of diameter over 50 mm but not exceeding 600 mm shall be of cast iron and shall comply with the relevant requirements of SABS 664:
(b) for working pressures over 1,0 MPa and of diameter exceeding 600 mm shall be of cast steel and shall comply with the material and construction requirements of SABS 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 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 diameter 250 mm and under, and all valves of diameter 300 mm 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 in accordance with BS 1400 (zinc-free bronze), 304 stainless steel or as approved.

(i) Alternatively resilient seal valves (RSV) may be offered unless excluded in the project specification.

The gate of the RSV shall be completely covered by natural or an approved neoprene rubber:

(k) (i) the gland packing shall be lubricated and graphite cotton packing provided in accordance with the requirements of BS 437 Type A;
(ii) 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 as specified in 3.6.2;
(n) the electrically-operated actuator, where specified in the project specification, shall comply with 3.7.2 (m) to (p) inclusive.

3.7.2 Butterfly valves

Butterfly valves for working pressures up to 2,5 MPa shall comply with (a)-(p) below. For working pressures exceeding 2,5 MPa they shall comply with the requirements of the project specification.

(a) They shall comply with the relevant requirements of BS 5155 and (b)-(p) below;
(b) be manufactured from materials as specified in Table 3 of BS 5155;
(c) be suitable for connecting to pipe flanges by individual bolting;
(d) have a replaceable stainless steel or zinc-free, phosphor bronze (both of an approved quality) seat mechanically fixed to the body and resilient rubber or neoprene seal, replaceable and adjustable on Site, mechanically fixed to the edge of the disc;
(e) the seal retaining rings and screws shall be of an approved stainless steel or zinc-free phosphor bronze;
(f) the main shaft shall be offset from the centerline of the disc so as not to pass through the seal;
(g) the valve shall 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;
(h) the body ends shall be flanged and drilled in accordance with 3.6.2 and off-centerline;
(i) be clockwise closing;
(j) be for installation with the main shaft horizontal;
(k) the operating shafts shall be vertical;
(l) the valve design shall be 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 hand wheel 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;

(m) the actuator shall not be an integral part of the main body but shall be 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;

(n) the hand wheel shall be fitted horizontally at a height that provides for reasonable operation under the conditions shown on the drawings;

(o) its protection against corrosion shall comply with the requirements of 3.8;

(p) the actuator supplied shall 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

(q) 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.

3.7.3 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 valves shall be double flanged for horizontal or vertical mounting, of robust construction, suitable for the operating head and close drop tight. Access to the moving parts shall be possible without removing the valve from the line. In addition it shall have:

(a) the body, cover and door shall be of close-grained cast iron;

(b) the door shall be fitted with a zinc-free phosphor-bronze face closing on a corresponding bronze face in the body;

(c) 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;

(d) in the case of water type spring check valves, either stainless steel or carbon steel discs and resilient seats, and

(e) the valve bodies shall be manufactured of the materials specified, and tested in accordance with 7.3.1.6.

3.7.4 Air valves for water

(a) Air valves for water of the types, pattern and ball and inlet diameters for the following ranges of working pressure are covered by this specification:

Type	Pattern	Ball Diameter mm	Max. Working Pressure MPa
Single small orifice	float	50	0,68
Single small orifice	float	80	1,6
Single small and large orifice	float	100-200	4,0
Single small orifice lever		100-200	4,0
Double orifice	2 floats(or multiple)	100-200	4,0
Double orifice 1 lever (or multiple)	1 float (or 1 lever balancefloat)		100-2004,0

(b) The body for all types of air valves shall be:

(i) for working pressures up to 2,5 MPa, cast iron that conforms with the relevant clauses of BS 1452 for Grade 220, and
(ii) for working pressures exceeding 2,5 MPa, cast steel.

(c) the balls and seating shall be manufactured from materials used in the manner specified in the project specification.

(d) Each air valve shall be supplied with:

(i) a bronze isolation cock, (for 25 mm ND valves only), and
(ii) an isolating gate valve as specified in 3.7.1, 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.

(e) 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.

(f) 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.

(g) Double and multiple 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. The small orifice shall be of the lever type as specified in (f) above.

3.7.5 Air valves for sewer rising main

(a) All materials used in the manufacture of the valve shall be so compatible as to reduce corrosion and electrolytic action to a minimum (See Cl. 5.1 (c) of SPEC HP);
(b) They shall be constructed of close-grained cast iron;
(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) Operating mechanisms shall be of high quality stainless steel;
(g) the large and small orifice sealing components shall be manufactured of vulcanite and polyurethane elastomer, or such other materials as are specified in the project specification or are approved;
(h) The seat profiles of the large and small orifices shall be such that the valves are gas-tight at atmospheric pressure;
(i) the valve seats shall be readily accessible for cleaning and inspection on removal of the cover bolts;
(j) The head casting shall be specially strengthened and dimensioned to receive a vertical vent pipe, if required subsequently;
(k) The operation of the valve shall be such that the sewage never comes into contact with the balls or valve seats. To achieve this, a large stainless steel float shall be fitted with a rod which is suitably sleeved into the body of the valve. When the air is expelled and the level rises in the float chamber, the rod shall push the ball upwards until it seats firmly in the large orifice. As gas and air accumulates in the valve body and depresses the water level and consequently allows the float to drop, the small orifice shall come into operation to release the air pressure in the valve body;
(l) The stainless steel float shall be shaped to allow a substantial margin of stability in the handling of exhaust gases. Comprehensive back-washing facilities shall be provided for all sealing surfaces of the operating mechanism. Facilities shall also be provided for complete flushing of the air chamber and passageways by high pressure sprays of water; and
(m) Each air valve shall be provided with an isolating valve of the type specified in the project specification.

3.7.6 Pressure gauges

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

These gauges shall be in accordance with Subclause 3.5 of SPEC MV and/or as specified in the Project Specification.

3.8 Corrosion protection

3.8.1 Pipework, 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 following clauses of SPEC HP:

(a) Pipework and specials.

(i) Steel: in accordance with 5.5.1 to 5.5.4 inclusive
(ii) Spun iron: in accordance with 5.5.2 (vii) and 5.5.4, with coal-tar enamel to a minimum dry film thickness of 50 micrometers.

(b) Valves. In accordance with 5.5.5
(c) Pumps. In accordance with 5.5.6.2
(d) Electric motors and gearboxes. In accordance with 5.5.6.1
(e) Hot dipped galvanized items. In accordance with 5.5.7
(f) On arrival on Site and both before and after erection all items of steelwork and cast-iron shall be examined for damage to the paintwork, which shall, in accordance with the relevant clauses of SPEC HP, be repaired as soon as practicable.

3.8.2 Against damage during transit to the work site

The ends of the pipework and body ends of valves shall be sealed and the jointing surfaces protected before dispatch to the Site.

3.8.3 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, all as specified in Cl. 5.3.9 of SPEC HP, or other approved insulating material, shall be applied in addition to, or instead of, any of the protective coatings specified in 3.8.1 as and where required in terms of the project specification.

3.8.4 Flexible couplings

Flexible couplings for steel pipes shall be thoroughly cleaned and then treated as specified in Cl. 5.5.1 (b) of SPEC HP and in the project specification.

3.8.5 Bolts, etc

Mild steel bolts, nuts and washers for joints shall be thoroughly

cleaned and hot-dip bitumen coated where the joint is buried, and hot-dip galvanized in accordance with Cl. 5.5.8 of SPEC HP, unless another means of corrosion protection is specified in the project specification.

3.8.6 Corrosive soil

Where scheduled or ordered, steel or cast iron fittings and joints that are to be subjected to corrosive soil conditions shall be wrapped with an approved plastic tape, in accordance with Cl. 5.3.9.4 of SPEC HP, or protected with other scheduled or approved materials.

3.8.7 Welded joints

The joint shall be protected in accordance with Cl. 5.3.9.3 and where applicable Cl. 5.6.4, both of SPEC HP, and as detailed in the project specification.

4. PLANT

4.1 Setting out

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

4.2 Temporary supports

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

4.3 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.

4.4 Testing

The Contractor shall provide the pump, pressure gauges, calibrated storage tank, and the necessary tools and fittings required for the performance of the tests given in Clause 7.

4.5 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.

5. INSTALLATION AND OPERATING REQUIREMENTS

5.1 Installation and laying

5.1.1 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.

5.1.2 Outside structures

5.1.2.1 General

Pipes outside structures shall be laid to even grades and with a cover of 1,0 m 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 (and should generally be less) than the deflection recommended by the manufacturer of the pipe (e.g. the deflection shall not exceed 1,5 % per joint in the case of AC pipes).
Where site welding of joints is approved (See 5.2.2) 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.

5.1.2.2 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.

5.1.3 Damage

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

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5.1.4 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 recommended. All pipes shall be swabbed as work proceeds.

5.2 Jointing

5.2.1 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 joining (epoxy paint need not be removed). Insertion pieces shall comply with the applicable requirements of 3.6.4 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 external coatings are restored so that they comply in all respects with the specification for such coating and are soundly bonded to the existing coatings. All pipes and specials, whether flanged or not, shall be supplied complete with all jointing materials, bolts and nts necessary to

make and complete all joints.

5.2.2 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:

(a) One seam for pipes up to 1 000 mm ND.
(b) Two seams for pipes over 1 000 mm ND and up to 2 000 mm ND.

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 and shall be carried out by welders who are qualified in terms of the procedure approval test given in 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 approval 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 line-up 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 option of the Engineer, roll welding will be permitted provided proper arrangements are made to maintain the alignment between adjacent pipes being welded.

Where spigotted and socketed joints are approval, 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 ± 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 ± 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 (90º) 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 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. (See 7.2.1)

5.2.3 Detachable couplings (AC, PVC 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 couplings and rubber seal rings of AC pipes. Polyurethane joints for PVC 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 pipe joints. uPVC and AC 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.

5.2.4 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 450 mm ND and larger to facilitate handling and minimise 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 meters of a maximum of 22,5º or hot bent) and all reducers (or expanders) shall have a maximum angle of divergence of 10º.

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.

5.3 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.

6. TOLERANCES

6.1 General

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

6.2 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.

6.3 Alignment (plan and level)

Unless otherwise directed, the permissible deviation in alignment between control points (see 6.2) from a straight line joining the control points, when measured on the top centre of the pipeline, shall be ± 5 mm.

7. TESTING/COMMISSIONING

7.1 General

The pipe work valves and specials shall be tested by means of test equipment supplied by the Contractor (see 4.4)

In the case of steel pipelines butt-welded or fillet-welded in the field, joints shall be tested in accordance with 7.2 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 in this connection (see 8.1.1). When carrying out the hydraulic test (see 7.3), 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 leakage rate given in 7.3.3, 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.

7.2 Initial tests on welded steel pipes

7.2.1 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 surfaces 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. 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 50ºC 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 16ºC or above 52ºC.

(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 min and not more than 60 min 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.

7.2.2 Radiographic examination

Joints shall be examined radiographically as and to the extent set out in the project specification (see 5.2.2).

7.3 Standard hydraulic pipe test

7.3.1 Test pressure and time of test

7.3.1.1 Unless otherwise ordered, hydraulic field testing shall be commenced only after permanent anchor blocks have attained specified strength or after 28 d, 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 in 7.3.1.2 appropriate to the type and, when relevant, class of pipe in the pipeline under test.

7.3.1.2 Subject to the provisions of 7.3.1.3 and 7.3.1.4 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.

7.3.1.3 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.

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

Type of pipe Specification Test pressure expressed as % No of the specified hydraulic test pressure
Mild steel SABS 719 50 % (3,5 MPa max.) Cast iron BS 2035 67 % (or works test pressure)
Asbestos cement (COD) SABS 1223 75 % of the test pressure for permeability Test
Black polyethylene SABS 533 100 % uPVC SABS 966 75 %

7.3.1.5 Where circumstances permit, in the case of asbestos cement pipes and cement mortar lined steel pipes, the pipe work shall be filled at least 24 h 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.

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

7.3.2 Visible leaks

7.3.2.1 Except as allowed in 7.3.2.2, the test pressure specified in 7.3.1.2 shall be maintained for a period of at least 3 h (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

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

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 replace, at the expense of the Contractor, and such replacement material shall, after installation, be tested at the expense of the Contractor.

7.3.2.2 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 h.

7.3.3 Permissible leakage rates

The test pressure shall be maintained for a further period of 1 h after the completion of the procedure given in 7.3.2, 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 litres, calculated from the applicable of the following formulas:

(a) Jointed pipes in steel, cast iron, black polythene and uPVC:

0,01 x diameter of pipe in millimetres
x length of test section in kilometres
x square root of the test pressure in megapascals

(b) Asbestos 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

8. MEASUREMENT AND PAYMENT

8.1 Scheduled items

8.1.1 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 in 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.

8.1.2 Extra-over 8.1.1 for excavation for bell-holes in rock .....Unit: m^3

No additional payment will be made for bell-holes (refer 5.1.2.1), except where hard rock is encountered in the trench, in which case an extra over payment on trench excavation will be made for rock.

8.1.3 Extra-over 8.1.1 for encasing joints .....Unit: No.

Where wrapping or protection of joints, etc. in terms of 3.7.3 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.

8.1.4 Temporary valves, etc. .....Unit: No or Sum

Payment for the supply or loan of temporary valves, and caps, blank flanges, or other isolating devices ordered by the Engineer in terms of 7.3.1.1 will be made at day work rates or at a price to be agreed by the Engineer, unless the method of payment for the work has been dealt with in the project specification and a suitable item included in the schedule.

8.1.5 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.

8.1.6 Cold bending of pipes

An extra over payment on the sum tendered in 8.1.1 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.
Payments will be made at day work rates or at a price agreed by the Engineer.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

APPENDIX A. APPLICABLE STANDARDS

Reference is made to the latest issues of the following standards:

BS 534 Steel pipes and specials for water and sewage
639 Covered electrodes for the manual metal-arc welding of carbon and carbon-manganese steels
1387 Steel tubes and tubulars suitable for screwing to BS21 pipe threads
1400 Copper alloy ingots and copper and copper alloy castings
1452 Grey iron castings
1780 Bourdon tube pressure and vacuum gauges
2815 Compression asbestos fibre jointing
3139 High strength friction grip bolts for structural engineering
3294 The use of high strength friction grip bolts in structural steelwork: Part 1: General grade bolts
3381 Metallic spiral wound gaskets for use with flanges to BS 1560: Part 1 and 2
4504 Flanges and bolting for pipes, valves and fittings. Metric series Part I: Ferrous
4604 The use of high strength friction grip bolts in structural steelwork (metric series)
5155 Cast iron and carbon steel butterfly valves for general purposes

DIN 2514 Flanges; projection with groove and recess nominal pressure 10-40; design dimensions

SABS 62 Steel pipes and pipe fittings up to 150 mm nominal bore suitable for screwing to SABS 1109 pipe threads
135 ISO metric black bolts, screws, and nuts (hexagon and square)
136 ISO metric precision-hexagon-head bolts, screws, and nuts (coarse thread medium fit series)
191 Cast steel gate valves
533 Black polyethylene pipes for the conveyance of liquids
546 Cast iron fittings for asbestos cement pressure pipes
664 Cast iron gate valves for waterworks
719 Electric welded low carbon steel pipes for aqueous fluids (ordinary duties)
966 Components of Unplasticized polyvinyl chloride (uPVC) pressure pipe systems
974 Rubber joint rings (non-cellular)
Part I: Joint rings for use in gas, water, sewer, and drainage systems
1109 ISO pipe threads for pipes and fittings where pressure-tight joints are made on the threads
1123 Steel pipe flanges
1223 Fibre cement pressure pipes and couplings

API Std. 1104 Standard for welding pipelines and related facilities

AWWA C 504 Rubber seated butterfly valves

SPECIFICATION MR : WATER TREATMENT PLANT

Clause

21. **TOLERANCES**

6.1 General

22. **TESTING/COMMISSIONING**

7.1 General

23. **MEASUREMENT AND PAYMENT**

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

SPECIFICATION MR : PACKAGE WATER TREATMENT PLANT

7. SCOPE

This specification covers the requirements for the provision of package water treatment plants.

8. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specification

This specification shall be read in conjunction with the following:

(a)	Project Specification	
(m)	SPEC AT	:GENERAL
(a)	SPEC HP	:CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES
(b)	SPEC HT	:GENERAL METAL WORK
(c)	SPEC LM	:MEDIUM-PRESSURE PIPEWORK, VALVES, ETC.
(d)	SPEC PA	:WATER PUMPS : (MEDIUM PRESSURE (200 mm dia and under)
(e)	SPEC ST	:ELECTRICAL WORK (MEDIUM VOLTAGE PLANT - 200 TO 650 VOLTS)
(f)	SPEC SU	:ELECTRIC MOTORS (1 kW to 450 kW)

2.2 Application

This specification contains clauses that are generally applicable to package water treatment plants.

Interpretations of and modifications to this specification are set out in Portion 2 of the Project Specification which precedes this specification in a Contract Document.

2.3 Definitions and abbreviations

For the purpose of this specification, the definitions and abbreviations given in the applicable specifications listed in 2.1.1 (b) to (h), shall apply.

3. DESIGN, MATERIALS AND MANUFACTURE

3.1 General design

3.1.1 Quality of raw water and flow rate to be treated

The quality of raw water and flow rate are given in the Project Specification.

3.1.2 Quality of treated water

The quality of treated water shall comply with SABS 241.

3.1.3 Chemicals to be used

The chemicals to be dosed shall be as stated in the Project Specification.

3.1.4 Treatment process

The treatment process shall include the following unit water treatment processes:

1. Chemical dosing
2. Rapid mix of chemical into raw water
3. Flocculation
4. Clarification
5. Filtration
6. Chlorination

3.1.5 Design parameters

3.1.5.1Rapid mix

The rapid mix unit shall be designed to produce a shear gradient within the range given in the Project Specification for maximum and minimum flows, and to suit the chemicals proposed.

3.1.5.2 Flocculation

Flocculation shall preferably be carried out within the clarifier.

3.1.5.3 Clarification

The clarification unit shall be either horizontal or spiral flow sedimentation tanks or an up flow clarifier type unit.
The loading rate shall be not greater than 1,2 $m^3/m^2/h$.
Desludging of the unit shall be done automatically and duration and frequency shall be adjustable.

3.1.5.4 Filtration

The filters may be rapid gravity or pressure filters.

The under drain system shall be as stated in the Detail Sheets and approved at tender award. The filter media shall be of quartzitic origin and have an effective size in the range 0,6 mm to 0,9 mm and a uniformity coefficient of not greater than 1,4. The effective size and uniformity coefficient shall be as stated in the Detail Sheet and approved at tender award.

3.1.5.5 Chlorination

The chlorinator shall dose a liquid HTH or hypochlorite solution into the filtered water. The dose rate shall be manually adjustable to give a chlorine dose in the range 1 mg/l to 4 mg/l.

The strength of solution dosed shall be as stated in the Detail Sheet.

3.1.5.6 Chemical dosing equipment

Either solution pumps or solution gravity equipment may be provided. Chemical dosing equipment shall be capable of dosing the chemicals given in the Project Specification at the solution strengths and dose rates stated. The dose rates shall be manually adjustable and shall be accurately controllable to within a tolerance of ± 5%. In the event of cessation of raw water inflow the chemical feeders shall shut off automatically.

Two feeders for each chemical shall be provided.

The equipment shall include two solution tanks for each chemical each of capacity sufficient for 24 hours of operation at the maximum dose rates and shall include for solution makeup equipment. The dose lines shall include a rotameter for flow measurement and loading valves if necessary to ensure a constant dosing rate.

3.1.6 Raw water flow control

A raw water flow meter shall be provided to measure and record the flow rate. The meter shall indicate the rate of flow, and integrate the total flow. The meter shall be capable of measuring flows within the range specified in the Project Specification to an accuracy of ± 2%. The indicating and recording instruments shall be mounted on the control panel.

3.1.7 Raw water flow control

A valve shall be provided to control the rate of raw water flow

into the works. The valve shall be of a type suitable for use on raw water, shall be sized to control the rate of flow over the flow range specified in the Project Specification and shall be capable of continuously throttling the flow without distress or damage within the range of supply pressures stated in the Project Specification. The valve shall be manually adjusted.

3.1.8 Pumps and electric motors

Pumps and motors shall comply with applicable requirements of SPEC PA and SPEC SU respectively. Electric motors shall be TEFC (Totally enclosed fan cooled).

3.1.9 Electrical installation

The electrical installation shall comply with SPEC ST.

The plant shall be protected from flooding or any other damage that may be caused by, or occur during, a power failure.

3.2 Materials

Materials of construction shall be mild steel coated in accordance with Sub clauses 5.5.6 to 5.5.9 of SPEC HP, or GRP or other non-corrodible materials.

The Contractor shall be responsible for choosing materials which are compatible with the liquids and chemicals to be handled.

4. PLANT

4.1 General

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

4.2 Handling and rigging

The plant and rigging equipment used by the Contractor for the handling and placing equipment shall be such that no installed equipment is overstressed during any operation.

5. INSTALLATION AND OPERATING REQUIREMENTS

5.1 Placing on foundation blocks

In terms of Sub clause 5.2 of SPEC AT the Contractor shall provide drawings showing the foundation blocks and shall erect all equipment after these blocks have been completed by the Civil contractor.

Before positioning any equipment to be grouted in the Contractor shall ensure that the concrete surface has been roughened and is free of foreign materials, grease, oil, etc. The Contractor may arrange with the civil contractor for the latter to carry out the grouting under the direction of the Contractor. Equipment shall be placed, correctly leveled and aligned such that grouting clearance are maintained between the equipment base, foundations and formwork.

The Contractor shall satisfy himself that the base plates are fully supported and that no voids have been left on the underside of any parts of the base plate.

5.2 Defects

Each item of equipment shall be thoroughly examined for damage or defects before installation. Should any damaged or defective equipment be installed it shall be removed and replaced at the Contractor's expense and to the satisfaction of the Engineer.

5.3 Keeping equipment clean

Every reasonable precaution shall be taken to prevent the entry of foreign matter into the equipment and pipes.

6. TOLERANCES

6.1 General

The complete water treatment plant shall be guaranteed to deliver treated water of the quality and at the flow rate as specified and to operate satisfactorily in all respects under the specified operating conditions.

7. TESTING/COMMISSIONING

7.1 General

Testing 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 the expenses incurred in this connection.

Chemical dosing equipment shall be tested to establish the maximum and minimum dosing capability of the equipment supplied and a calibration curve produced for the entire operating range. The calibration curve shall be incorporated into the operating and maintenance instructions.

Pipe work and any vessels which may contain liquid shall be filled and left to stand for at least three hours and thereafter all leaks shall be made good at the Contractor's expense.

The Contractor shall operate the plant and demonstrate that it can continuously supply treated water of the required standard for a minimum continuous period of 8 hours.

8. MEASUREMENT AND PAYMENT

THE TERMS OF Clause 8 of SPEC : AT : GENERAL shall apply.

The rate tendered for commissioning and testing shall include all costs associated with sampling the treated water and the chemical analysis at an approved laboratory to demonstrate that the required standard has been attained.

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SPECIFICATION MV : MEASURING AND RECORDING INSTRUMENTS

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SPECIFICATION MV : MEASURING AND RECORDING INSTRUMENTS

4. SCOPE

1.1 This specification covers the general requirements for measuring and recording instruments. It deals with water-meters, level recorders and associated integrating instruments for use with potable and raw water as well as raw sewage and effluent.

The working pressures are generally up to 1,6 MPa and nominal pipe diameters vary from 50 mm to 2 000 mm. This specification does not cover small domestic water meters.

5. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specification

Where this specification is required for a project, the following specifications shall, inter alia, form part of the contract document :

(a)	Project Specification		
(b)	SPEC AT	:	GENERAL
(c)	SPEC HP	:	CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES
(d)	SPEC LQ	:	MANUFACTURE OF MEDIUM-PRESSURE STEEL PIPES

2.2 Application

This specification contains clauses that are generally applicable to contracts for the supply, installation and commissioning of water meters. Interpretation of and variations to this specifications are set out in Portion 2 of the project specification which precedes this specification in a contract document.

2.3 Definitions

For the purpose of this specification, the definitions given in the applicable specifications listed in 2.1.1 (b) to (d) shall apply.

2.4 Abbreviations

For the purpose of this specification, the abbreviations given in the applicable specifications listed in 2.1.1 (b) to (d) shall apply and the following shall have the meaning given:

DSI : Dall short insert.
IP : A symbol which, followed by two characteristic numerals, signifies the degree of mechanical protection to ingress of foreign bodies and water as defined in BS 4999 : Part 20
NEMA: National Electrical manufacturers Association

2.5 Explanation of terms

2.5.1 Materials

In the context of this specification the term materials covers both the basic materials used in the manufacture and fabrication of the meters, sensors and recording instruments, and the meters, sensors and recording instruments themselves as finished products that are to be installed and commissioned.

3. DESIGN, MATERIALS AND MANUFACTURE

3.1 General

The responsibility for selecting materials compatible with the liquids or surroundings with which the equipment comes into contact rests with the Contractor. The materials used shall be at least equal to those specified in this specification.

3.2 Water meters

3.2.1 General

Electronic metering instruments shall have digital and linear output with a turndown ratio of not less than 30 : 1.

Where the turndown ratio is 4:1 or less, hydraulic instruments having a square root output may be used.

Where installed in a gravity supply system, the meters shall be suitable for operating in a battery system (say 24 V) so that the meters will continue totalizing in the event of a failure of the normal 220 V 50 Hz AC supply.

For pumping systems a battery is not required.
Where specified in the Project Specification, the design of the meter shall be such that the totalizer can be read remotely, making use of a solid-state electronic (or as approved) transmitter incorporating a sealed slot-sensing proximity switch. Signals shall be transmitted via a two wire system suitable for a 4 - 20 mA pulse/current output (or as approved). The system shall also be capable of incorporating instruments of the type specified in Subclause 3.3.

The contractor shall be responsible for ensuring that adequate provisions are made for filtering out any power supply system irregularities (surges, harmonics, etc.) Which may in any way affect the proper operation of any components of the metering and recording instrument systems.

The meters shall be capable of withstanding a normal working pressure of not less than 1,6 MPa and field test pressure of 2,4 MPa.

Note : In addition to tenders for the system described in this specification, tenderers are invited to submit offers for alternative instruments and sensors which may be approved for use by the Engineer provided they comply with the basic requirements as specified. Such alternatives shall be fully described in the tender in accordance with the relevant clause of the Conditions of Tender.

3.2.2 Types of meters

The water-meters shall consist of the following or equal approved types, as specified in the Project Specification :

(b) Ultrasonic "time of flight" type. An acceptable meter would be the "Series A500" manufactured by Sparling, GB, supplied by Bestobell, South Africa or the "Kent Ultrasonic Flowmeter" supplied by Kent Meters, (SA) (Pty) Ltd.

(c) Insertion flow-sensor magmeter. An acceptable meter would be the "M/S series" flow meter manufactured by Turbo-Werk Messtechnik, West Germany, supplied by Liquid Meters, Johannesburg.

A minimum of two sensors shall be used for pipe sizes up to 600 ND. For larger sizes additional sensors will be required depending on pipe size.
The sensors for types (a) and (b) meters shall be of the "hot point" type, capable of being removed from the pipeline without having to shut down the water supply. The supply of flow meter kits for types (a) and (b) meters is not acceptable. The meter shall be supplied complete within its own body as specified in Subclause 3.2.3.1.

(d) Magnetic flow meter. An acceptable meter would be of the Turbowerk Messtechnik "type MS 711/E" as supplied by Liquid Meters, Johannesburg, or the Kent "UTC" meter, supplied by Kent Meters (SA) (Pty) Ltd.

(e) Woltmann turbine type. An acceptable meter

would be the Meinecke-Cosmos "WP Super Dry" supplied by Kent Meters, (SA) (Pty) Ltd. The totalizer shall have a digital register of not less than 7 digits registering to 0,1 m^3. A condensation wiper shall be fitted to dry type glass meter covers.

(f) Propeller flanged tube type. The design of the propeller and bearings shall be such that the meter can operate accurately in raw, unscreened irrigation water without requiring a strainer measuring instrument shall consist of a self-contained unit which can easily be removed without removing the meter housing from the line. The totalizer shall have a digital register of not less than 6 digits registering to 0,1 m^3. An acceptable meter would be the "Sparling MLFT" meter supplied by Bestobell, RSA.

(g) Dall short insert. Where the required turndown ratio is 4:1 or less a DSI is an acceptable alternative to types (a), (b), (c), (d) or (e).

All isolating cocks shall be bronze and the hydraulic tubing shall be copper or other approved non-corrosive material. The mating flanges shall be either stainless steel as specified in Subclause 3.2.3.1 or cast iron in accordance with BS 1452 grades 17 to 26. The cast iron surfaces shall be protected with an approved epoxy polyamide paint to a total dry film thickness of at least 350 micrometers or epoxy hot coat to a total dry film thickness of at least 450 micrometers. All protection paints shall be applied in accordance with SPEC HP.

o) Metering control valve. (Required for flow rate control and measurement of irrigation water). An acceptable meter would be the "Hydrometer" made by "Bermad" of Israel. The meter shall be of the Woltmann type mounted vertically above a diaphragm-actuated globe pattern valve of the type specified in Subclause 3.8 of SPEC 1200 LK. The valve shall function in a manner enabling it to maintain a constant flow rate regardless of the differential pressure across the valve within a range of 0,005 MPa to 1,0 MPa. The meter may discharge to atmosphere where specified in the Project Specification. Under these circumstances the Contractor shall fit a suitably sized SS orifice plate to maintain the required back pressure.

The control head shall include a rate of flow indicator (l/s, m/h) and a digital totalizer register (m), and shall be designed for electric pulse transmission for remote reading and computerising.
The flow control pilot shall be of the flipper or equal approved type, which shall sense flow rate of between 1 m/s and 5 m/s and control the flow rate through the meter to within ± 10% of the specified constant required.
The flipper and shaft shall be made of 316 L stainless steel. The bottom adaptor and all other parts exposed to the irrigation water shall be made from zinc-free phosphor bronze in accordance with BS 1400 or of 316 SS as appropriate. All other parts shall be in accordance with the manufacturer's standard.

The water meter component shall include internal flow straighteners made from an approved plastic, and located before and after the valve. The filter for feed water to the pilot valves shall be large and fitted externally to the valve body to simplify

maintenance and clearing.
Alternatively the control valve ("Bermad" or equal approved) and water meter (Type "Meinecke-Cosmos WS" or equal approved) may be supplied as separate units.

3.2.3 Meter bodies

3.2.3.1 For types specified in Subclauses 3.2.2 (a) and (b).

The meter body shall be made of 316 L stainless steel and accurately rolled to the inside diameter of the pipeline into which the sensors are to be installed. The body shall be manufactured and tested in accordance with SPEC LQ.
The Contractor shall submit to the Engineer shop drawings for approval, giving details of the "hot tap" to be welded to the meter body.

3.2.3.2 For type specified in Subclause 3.2.2 (c)

The Contractor shall supply the complete meter. The flow tube shall consist of non-magnetic stainless steel with a hard rubber lining and 316 Ti stainless steel electrodes.

3.2.3.3 For types specified in Subclauses 3.2.2 (d), (e) and (g)

The body shall consist of a high grade mechanise CI and be protected against corrosion with a suitable epoxy paint as specified in Clause 5.4 and 5.5.1 (b) of SPEC HP. Surface preparation shall be in accordance with Clause 5.2.1.2 of SPEC T/HP. The paintwork shall be tested in accordance with Clause 7 of SPEC HP. The body for type (e) meters larger than 3,00 m ND may consist if fabricated steel as specified in Subclause 3.2.3.1 or mild steel protected with fusion bonded epoxy paint as specified above.

3.2.4 Sensors

The transducer sensors of the ultrasonic meters shall be made of Grade 316 S16 (or other approved) stainless steel.

The primary element of the meter shall be of the "hot tap" insertion type suitable for mounting at a 45° insertion angle through a 316 stainless steel bush suitable tapped, and shall employ two "Teflon" (or other approved) seals to prevent leakage.

The primary element shall be capable of sensing velocities from 0,2 m/s to 6,0 m/s in water having a conductivity of 2,0 micro Siemens.

The primary element shall be connected directly to the electronics using a continuous length of screened cable up to 75 m in length.

The meter electronics shall utilize solid state circuitry and initiate flow on an analog meter along with a 4 - 20 mA isolated output for remote recording or control.

3.2.5 Transmitter for differential pressure.

An electronic differential pressure sensor capable of accurate electronic transmission of the differential pressure shall be coupled to the DSI.

The sensor shall be capable of withstanding pressures of at least 1,6 MPa and shall be contained within a waterproof housing. (An acceptable sensor would be the Kent K-DC).

A square root integrator shall be coupled to the transmitter to derive the total flow. An adjustable "drop-out" control shall be incorporated into the module at present totalizing on a residual "zero" input signal.

Input: 0-20 mA

Output : Not less than 36 000 counts/hour

3.2.6 Fault detection

Built in facilities shall be provided for automatic detection of loss of signal or system faults with visible or audible indication.

3.2.7 Balance adjustments

Easy balance/zero adjustment facilities shall be provided in all metering equipment.

3.2.8 Waterproofing

Because of the probability of the meter body being submerged, from time to time, all parts of the meter and electronic equipment likely to be affected shall have class NEMA 6 and IP 86 protection. The depth of submergence shall be 4 m for up to 90 days. Where there is no likelihood of the meter becoming submerged for any length of time the class of protection may be reduced to NEMA 4 and IP 65.

The recorder, totalizer and electronic equipment will be located in a separate chamber above ground level and will require only the manufacturer's standard protection.

3.2.9 Factory calibration of meter

Factory calibration tests shall be carried out on the actual metering equipment (as specified) supplied, and a calibration certificate submitted stating the accuracy and repeatability for various flows within the useful range of the meter.

3.2.10 Replacement of parts

The supplier shall state the effect that replacing of any vital part of the meter sensing equipment will have on the accuracy and calibration of the meter.

3.2.11 Mains/Battery failure

The supplier shall state what effect total loss of power will have on resumed operation of the meter, i.e. will balance/zero or totaliser reading be affected in any way.

3.2.12 Routine maintenance

The supplier shall state what regular servicing is necessary to ensure continuing accuracy of the metering equipment.

3.2.13 Performance specification

The meter shall be suitable for the accurate measurement of raw water. The meter shall be capable of measuring the flow linearly at Reynolds numbers of 4 000 and above to within ± 1% and ± 2% of actual flow for electronic and Woltman type meters respectively for flow rates between

0,6 m/s and 6,0 m/s and with a repeatability of ± 0,3 % of the reading over the full operating range. Propeller type meters (Clause 3.2.2 (e)) shall be calibrated and geared to register within ± 2 % of true flow within the meter's rated range. DSI's shall be accurate to within ± 2 % of actual flow within the specified operating range (4:1).

All the meters shall have a pulse type of output. The calibration factor shall not be affected by changes of temperature between 4° C and 35°C or pressures between 10 kPa and 1600 kPa. The pipeline will run 100 % full at all times.

The downstream back pressure on the meters may, under certain circumstances, be as little as 5 kPa. Should cavitation be a danger that could effect meter accuracy, this shall be indicated in the Detail Sheets.

The output signals shall be :

4 - 20 mA current loop interface
0 - 5 V analog signal.

The output signals shall be suitable for driving computers, electronic converters, digital counters, recorders, indicators, controllers and for transmitting signals through a telemetry system.

3.2.14 Power Supply

Unless otherwise specified in the Project Specification, the power supply shall be 220 V, 50 Hz, Single phase, a.c.

Where specified in the Project Specification, or otherwise required, the battery capacity shall be sufficient to operate the totalizer for a minimum of 7 days without requiring recharging.

3.2.15 Earthing

The water mains will consist of either asbestos cement or electrically insulated metal pipes. The Contractor shall therefore, where deemed necessary by him, install an efficient earthing system and lightning arrester capable of protecting the electronic equipment installed by him.

3.2.16 Battery pack

The battery pack shall be of the totally enclosed pattern mounted within a separate compartment of the control panel. It shall be designed for operation on a 220V, lph, 50Hz, a.c. supply and shall be of the fully-

automatic maintenance-free type.

The unit shall have d.c outputs at voltages suitable for the duty or duties for which the battery pack is specified, viz:-

24 V for flow-metering, recording and integrating.

Where necessary d.c-a.c inverters shall be supplied to provide standard sinusoidal voltage (s) at 50 Hz.

The rating of battery packs and inverters shall be suitable for driving the normal load (plus a 30% safety factor) for a period of 48 hours without recharging, unless otherwise specified.

Trickle charge and boost charge rates shall be provided in accordance with the battery manufacturer's recommendation and shall be automatically controlled according to battery condition, using a constant voltage current controlled (C.V.C.C) charger. In the event of the battery state-of-charge falling to a level where the battery can be permanently damaged the system shall cut out completely.

The unit shall incorporate the following features:-

On/Off switch Input and output fuses.
Indicator lamps) "Power On"
or LED'S) "Battery charger input failed"
"Battery charger output failed"

Charge rate ammeter and test button
Voltmeter with on-load test button
Auto/Normal/Boost charge rate selector switch
Reverse polarity protection
Set of Yuasa "NP", or equal, sealed maintenance-free rechargeable lead acid batteries (10 A.H. minimum total capacity at 20-hour discharge rate, unless otherwise specified).

3.3 Instruments.

3.3.1 Power Supply

The power supply shall be as specified in 3.2.14.

3.3.2 Recording instruments.

All recording instruments shall be of approved type and shall conform with the requirements of BS 90. Unless otherwise

specified they shall have a chart speed of 20 mm per hour or 10 mm per hour as may be approved and test speed of 150 mm per hour. They shall be complete with sufficient charts for one year's working.

The driving mechanism shall be electrically wound with an approved escapement of the lever type with Brequet hair spring and shall incorporate an electrically wound clockwork reverse capable of maintaining accurate timekeeping for 24 hours after loss of supply. Alternatively a synchronous motor with 24 V battery supply may be used.

One recording instrument with fan fold recorder charts shall be supplied with each meter. The minimum writing width shall be 100 mm. The charts shall be divided weekly into days of the week and hourly intervals annotated Monday, Tuesday and so on and 24h00, 01h00, 02h00 and so on.

The spacing between hourly intervals shall not be less than 10 mm. A chart 7 m in length would therefore suffice for 4 weeks (the required interval between chart changes).

The charts shall have the following printed on them:

Location
as well as the following:

	Date	Time	Meter Reading
Week ending Monday			
Week commencing Monday			
			_____

Period on this chart ... weeks TOTAL
_____m^3

The vertical scale shall be in either m^3 or kilolitres per day (kl/day) as specified in the project specification and shall have a range as appropriate.
At least 25 charts shall be supplied with each instrument.

The chart drive shall incorporate an electric synchronous motor suitable for a 50 Hz supply. A heater shall be incorporated with

each motor in case of damp atmosphere conditions. The felt-tip pen system shall be capable of continuous recording for twelve months.

Where the meters are connected to a centrally placed computer (PC) by means of a telemetry system, the records will in all probability be omitted and need only be supplied if specified in the Project Specification.

3.3.3 Flow-rate indicator

A flow-rate indicator having a 4 digit LED display, with approximately 8 mm high characters, marked in Ml/d and reading from 0,00 to 99,99 Ml/d or 1 l/s to 9999 l/s as appropriate shall be supplied with the meter.

3.3.4 Totalizer

The electronics shall include an 8 digit non-resettable totalizer recording in cubic metres, field programmable for pulse ratio from 0,0001 to 10 counts per second, a vernier dial for calibrating the instruments to indicate flow in Ml/d, or l/s as appropriate, a range switch and built in calibration test switch. The meter shall allow for calibration testing with the primary element in the following process and the display shall indicate verification of the calibration.

3.3.5 Identification label

Each recording instrument shall be fitted with an engraved identification label with black letters 6 mm in height on a white background.

3.3.6 Site calibration

The meters shall be site calibrated by the Contractor using, where practicable, existing reservoirs as measuring tanks to verify their accuracy. This work will have to be done at periods when convenient to the Employer. The Contractor shall liaise with the Town Engineer to establish an acceptable time and also to arrange for the inlet valves to the reservoirs to be shut off.

Prior to commissioning, the Contractor shall submit to the Engineer, for approval, a programme detailing the method and duration of the proposed calibration tests and, after the tests,

shall present to the Engineer a full report, with tabulated measurements, meter readings, recorder charts, etc. covering the actual tests. Within the month before the completion of the maintenance period, the Contractor shall repeat the site calibration test and prove the consistency of the meters in service.

A full record of servicing and any calibration adjustments carried out during the maintenance period shall be kept, and submitted to the Engineer.

3.3.7 Telemetry

All instruments shall be so designed that electrical transmission (probably radio link) may be installed at a date specified in the Project Specification to enable the instruments to be connected to a computer (PC) to be installed in the Employer's offices.

3.4 Level recorder

3.4.1 Instruments

Where specified in the Project Specification, a continuous level measuring system shall be placed in each reservoir. The system shall be suitable for remote indication and recording.

The level-sensing unit shall transmit the level in the reservoir through a 4 to 30 mA output signal. The unit shall comprise a pressure bulb plus pressure transducer, or a capacitance probe or piezoresistive sensor plus measurement transmitter. The output signals shall be suitable for driving computers, electronic converters, controllers and the transmitting signals through a telemetry system.

The measurement shall be accurate to within ± 0,5 % at both 100 % and 0 % levels with a repeatability within ± 0,1 %.

The calibration elements shall be easily accessible and shall be fitted with a coarse as well as a fine adjuster for calibration for 0 % and 100 % level.

Each level sensor shall be supplied complete with a depth recorder and depth indicator similar to the instruments as specified in Subclauses 3.3.2 and 3.3.3 respectively except that the instruments shall register in percentage from 0 % to 110 %, while the depth indicators shall have 4 digit LED displays

reading to 0,1 %.

3.5 Pressure gauges

The working range of the pressure gauges shall be able to withstand the maximum positive surges and starting pressures specified in the Project Specification.

Gauges shall be manufactured in accordance with BS 1780, Part 2 (metric), except that they shall register pressure in kPa from 0 to 100 % above the maximum operating head (Class 1 accuracy of not less than ± 1 % of full scale deflection) with a repeatability better than 5 kPa.

Letters and figures on the dials of these gauges shall be non-fading black on a white background. Drawings showing proposed dial markings shall be submitted for approval before the gauges are calibrated.

The gauges shall have bronze casings and bezel rings not less than 100 mm diam. To the outer edge of the calibrated area, and phosphor bronze Bourdon tubes. The internal components shall be of 316 stainless steel, zincfree phospor bronze or some other corrosion-resistant material other than aluminium. The gauges will be subjected to fluctuating pressure of up to 65 % of the full scale range.

All gauges shall be fitted with gauges cocks, and be suitable for surface mounting with bottom connection. The maximum operating and static pressures are stated in the Project Specification.

3.6 Strainers

An in-line Wye type, double flanged, fabricated mild steel strainer shall, where specified in the Project Specification, be fitted upstream of type (d) and (f) meters to prevent damage to, and blocking of, the meter rotating element.

The strainer shall be fitted with a quick release cover to facilitate easy removal of the stainless steel strainer element. The cover shall be fitted with a scour valve having a nominal diameter not less than half the nominal diameter of the strainer element.

The strainer element shall be fabricated from 316 L stainless steel with holes not exceeding 5 mm in diameter.

The total area of the holes in the strainer surface shall not be less than 10 times the cross sectional area of the inlet pipe.

The design of the strainer element shall be such that it is capable of withstanding an internal pressure of at least 1,6 MPa in the event of blockage.

The strainer body shall be manufactured in accordance with Subclause 3.2.1 and Clause 5 of SPEC LQ and shall be designed for a minimum working pressure of 1,6 MPa.

The mild steel shall be grit blasted to at least Sa 3 and corrosion protected in accordance with Subclause 5.5.1 (b) of SPEC HP.

10 mm Schroeder valves shall be subjected to a hydrostatic test and 10 % of the strainers near the flanges for reading the pressures to determine the head loss through the strainer element.

Each strainer shall be subjected to a hydrostatic test and 10 % of the strainers

shall be radio-graphically tested as specified in Subclause 7.2 and 7.3 respectively of SPEC LQ.

Paintwork shall be tested in accordance with Clause 7 of SPEC HP.

12. PLANT

4.1 Handling

The plant and equipment used by the Contractor for handling the meters, and other instruments during manufacturing and erection, shall be such that no meter or instrument is overstressed during any operations covered by this specifications.

13. APPLICATION/REQUIREMENTS

5.1 General

The workmanship shall be of the highest quality throughout, consistent with the type of equipment supplied, and any inferior work will be cause for rejection.

5.2 Commissioning and visits

The civil contractor will install 100 mm conduits complete with draw wires to interconnect the various chambers to enable the Contractor to

lay the necessary cables. The Contractor shall excavate the necessary trenches between the control chambers and as otherwise required.

The Engineer will advise the Contractor where applicable when the meters have been installed by the civil contractor and are ready for commissioning. Commissioning shall commence within 14 days of receipt of the Engineer's written instruction to commence.

14. TOLERANCES

6.1 Meters

The accuracy of the meters shall be within the limits specified in Subclause 3.2.13. The accuracy of electronic equipment shall be consistent with that of high quality instruments.

15. TESTING/COMMISSIONING

All instruments shall be tested as appropriate to verify their accuracy and reliability. The terms of Clause 7 of SPEC AT : General shall apply.

16. PAYMENT

8.1 Supply and delivery

The terms of Clause 8 of SPEC AT : General shall apply.

8.1.1 Water meter

The price entered in the Schedule of Quantities for the water meters shall cover the cost of the supply and delivery to the civil contractor's stores of the meters complete with bodies (and stainless steel extension tubes to facilitate removal of the meter sensors under full flow conditions where applicable) as well as supply and delivery to the Engineer of installation and operating instructions and detailed dimensioned drawings as specified in Subclause 5.2 of SPEC AT.

8.1.2 Recording and measuring instruments

The price tendered for the recording and measuring instruments shall cover the cost of the supply and delivery to the Employer's store of flow rate digital indicators and chart recorders, totalizer, batteries, tec., the necessary interconnecting wiring, 25 charts per instruments, all mounting brackets, and instructions to enable others to maintain the equipment while in storage, as well as supply and deliver to the Engineer's office of installation and operating instructions and detailed dimension drawings as specified in Subclause 5.2 of SPEC AT.

8.2 Installation

The price tendered for the installation of the equipment shall cover the cost of installing, testing and commissioning of all equipment as well as the supplying and installing of all wiring, cabling, and incidental parts required for the connecting up to the power supply to ensure the proper functioning of the equipment.

SPECIFICATION PA : WATER PUMPS : MEDIUM PRESSURE
(200 mm dia and under - manufacturer's standard equipment)

Clause

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5. **INSTALLATION AND OPERATING REQUIREMENTS**

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6.1 General
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7. **TESTING/COMMISSIONING**

SPECIFICATION PA : WATER PUMPS : MEDIUM PRESSURE (200 mm dia and under)

8. SCOPE

This Section covers the requirements for 200 mm diameter and smaller water pumps and ancillaries for indoor pumping of treated and raw water at working pressures up to 2,5 MPa in pump stations and other locations where stringent specifications are not required. It deals with the mechanical design of all parts of the pump, its manufacture, installation, testing, commissioning and the performance guarantees required. The electrical motors, switchgear, pipe work, valves and specials to operate the pumps are dealt with in other standard specifications.

9. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specifications

Where this specification is required for a project, the following specifications shall, inter alia, form part of the contract document:

1. Project Specification
2. SPEC AT : GENERAL
3. SPEC LM: MEDIUM-PRESSURE PIPEWORK, VALVES, ETC.
4. SPEC HP : CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES

5. SPEC SU: ELECTRIC MOTORS (1 kW to 450 kW).

2.2 Application

This specification contains clauses that are generally applicable to mechanical engineering construction. Interpretations of and modifications to this specification are set out in Portion 2 of the project specification which precedes this specification in a contract document.

2.3 Definitions

For the purposes of this specification the definitions given in the applicable specifications listed in 2.1.1 (b) to (e) and the following definitions shall apply:

2.3.1 Physical

Coupling. Any process of jointing (except welding) straight pipes to one another and to specials and valves.

Special. Any pipe other than a straight pipe.

NOTE: Under this definition are included all sizes of specials of shapes such as bends, tees, crosses, angle branches, reducers and tapers.

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

Throat bushing. A close-clearance restrictive nonferrous ring around the shaft between the seal (or packing) and the impeller to increase box pressure, isolate the box fluid from the pumpage or reduce the flow of box fluid into the pumpage.

2.3.2 Performance or Design Characteristics

(i) Static head.

The difference between the free water surface levels on the suction and delivery sides of the pump.

(b) External friction head.

The head required to overcome the friction external to the works provided under this Contract.

(c) Plant losses.

The friction losses in all pipe work, specials and valves within the limits of this Contract.

(d) Velocity head.

The velocity head in the delivery branch given by $v^2/2g$ at the point of pressure measurement.

(h) Total head.

The sum of (a), (b), (c) and (d).

(f) Nett effective head.

The sum of (a) and (b).

(p) Specific power consumption is the total motor power input to the motor in kilowatts divided by the pump power output as defined in BS 5316.

(q) Maximum discharge pressure.

The maximum possible suction pressure to be encountered, plus the maximum differential pressure the pump is able to develop when operating at the specified condition of speed, specific gravity, and pumping temperatures with the furnished diameter impeller.

(i) Rated suction pressure.

The suction pressure for the operating conditions at the guaranteed duty point.

(j) Maximum suction pressure.

The highest suction pressure to which the pump is subjected during operations.

(k) Maximum allowable casing working pressure.

The greatest discharge pressure at the specified pumping

temperatures for which the pump casing is designed.

(b) Pressure casing.

The composite of all major stationary pressure containing parts of the unit, including all nozzles or other parts attached thereto.

(c) Nett positive suction head (NPSH) available.

The total suction head in meters of liquid absolute, referred to the pump centerline for horizontal pumps and to the top of the impeller for vertical pumps, minus the vapor pressure of the liquid at pumping temperature in meters absolute.

(n) Nett positive suction head (NPSH) required.

The head in meters of liquid (water) required at the pump centerline for horizontal pumps or at the top of the impeller for vertical pumps for the specified capacity.

(o) Duty point.

That point on the pump characteristic curve for required performance of the pump as stated in the project specification in terms of "total head" and "required minimum discharge".

(p) Motor power input.

Refer to Sub clause 3.2.4.3 of BS 5316 Part 2.

2.4 Additional abbreviations.

For the purposes of this specification the abbreviations given in the applicable specifications listed in 2.1.1 (b) to (e) shall apply and the following shall have the meanings given:

NPSH : Nett positive suction head

3. DESIGN, MATERIALS AND MANUFACTURE.

3.1 General

The Contractor shall be responsible for choosing materials for pump manufacture which are compatible with the pumped fluid and suitable

for the intended duty under service conditions. The materials specified herein will generally be acceptable for water, and prior approval will be reuired for the use of other materials.

3.2 Pump construction.

3.2.1 General

Pumps shall be of the centrifugal type.

Pumps shall be accurately and efficiently balanced statically, dynamically and hydraulically so that there will be no unbalanced end thrust, when either new or worn and to eliminate noise and vibration when running. Where end thrust arises, adequate long wearing thrust bearings shall be provided. Dynamic balancing shall be done by the removal of parent metal in a manner which does not affect the structural strength of the rotating element. The use of solder or similar deposits for balancing will not be accepted.

All parts shall be of ample dimensions and strength and of the best and most suitable material, corrosion-resistant, free from flaws, accurately machined, properly assembled and fitted so as to avoid initial stresses and to ensure free running. All fittings such as packing glands, shaft assemblies, thrust bearings and plummer blocks shall be of adequate size and sound design.

3.2.2 Pump selection

The pumps shall be selected to run as closely as possible to their best efficiencies over the operating range stated in the project specification. No pump with a constant speed drive which requires a maximum or minimum diameter impeller will be acceptable. The impeller diameter shall be such that at least 5 % increase in head at the rated capacity can be obtained by installing a larger diameter impeller of the same patter. The minimum allowable diameter shall be 105 % of the pump manufacturer's minimum catalogue diameter.

Pumps shall be fitted with motors complying with the SPEC SU.

All pumps, motors, valves, etc. of the same size for the specified duty shall be interchangeable.

3.2.3 Critical speed and balance.

The operating speed of rotating elements shall be below and as far removed as possible from the critical resonant speeds thereof.

Operating vibration levels of all rotating equipment installed shall be to the satisfaction of the Engineer. Strict attention shall be paid to this aspect of the installation.

3.2.4 Casings.

Casings shall be close-grained cast iron.

3.2.5 Impellers.

Impellers shall be made of cast iron or zinc-free bronze.

The casings and impellers of small pumps (up to 50 mm dia. Suction branch) may be manufactured from pressed stainless steel plate (at least to AISI-304).

3.2.6 Shafts.

Shafts shall be of chrome steel or other approved material. They shall be held axially and radially by roller or deep grooved ball bearings. The impeller shall be driven by a sunken shaft key.

3.2.7 Shaft sleeves.

Where the pumped fluid is incompatible with the shaft material, suitable sleeves which afford full protection to the shaft shall be fitted.

3.2.8 Bearings.

The bearings shall be either grease- or oil-bath lubricated or water lubricated for submersible pumps. Where grease is used, a high quality bearing grease of lithium-soap base, free of resins and acids with an anti-corrosive effect, shall be used. The grease shall have a penetration figure of between 2 and 3, and a drip point of not below 175 %. A thrust bearing shall be provided to accommodate the end thrust of the impellers. The bearing numbers shall be given for all bearings in the pumps to facilitate them. The lubrication points of the bearings shall be situated in a safe accessible position, so that lubrication can be done without taking the pump out of operation. Thrust bearings for vertical

pumps may be located in the drivers.

Bearing housing closures of the labyrinth type slinger are required on horizontal pumps at each point where the shaft projects through a bearing housing, except that a mechanical oil seal is acceptable at the coupling end of the bearing housing. A non-labyrinth type slinger is acceptable on the stuffing box end of a bearing housing when it is combined with a mechanical oil seal. Bearing housings on vertical centrifugal pumps shall have equally adequate protection.

3.2.9 Stuffing boxes

All pumps shall be equipped, unless otherwise specified, with soft-packed stuffing boxes of ample depth. Lantern rings shall be used in all pumps with a liquid or grease seal and these shall be provided with inlet and outlet connections.

Stuffing boxes shall have not less than four rings of packing plus the lantern ring and renewable-type non-ferrous throat bushings.

Stuffing box glands shall be easily removable and must permit replacement of packing without removal or dis-assembly of any other part of the pump.

Glands shall preferably be made with completely enclosed bolt holes. Slotted holes open at one side are acceptable only if studs are provided for securing glands. Gland leakage from the pumps shall be led through suitable tubing to a point immediately outside the pump house.

3.2.10 Mechanical seals

Alternatively to stuffing boxes or where ordered, mechanical seals complying with (a), (b) or (c) below, shall be used. The design shall be such that the static head on the pump discharge induces a closing action on the seal to ensure that no leakage occurs during pump shutdown.

1. Treated and filtered water

A single self-aligning balanced mechanical seal manufactured in 304 stainless steel and fitted with ceramic on carbon seals.

2. Raw water

A single self-aligning balanced mechanical seal manufactured in 316 stainless steel and fitted with at least matched solid tungsten carbide (or other approved) rotating and stationary faces shall be supplied.

An external flush shall be provided to ensure heat dissipation through circulation. Where raw water is being pumped a cyclone separator (or external clear water source) shall be fitted.

3. Abrasive liquids

A double self-aligning mechanical seal manufactured in 316 stainless steel and fitted with at least either carbon on ceramic (for water lubrication) or carbon on Ni-iron (for oil lubrication) shall be supplied. Should the Contractor consider it necessary, more expensive materials shall be fitted.

An independent fresh water (or oil) flush shall be provided. Care shall be taken to ensure that the pressure of the flushing fluid is at least 100 kPa greater than the pressure of the liquid on the inboard side of the seal.

3.2.11 Base plates

Pumps and motors shall be mounted on base plates of rigid design, manufactured in either cast iron or fabricated steel, equipped with anchor bolt holes, anchor bolts (see 3.2.12), drain connections and unobstructed grout holes. Base plates and pump supports shall be so constructed and the pump so mounted as to minimize misalignment caused by deflections arising from normal piping strains, internal differential thermal expansion, hydraulic piping thrust and similar causes.

Base plates shall be protected against corrosion to at least the standard specified in Sub clause 5.5.2 (i) of SPEC HP.

Alternatively, pumps and motors may, with the approval of the Engineer, be of the monoblock design, with the impeller mounted on the motor shaft.

3.2.12 Anchor bolts

Anchor bolts shall not be less than M16. Rag bolts of an approved design shall be used as anchors. The Contractor shall either drill holes of an appropriate diameter and depth into the concrete base, and grout the anchor bolts in, using an approved prepacked two part epoxy mortar, or shall state the size of grout holes to be left by the civil contractor (refer to 5.1). The Contractor shall be responsible for grouting in the anchor bolts, using an approved non-shrink grout.

3.2.13 Auxiliary pipe systems

Recirculating piping systems for gland oil, lubrication oil and accessories such as gauges and valves, shall be furnished by the Contractor, fully assembled to facilitate easy maintenance. Material used for all auxiliary piping and valves shall be suitable for the designed duty of the pumps, and all items shall be properly cleaned before assembly. They shall be installed in a manner which prevents vibration of the pump.

3.2.14 Couplings

3.2.14.1 General

The pumps and motors shall be direct coupled with a suitable type of coupling which will take up minor mis-alignment or off-setting of the motor and pump shaft satisfactorily. Couplings shall be statically and dynamically balanced.

The coupling shall be designed in such a manner that no axial or radial loads will be imposed on the motor and pump bearings in excess of the loads approved by the motor and pump manufacturers respectively for the installation offered. Spacer couplings shall be provided with pumps of the back pull of type or where frequent maintenance is likely to be required.

The couplings shall be robust, shall be readily dismantled and reassembled, and shall have a service factor of at least 1,5.

3.2.14.2 Drives for vertical spindle pumps

The electric motors shall be mounted on approved

stools resting on the motor room floor. The main transmission shall be of the open automotive tubular type and of such dimension and manufacture that no whip or excess vibration occurs under all working conditions. The steel hollow shaft shall have universal joints at each end with a splined sliding yoke on the pump coupling side. The sliding joint shall be such as to accommodate any change in length and the universal joints shall be of the Hardy Spicer type, or similar, with all bearings of the needle roller type.

Attention is drawn to Sub clause 3.2 of SPEC : AT regarding guarding of plant, tec. All shafting and couplings shall be protected by galvanized wire or expanded metal cages.

In the single shaft system the bottom couplings only shall be guarded, and in the two shaft system the complete shaft shall be protected with a cage from top to bottom with hinged inspection openings for inspection and lubrication of the joints. All motor stool openings shall similarly be protected with removable guards.

3.2.14.3 Guards

A strong removable all-metal guard shall be provided over the coupling and drive shafts as a protection against accidents. Guards shall be sufficiently heavy and rigid in design to avoid contact with the coupling or shaft as a result of accidental body contract.

3.2.15 Air and drain cocks

Air cocks shall be provided on the pumps and at any high points on the delivery mains within the limits of this Contract. These shall be connected by piping to single ball air valves on the outside wall of the building.

Drain cocks shall be provided on the pumps, and also on drains from the pump seals.

All water and drain cocks shall discharge visibly into funnel shaped receivers discharging to waste.

3.3 Pump types and motors

The pumps shall confirm to the relevant specification below for the type scheduled, and to the details given on the relevant Detail Sheet as approved.

3.3.1 Horizontally split casing centrifugal pumps

The casing shall be of the volute type, split on the rotating element centre line. Both branches shall be cast in the lower portion, making it possible to inspect the pump interior and remove the rotating parts without breaking pipe joints or interfering with the alignment.

Impellers shall be of the double entry shrouded type in hydraulic, static and dynamic balance for single stage pumps, and of the single entry type for two stage pumps. For multi-stage pumps the impellers shall be mounted either back to back or suitable thrust bearings shall be used to ensure balanced axial thrust.

The bearings shall be carried in housing cast integral with the lower half casing. The upper bearing caps shall be removable to enable the rotating element to be removed vertically from the lower casing bearing supports. Alternatively, the bearing may be housed in accurately machined sealed housings bolted to the lower half casing.

Gland swing bolts shall be provided to allow for easy repacking.

3.3.2 End suction pumps

The pumps shall be of the horizontal, single or two stage type, with bearing brackets. The pumps shall be of the end suction type (axial inlet) with discharge flanges either horizontal or vertically upwards. The impeller shall be overhung and of the radial type. Pumps of the back-pull-out type are preferred.

3.3.3 Multi-stage pumps

The pumps shall be of the multi-stage type.

The casing shall be split radially at each stage, or constructed as specified in 3.2.14.1, to provide ready access to the interior of

the pump. The suction and delivery ends of radially split pumps shall have feet cast into the volute.

The bearing brackets shall be overhung and bolted to the volute ends. The drive end of the shaft shall be fitted with a roller or heavy duty ball-bearing and a deep groove ball-bearing shall be fitted at the other end to take up any axial thrust.

3.3.4 Submersible borehole pump - motor below pump

The unit shall consist of a vertical pump directly coupled to a three phase AC motor, with absolutely waterproof insulation of the windings designed to work under water level in a well. A submarine cable attached to the discharge pipe with cable clips shall be used to supply electric power to the motor.

The pump shall have either radial or mixed flow impellers. The radial pumps shall be filled with renewable diffusers, whereas mixed flow pumps shall be fitted with guide vanes cast integral with the stage casings. All metallic bearings shall be water lubricated and protected against the ingress of sand.

The impellers shall be zinc free bronze and the diffusers shall be CI.

The discharge connection located at the top of the pump shall incorporate a check valve.

An intake strainer shall be provided at the suction piece.

The stage casing shall consist of either specially protected tubular steel or close grained cast iron. The discharge and suction pieces shall consist of close grained cast iron.

The shaft and shaft sleeves shall consist of stainless steel of an approved quality. Bearing bushes shall be of special quality bronze.

The pump shaft shall be connected to the motor shaft by means of a muff coupling.

3.3.5 Totally submersible portable pumps

The pumps shall be capable of handling dirty, sandy water. The pump intake shall be protected by an adequately sized bar screen capable of passing solids at least 6 mm and not more

than 12 mm in diameter, depending on the impeller used.

The pumps comprise motor and pump as one unit, with the impeller mounted on the extended motor shaft and suction inlet arranged from the bottom of the casing. The shaft shall run in deep groove oil-lubricated ball bearings.

The motor and mechanical seal oil reservoirs shall be separated by an intermediate mechanical seal to ensure non-contamination of either reservoir.

Mechanical seals shall be of the double self-aligning type as specified in 3.2.10.
Free standing units are acceptable, and the pump shall stand on a suitable suction pedestal, with clear passageways, mounted on the lower casing.

The pump shall be capable of running dry without damage.

Discharge shall be by means of heavy duty flexible synthetic hose (HELIFLEX or equivalent) or an automatic quick coupling device connected to the rigid pipe work.

The impeller shall be longitudinally adjustable on the shaft to restore capacity despite wear. All wearing parts shall be easily replaceable.

3.3.6 Electric motors

Motors for pumps shall comply with SPEC T/SU except as set out below : -

(c) Motors for pumps specified in 3.3.1 to 3.3.3 shall be Squirrel Cage Drip-Proof, unless otherwise required by the project specification to be TEFC (Totally Enclosed Fan Cooled) or to be Slip Ring type where starting currents are being limited.

(d) Motors for pumps specified in 3.3.4 shall be specially designed 3-phase squirrel cage motors designed to fit into borehole casings of the size specified in the project specification, and shall be suitable for continuous operation under totally submerged conditions.

(e) Motors for pumps specified in 3.3.5 may be either 3-phase Squirrel Cage type suitable for continuous in the dry or submerged.

3.4 Protection and painting

The relevant sub clauses of Clause 5.5.6 of SPEC T/HP shall apply. The degree of protection required shall be as specified in the project specifications.

4. PLANT

4.1 General

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

4.2 Handling and rigging

The plant and rigging equipment used by the Contractor for the handling and placing of pumps, motors, valves and pipes shall be such that no installed equipment is over-stressed during any operation.

4.3 Setting out

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

4.4 Testing

The equipment provided by the Contractor for testing shall include the pump, pressure gauges, calibrated storage tank, and the necessary tools and fittings required for the performance of the tests given in Clause 7.

5. INSTALLATION AND OPERATING REQUIREMENTS.

5.1 Installation

Unless otherwise specified, the concrete foundation block will be cast by the civil contractor to the dimensions given and position shown by the Contractor. The instructions to the civil contractor will include for the foundation to be at least 600 mm thick for all pump sets of 30 kW and over. Unless otherwise requested in writing by the Contractor, the anchor bolts shall be secured as specified in 3.2.12. The foundation block will be cast between 15 and 30 mm lower than the bottom of the pump base plate.

The pump unit shall be accurately aligned and leveled on Site by the

Contractor, using metal blocks and shims under the base at the anchor studs (and also midway between studs in the case of heavy equipment). The anchor nuts shall then be drawn tight against the base. The pump and motor shall then be checked for alignment. If alignment needs improvement, metal shims or wedges shall be added at the appropriate places under the base. The contractor shall align the units using two clock dial gauges, and shall ensure that the measured deviations nowhere exceed those recommended by the manufacturers of the motors, pumps and flexible couplings respectively. The readings shall be made available to the Engineer upon request.

The Contractor shall then grout up the units solidly, filling the voids inside and under the base plate with an approved non-shrink grout.

After the pumps have been in operation at least one day, the foundation bolts shall be finally tested for tightness, the alignment checked (using clock gauges), and dowel pins fitted in the pump and motor feet in the approved manner.

When the grout has thoroughly dried (about 14 days after grouting), the exposed edges shall be painted using an approved oil paint of the same colour as the pump base plate.
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 pump. The suction pipe work shall be completely airtight and installed in a manner to ensure that no air can be trapped in the suction pipe (and manifold).

5.2 Inspection

The Contractor shall check all items of electrical plant for correct phasing and insulation resistance. Where fitted, the motor heaters shall be switched on for at least 5 hours immediately prior to running for the first time.

Before energizing any of the motors covered by this Specification for the purpose of commissioning, the Contractor shall measure the insulation resistance if each motor between phases and to casing by means of a 500 Volt "megger" instrument and the values shall be recorded and forwarded to the Engineer for information. If any of the readings for a particular motor are lower than 1,5 megohms, that motor shall not be energized until it has been dried out by the Contractor by a method to the Engineer's prior approval. Until the lowest of the insulation resistance measurements on that motor exceed 1,5 megohms the motor shall not be energized.

The Contractor shall liaise with the contractor commissioning the motor control equipment.

5.3 Nameplates

A corrosion-resistant nameplate shall be permanently attached to the pump and contain the following information:

Manufacturer's name
Serial number of pump
Size and type of pump
Rated capacity in cubic metres per hour (m^3/h)
Pumping head in metres (m)
Pump speed (rpm)
Maximum allowable casing working pressure in kilopascals (kPa)

5.4 Priming of pumps

Where pumps are connected to a flooded suction manifold, a master gate valve shall be fitted in the manifold as close as practicable to the water retaining wall where it commences, as a safety precaution against flooding. Where a positive head is available on the suction side of the pumps, no special priming equipment need be provided.

5.5 Operating temperatures
Unless otherwise required by the project specification, each pump and lectric motor shall be capable of operating satisfactorily at an assumed maximum shade temperature of 40º.

6. TOLERANCES.

6.1 General

The standard laid down in this specification shall be adhered to in all cases, unless the standards used by the Contractor are more stringent. In all cases where the Contractor deviates from the above standards the Engineer shall be informed in writing and only after acceptance by the Engineer can the alternative standards be used?

6.2 Guarantee

The complete pumping assembly shall be guaranteed for pressure, capacity and power consumption at the specified design operating conditions, water NPSH, and satisfactory application in all respects to the operating conditions specified on the individual pump specification

sheet.

7. TESTING/COMMISSIONING

7.1 General

The Contractor shall carry out the tests specified below and such additional tests in the Manufacturer's works, on the site or elsewhere as in the opinion of the Engineer are necessary to determine that the Works comply with this Specification.

All labour, materials, fuel, stores, apparatus and instruments for the test shall be supplied free by the Contractor save as provided hereunder.

The cost of such tests and/or analyses as are required by the Engineer to be effected by independent authorities will be refunded to the Contractor by the Employer if the results of such tests and/or analyses prove satisfactory.
The Employer will provide free of charge, as and when available, the electrical load or supply and the necessary water required to the run the plant for the Contractor's preliminary runs and for the final acceptance tests. The contractor shall carry out the tests on site so as not to interfere with the operation of the Works or the execution of other contracts.

Three copies of the Contractor's records of all tests shall be furnished to the Engineer.

7.2 Pump tests - Manufacturer's works

Tests shall be carried out on the pumps at the manufacturer's works before shipment, or shall have been carried out on identical pumps, or such pumps shall have been in service for extended periods and be giving satisfactory results, all under conditions identical with or closely approaching those under which they will operate under this contract. Certified test results, whether from the works or elsewhere, shall be provided when so ordered by the Engineer.

7.3 Pump unit tests - site of works

Tests are described in the project specification shall be carried out by the Contractor at his own expense on all pumping units after installation.

The first test shall be carried out by the Contractor after he has run the plant for a period of at least 4 hours and is satisfied that the pumping

units are ready to be taken over by the Employer. The Contractor shall provide all the necessary instruments, staff and labour for the test. A representative of the Engineer will be present at the test and shall be provided with full details and the calculated results.

If in the first test the characteristics in regard to discharge at "duty point" head falls short of those specified or stated by the Contractor in his tender, the Contractor shall immediately remedy the defects to ensure that the installation complies with these requirements, at his own expense and within such time as may be laid down by the Engineer. When the Contractor has made good the defects, and is satisfied that the pumping unit is ready to be taken over by the Employer, a second test shall be carried out by the Contractor.

If, in the second test, the performance of any of the pump units falls short of requirements, using the criteria in the preceding paragraph, the equipment of part thereof may be rejected, in which case the Contractor shall take immediate steps to replace the rejected equipment with equipment complying with the specifications. Further, any payments made by the Employer to the Contractor in respect of such rejected equipment shall be repaid by or recovered from the Contractor within 30 days of such rejection.

Such replaced equipment shall be subjected to a test and the provisions of the two preceding paragraphs shall apply thereto.

In carrying out the tests the quantity of water pumped shall be measured volumetrically if facilities are available, but if not, by a Venturi or other meter made in strict accordance with the relevant BS Specification. The readings of discharge given by the meter shall be taken to be correct and accepted as such by the Contractor.

Where ordered in the project specification, the Contractor shall provide apparatus to measure accurately the electrical power consumed, and the pressure and flow rate in the pipe system.
The Contractor shall hand to the Engineer certified proof that all gauges and meters supplied by him for testing purposes were accurately calibrated not more than 3 months prior to the date of testing the pumps supplied under this Contract.

The fact that the Employer will take the pumping units into service after testing will in no way relieve the Contractor of his responsibility for the proper performance of the equipment unless any improper performance should be due to negligence on the part of the Employer.

8. **MEASUREMENT AND PAYMENT**.

The terms of Clause 8 of SPEC : AT shall apply.

APPENDIX A. APPLICABLE STANDARDS

AISI 304 A stainless and heat-resistant steel

BS 5316 Acceptance tests for centrifugal, mixed flow and axial pumps

SPECIFICATION ST : ELECTRICAL WORK (MEDIUM VOLTAGE PLANT - 200 TO 650 VOLTS)

Clause

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4.2 Temporary supports
4.3 Handling and rigging
4.4 Testing

10. **INSTALLATION AND OPERATING REQUIREMENTS**

5.1 Working in the vicinity of electrical

11. **TOLERANCES**

12. **TESTING/COMMISSIONING**

13. **MEASUREMENT AND PAYMENT**

APPENDIX A. APPLICABLE STANDARDS

SPECIFICATION ST : ELECTRICAL WORK (MEDIUM VOLTAGE PLANT - 200 TO 650 VOLTS)

1. **SCOPE**

This specification deals with electrical work above 200 volts RMS, a.c or d.c but not exceeding 650 volts and with associated control gear for constant

speed motors and, in general terms, for variable speed motors from 1 kW up to 300 kW. Details of the motor controls for variable speed motors are specified in the Project Specification.

This section does NOT deal with the requirements for electric motors, nor for high voltage equipment, nor with the requirements for general house wiring.

2. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specification

Where this specification is required for a project, the following specifications shall, inter alia, form part of the contract document :

1. Project Specification
2. SPEC AT :GENERAL
3. SPEC HP :CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES
4. SPEC SU :ELECTRIC MOTORS (1 kw TO 450 kW)
5. SPEC SX : CABLING AND EARTHING (if applicable)

2.2 Application

This specification contains clauses that are generally applicable to mechanical and electrical construction works forming part of civil engineering construction works. Interpretation and variations of this specification are set out in Portion 2 of the project specification which precedes this specification in a contract document.

2.3 Definitions

For the purpose of this specification, the definitions and abbreviations given in SPEC T : AT : General and the following abbreviations shall apply:

A Ampere
a.c. Alternating current
d.c. Direct current
ACB Air circuit breaker

MCB Mini circuit breaker
HRC High rupturing capacity
Hz Hertz
IEC International Electro technical Commission
IP A symbol which, followed by two characteristic numerals, signifies the degree of mechanical protection to ingress of foreign bodies and water as defined in BS 4999: Part 20
kW Kilowatt
RMS Root mean square
TEFC Totally enclosed fan cooled
V Volt

2.4 Electrical installation

The Contractor shall include for the supply, delivery and installation of the main switchboard complete with all the necessary switchgear, starters and other electrical equipment required for the proper and efficient operation of the equipment, together with all cabling from the main switchboard to the motors.

Electric power will be laid on to the Site by the Employer who will also supply and connect the meter of the incoming supply to an interconnecting cable provided under this contract from the main switch on the main switchboard. Unless otherwise stated the mains supply will be three phase, four wire, 380/220 v, 50 Hz. All electrical equipment shall be of high quality and shall be described in detail.

2.5 Regulations

The installations shall comply in all respects with the requirements of the Statutory Regulations as specified in Sub clause 3.2 and 3.3 of SPEC AT : General.

The Contractor shall bear the cost of making the necessary arrangement with the Electricity Supply Authority in respect of any inspection charges, fees, etc., that may be raised by such Authority, and shall be responsible for making such notifications as may be required regarding the inception, progress and completion of the work of installation to the said Authority.

3. DESIGN, MATERIALS AND MANUFACTURE

3.1 Electric motors

Electric motors shall comply with the relevant clauses of SPEC SU.

3.2 CABLING AND WIRING

3.2.1 General

All cabling and wiring shall be provided by the Contractor and shall be PVC insulated to BS 6231 for Type "BC" cables. All cables shall be terminated in watertight machined brass and plated cable glands with cone type armour clamp and neoprene shrouds. Unless otherwise approved, cables of less than 2,5 mm² cross-sectional area shall not be used. Where single strand conductors are approved for panel wiring, annealed copper of circular cross-section not less than 2 mm diameter shall be used. The cables from the starters to the motors and all other buried cables shall be PVC SWA PVC with either copper or aluminum conductors. Steel tape, lead sheathed or aluminum tape armoring may also be used. All cables shall be of adequate conductor cross section.

3.2.2 Signaling cable

Signaling cable shall be PVC SWA PVC with a conductor core cross section of not less than 1,5 mm², and shall be manufactured in accordance with SABS 150. Where specified, screened cables shall be supplied.

3.3 Metering box

The Contractor shall provide a metering box of approved size to accommodate the supply authority's equipment for the connected load. The box shall be waterproof, protected to at least IP 54 and suitable for external wall surface mounting. The box shall be constructed of hot dipped galvanized sheet iron of at least 2 mm thickness. The box shall be given three coats of approved paint in accordance with the relevant parts of SPEC HP or shall be otherwise protected to the satisfaction of the Engineer. The contractor shall mount the box not less than 1.5 m above ground level and provide a suitable cable guard to protect the supply authority's incoming mains cable. Where necessary, adequate space in the main switchboard shall be provided for the supply authority's equipment.

3.4 Auxiliary electrical equipment

3.4.1 Motor control panels

A suite of sheet steel cubicle type panels bolted or welded shall be provided for each motor, to accommodate the switchgear, gauges, instruments, relays, indications and controls for operation as specified in Clause 3.5. Each cubicle shall be compartmentalized in accordance with BS 5486 Part 1 Class 3CF and protected to at least IP 55 as defined in BS 5424 Part 1.

The relative arrangement of all this apparatus on the panel shall be to the approval of the Engineer. The instruments shall be flush mounted.

Within the suite of machine control panels there shall be provided a marshalling cubicle of adequate dimensions to accommodate all the incoming cables for the suite with sufficient terminals for all active and non-active cores of the incoming cables. Connections from the marshalling cubicle to adjacent cubicles shall be carried out in panel wiring.

3.4.2 Labels

A label shall be fitted below each instrument and other devices on the panel specifying its purpose. Each cubicle forming the panel shall be numbered from left to right, facing the panel, and a label engraved with this number and a general description of the cubicle function shall be affixed in an approved position on the front. A second identical label shall be affixed to the rear of each cubicle.

Labels which are indoors or inside boxes or kiosks shall be of approved material to ensure permanency of the lettering. The surface of the label shall have a matt or satin finish to avoid dazzle from reflected light.

Labels shall also be provided in conformity with the above requirements or by other approved means wherever necessary to designate panels or panel sections, to describe or identify circuits or circuit components, to provide warnings or reminders of dangerous or potentially dangerous circumstances and wherever called for elsewhere in this Specification.

Danger labels, e.g. "CAUTION - ISOLATE BEFORE REMOVING COVER" shall be white with red lettering.

Where withdraw able equipment is provided, both fixed and moving portions shall be suitably identified.

Labeling shall be clear and concise and the wording shall be to the approval of the Engineer.

3.5 Panel boards or cubicles

3.5.1 General

All cubicles for housing control equipment, instruments and other apparatus shall be of the totally enclosed, dustproof and verminproof type 1A, to BS 587 (or equal), for equipment to be housed under cover and type IV (hoseproof) to IEC IP55 for external use, adequately ventilated and designed to prevent condensation. If specified, heating shall be provided in each cubicle. Forced ventilation shall not be used unless approved by the Engineer. The cubicles shall be of uniform height and appearance and shall be mounted in approved positions on anti-vibration mountings. The Contractor shall comply with these requirements, which apply to all cubicle configurations whether mounted back to back, side by side or separately.

Panels shall be made of sheet steel of adequate thickness and suitably braced to form a rigid structure. The minimum sheet thickness of the pressed steel framework shall be 2,65 mm and the pressed steel panels 2 mm, except for panel fronts and desk tops which shall be not less than 3 mm thick. Panel fronts shall be flat and free from bow or ripple. Exterior corners and edges shall be rounded to give a smooth overall appearance. Design involving the use of externally visible assembly bolts and screws, or any design resulting in dust or water collecting crevices, will not be accepted.

Unless otherwise shown on the drawings, each panel shall be mounted on a self-draining steel plinth arranged to provide a recessed kicking strip at the front. A chequer plate floor shall be provided inside and above the level of the plinth having openings suitable for the bottom entry of cables. Sufficient undrilled gland plates shall be fitted not less than 230 mm above the floor level. Removable side covers to the gland plates shall be incorporated, or any other arrangement that shall give adequate access to the underside of the gland plates.

Particular attention shall be paid to the provision of easy access to all terminals, and apparatus, and the arrangement and method of mounting contacts, relays, instruments and other apparatus shall be to the approval of the Engineer. Hinged doors of the lift-off type shall be provided and shall be arranged to lie flat back and not restrict access to the apparatus and terminal blocks contained within the cubicle. The hinged doors shall be secured with integral handles, flush fitting, and sealed with a gasket of rubber or other approved material to prevent the ingress of dust. Provision shall be made for padlocking. No equipment other than front-of-panel items shall be included for mounting-plates and brackets which shall, if necessary, be hinged or otherwise arranged to give quick and easy access when required to equipment securing screws, terminals and wiring.

The inside of all cubicles shall be painted white, or some other approved colour, and the outside finished in an approved colour, both applied in accordance with 3.5.4. The panel boards or cubicles shall be complete with all necessary internal wiring, resistance, cable glands and gland plates, terminal boards, fixings, locks, screens and accessories.

Where required, the Contractor shall provide spare space and shall prefit panel sheets for installation of other apparatus not included under the Contract Works, and in such case the Contractor shall provide all the wiring, terminal blocks, cables, etc. for the connection to other apparatus. Drilling of the sheet and the wiring shall be carried out in accordance with the drawings and diagrams which will be provided by the Engineer. Panel boards or cubicles shall be provided with both rear and front access, as required and where applicable. The main bus-bars shall have a minimum 300 amp capacity and shall be of high conductivity hard drawn copper strip, supported on substantial insulators and designed to withstand the stresses, etc., associated with a fault current of at least 20 MVA for 0,2 seconds. The bus-bars shall be completely screened from the front by the starter chassis. The bus-bars droppers shall be rated 100 amps minimum. The design shall be such that neutral or control circuit bus-bars can be fitted. Each cubicle shall have a sheet steel floor. If bottom entry cables are required, a slot or slots shall be provided in the floor below the gland positions. The slots shall be sealed by covers of fireproofed timber or other approved material which shall b e cut at site to fit round cables installed. Alternatively, space between the steel floor and the

gland plates nay be sheeted round in an approved manner. The height of the cubicles shall not be greater than 2500 mm overall nor shall any meter scale, operating handle, button or switch be mounted higher than 2000 mm or lower than 600 mm from the floor. No part of any equipment shall be mounted closer than 300 mm from the floor. The cubicles shall be suitable for floor mounting unless otherwise specified.

The cubicles shall be slightly raised above floor level and a protective skirting provided. Cubicles for multi-circuit switchboards shall be sub-divided into single circuit sections, each provided with individual access door and rear cover. All dividing screens shall be of sheet metal, rigidly secured and arranged to segregate individual circuits and comply with the safety requirements of 3.4.2 and 3.7.19.

Wall mounting panels shall have hinged front doors fitted with lockable handles. The doors shall be of rigid construction and made of sheet steel of such a thickness that it is free from distortion when equipment is mounted and supported on the door. The fixing details for the wall mounted panels shall comprise eternally welded brackets.

Provision shall be made for safe and easy handling during transit and at Site. Lifting eyes, if used, shall be reversible and panel tops shall be reinforced where necessary.

All panel construction details and arrangements shall be approved before manufacture, which will be subject to inspection of agreed stages.

3.5.2 Locks

Approved locking arrangements shall be provided for the cubicles and built in locks shall be provided on the doors of the control panels. All the locks of the panel groups shall be similar. Each lock shall be provided with 3 keys.

3.5.3 Panel heating

Each cubicle shall be fitted with one or more thermostatically-controlled tubular heaters to prevent condensation and assist ventilation. The rating shall not exceed 60 watts per linear metre and the surface temperature of any part that may be contacted accidentally shall not exceed 65ºC. The heaters shall be so situated that no deterioration can be caused to any of the

apparatus or wiring in the cubicle. The heating circuit shall be independently fused, and controlled by a suitable labeled rotary pattern enclosed switch mounted in an accessible position within the cubicle.

3.5.4 Corrosion protection and finishing at place of manufacture

3.5.4.1 General

Refer to Sub clause 5.5.9.1 of SPEC : HP.

3.5.4.2 Chromium plated parts

Refer to Sub clause 5.3.7 of SPEC : HP.

3.5.4.3 Galvanized parts

Refer to Sub clause 5.3.1 and 5.3.2.1 (e) of SPEC : HP.

3.5.4.4 Panel finish

Refer to Sub clause 5.5.9.2 of SPEC : HP.

3.5.4.5 Bi-metallic corrosion

Refer to Sub clause 5.1 (d) of SPEC : HP.

3.5.4.6 Nuts, bolts, studs and washers

Nuts, bolts, studs and washers for incorporation in the plant shall confirm to the requirements of the appropriate approved standard. Bolts shall be of sufficient length that one thread shall show through the nut when in the fully tightened condition.

Washers, locking devices and anti-vibration arrangements shall be provided where necessary and shall be subject to the approval of the Engineer.

Where bolts pass through structural members, taper washers shall be fitted where necessary to ensure that no bending stress is caused in the bolt.

Nuts, bolts and screws incorporated in items of

plant shall be sherardised.

Where incorporated, items of plant and equipment which are submerged in water, nuts, bolts, screws and other fixings shall be made of nickel bearing steel.

3.5.4.7 Fabrics and wool

Fabrics, cork, paper and similar materials which are not subsequently to be protected by impregnation shall be treated with an approved fungicide. Sleeving and fabrics treated with linseed oil varnish shall not be used.

The use of organic materials shall be avoided as far as possible, but where these have to be used they shall be treated to make them fire-resistant and non-flame propagating.

The use of wood shall be avoided as far as possible. If used, woodwork shall be thoroughly seasoned approved hardwood which is resistant to fungal decay and free from shakes and warp, sap and wane, knots, faults and other blemishes. All woodwork shall be treated to protect it against damage by fire, moisture, fungus, bacterial or chemical attack, unless it is naturally resistant to those causes of deterioration. All joints in woodwork shall be dove-tailed or tongued and pinned. Metal fittings shall be of non-ferrous material. Adhesives shall be specially selected to ensure the use of types which are impervious to moisture. Synthetic resin cement only, shall be used for joining wood. Casein cement shall not be used.

3.5.5 Panel wiring

All panel and cubicle wiring shall be insulated with 1000 V grade to BS 6004 and BS 6500 (or such other standard as may be approved) or with other approved flame proof insulation. It shall be neatly and securely fixed to the panel in an approved manner with non-rustable cleats. The contractor will be responsible for leaving sufficient length of tails at each end of the multicore cables to

connect up to the terminal boards. He will also strip, insulate, ring through and tag the tails and will also seal the cable boxes. The Contractor shall be responsible for rechecking the individual cores and for the final connecting up and fitting of numbered ferrules. Unless otherwise approved, no insulate wire shall have less than 7 strands and each strand shall not be less than 0,75 mm diameter. If single conductor is approved for instrument wiring, annealed copper of circular cross section shall be used and the diameter of the copper shall not be less than 2 mm. There shall be no possibility of oil entering connection boxes used for cables or wiring. Wiring shall be carried out in a neat and systematic manner and securely fixed by insulated cleats or other approved methods, and arranged so that access to any apparatus or connections point is not impeded.

Where inter-panel wiring passes through panel side sheets etc., the numbers and letters used shall correspond with the appropriate wiring diagram and shall read from terminals outwards.

The wires shall not be jointed or broken into between terminal points.

Terminations for screw or stud terminals shall be of the claw washer pattern or equal, or of the crimped-on ring type, the latter being preferred. Terminations of stranded conductors to clamp type terminals shall be of the crimped-on solid rod type. Identification shall conform to Clause 3.4.2.

Wiring for future equipment shall be provided as far as possible and all wires shall be terminated.

Not more than one core of either internal or external wiring shall terminate on any outgoing terminal. Where duplication of terminal blocks is necessary, suitable solid bonding links shall be incorporated in the design of block selected.

Where required and at the Contractor's expense, samples of all wiring and terminations shall be submitted for approval within three months of the contract award date.

Each wiring fir instrument cases and to all apparatus shall

be insulated and coloured green. All wiring shall be arranged so that access to any apparatus or connection point is not impeded. Wiring for future equipment shall be secured as far as possible and no wire left with bare ends. Wiring carrying low-level d.c. signals shall be segregated from a.c. circuits and screened if recommended by the manufacturer of the associated instrument. The maximum potential between any two points within the panel shall not exceed 250 volts.

Any panel-mounted device to which connections are made by means of a plug and socket instead of a terminal block shall be wired in flexible cable of adequate rating between the "free" plug or socket and a fixed terminal block.

Identification ferrules shall be fitted at both ends of all wires not otherwise permanently identified, and the numbers or letters used shall correspond with the appropriate wiring diagram. The ferrules shall be of insulating material with permanent black characters on a glossy white or yellow background unaffected by oil and water. They shall be so arranged that they can be read logically from left to right when viewed normally.

Each wire connected to a stud-type or screw-type terminal in panel mounted equipment shall be terminated in a "Ross-Courtney" or crimped-on ring terminal.

All cubicle wiring shall, unless otherwise approved, conform to the following standard colour codes:-

Colour of Wire	Circuit particulars
Red, yellow and blue	Phase connections in current and voltage transformer circuits and in low voltage three phase auxiliary circuits.
Green	Neutral connections, whether earthed or unearthed, insulated earth wires.
Black	Connections in a.c single phase circuits.

Grey	Connections in d.c control circuits, these being connected in tripping relay coil circuits only to be provided with red ferrules marked "trip" in addition to wire number.
White	Connections in 50 volt d.c alarms circuits. Where 50 V d.c connections are carried out in 1/0.9 mm telephone cable, multicore coverings conforming to P&T Standards or equivalent may be used.

All control connections and instruments and relay wires shall be provided with numbered ferrules at each terminal. Groups of numbers on a single ferrule shall not be used. All circuit diagrams and detailed wiring diagrams shall be clearly marked with the numbers which are shown on the ferrules of the individual cores.

The same ferrule numbers shall not be used on wires in different circuits on the same panel. Corresponding wires on all panels shall gave identical numbers. Ferrules shall be of insulating material and shall be provided with a glossy finish to prevent the adhesion of dirt. They shall be clearly and durably marked and shall not be affected by damp or oil. Stranded wires shall be terminated with tin (not solder) "Ross Courtney" or other approved claw or crimped lugs, separate lugs being used for each suited to the size of the wire terminated. Alternatively, wires may be terminated in insertion type terminal blocks with pressure plates of an approved type. Wiring shall, in general, be accommodated on the sides of the cubicle and the wires for each circuit shall be separately grouped. Back-of-panel wiring shall be arranged so that access to the connecting stems of relays and other apparatus is not impeded. Wires shall not be joined or teed between terminal points and no terminal point or stem shall have more than two wires connected to it. Bus wires shall be fully insulated and run separately along top or bottom of the cubicle. Wherever practicable, all circuits in which the voltage exceeds 125 volts shall be kept physically separate from the remaining wiring. Where access is

from the rear, all wiring diagrams for control and relay panels shall be drawn as if viewed from the rear, and shall show the terminal boards and wiring exactly as arranged in service.
Multicore cable tails shall be so bound that each wire may be traced without difficulty to its associated cable. The spare cores of all multicore core cables shall be numbered and terminated at the top of the box, and the connections to a relay or control cubicle are continued in conduit and terminated in the cubicle. Where panels are mounted side by side to form a single suite, connections between the panels will be run in bus wiring by the Contractor.

3.6 Terminal boards

All terminal boards shall be mounted vertically at the sides of the cubicles in such a way as to give easy access to terminations and to enable ferrule numbers to be read without difficulty. Terminal boards shall not be less than 100 mm apart and shall be mounted at least 230 mm clear of the floor. Terminal boards shall be provided with stud terminals or insertion type terminals with pressure plate of an approved type. All connections shall be made to the front of the terminal boards. Current shall not be carried through the boards by the studs. Terminal boards shall have pairs of terminals for incoming and outgoing wires and not more than two wires shall be connected to any one terminal. Insulating barriers and the spacing between terminals shall be such as to give adequate protection while allowing easy access to terminals.

Covers of transparent insulating material shall be provided on terminal boards, the fixed portion of which shall be clearly labeled as to the function and voltage of circuits. No live metal shall be exposed at the back of the terminal boards. Where specified by the engineer, means shall be provided for terminating 1/0,9 mm telephone type conductors associated with the repeat alarm indications and remote control equipment by the use of special terminal blocks; such blocks shall be made up of pairs of terminals of which one shall be of the normal stud type for taking multi strand wire whilst the other shall be suitable for terminating telephone type cables cores by means of a soldered connection. Disconnecting links between pairs of terminals are not required. Adequate terminals shall be provided to permit the lead and return for all external devices to be carried in the same external cable, and to allow all active and non-active cores in the external cables to be terminated.

3.7 Equipment mounted on control board

3.7.1 Apparatus - General

All apparatus shall be of the best quality and the design and construction shall conform to the latest developments. All apparatus shall be clearly labeled with a combination of letters and/or numbers near them. These marks shall conform to the corresponding marks appearing on the wiring diagrams. All instruments, relays, switches, lamps, pushbuttons and the like shall be arranged in the cubicle in a neat, functional and logical manner.

Similar items shall be of the same type, style, pattern, or appearance throughout. Control and changeover selection switches for various functions shall be of the same style or appearance but with a handle of different shape for each specific function.

Instruments, controls and relays mounted on different panel sections but having similar functions shall be located in a physically similar position. Such equipment shall be mounted at a height not exceeding 2 000 mm and not less than 600 mm above floor level.
Apparatus located inside cubicles shall be mounted on the sides of the cubicles in such a way as to give free access to the panel wiring and terminals. Resistance boxes shall be mounted so that their adjustment screws are on a vertical and accessible face. All controls and equipment shall be flush mounted on the inside panel of the board.

3.7.2 Reliability of equipment

Instrumentation and control systems shall be so designed, manufactured and installed as to ensure the highest standards of operational reliability.

Apparatus mounted in panels shall be suitable for continuous operation at the maximum internal panel temperature expected in service and due account shall be taken of heat given off by other equipment. All electronic components shall be adequately rated, and circuits shall be designed so that change of component characteristics shall not affect plant performance. On the selection of transistorized equipment, special consideration shall be given to the effects of heat and the need for artificial cooling. The air temperature range within which such apparatus is designed to operate without effect on performance shall be

stated.

Where electronic units, such as amplifiers and oscillators, are incorporated in an instrument they shall be fully transistorized and constructed on printed-circuit boards which can be replaced without soldering. Deviations from these requirements shall be detailed in Annexure A and will be accepted only in respect of instruments of long established design and known reliability.

The standards of reliability for moving armature relays and electro-mechanical timers shall be not less than are specified in BS 5425, Part 1, for medium voltage contactors of Class III mechanical endurance, i.e. the number of no-load operations which can be made before it becomes necessary to replace mechanical parts shall be not less than 5 million and the number of on-load operations shall be not less than 250 000.

It is considered that solid-state devices are more likely to ensure the desired standards of reliability than electro-mechanical devices, although the letter is not precluded if they can be shown to have the order of reliability specified above.

All relays and timers, whether solid-state or not, shall be mounted on a plug-in base to facilitate replacement.

Routine maintenance and fault-finding in telemetry and computer equipment shall be facilitated by the provision of built-in diagnostic or self-checking systems. The following equipment shall be mounted on the board:

3.7.3 Main switch

3.7.3.1 General

Isolating links shall be provided on each panel to facilitate isolation of the a.c circuits to permit testing or other work on individual equipments on the panels without danger to other circuits.

3.7.3.2 MCB's

Where the full load current is less than 600 amps, the incoming main switch shall consist of at least a suitably rated Triple Pole and solid Neutral (TP&N) MCB of FW or other approved manufacture, of at least EH frame, manufactured in accordance with

SABS 156.

3.7.3.3 ACB's

Where the full load current exceeds 600 amps, the main incoming switch shall consist of a suitable rated, Triple Pole and solid Neutral, metal clad air circuit breaker (ACB) incorporating 'on', 'off' and 'earth' positions.

The ACB shall have a suitable certified breaking capacity and be fitted with over current releases in each pole, preferably fully magnetic in operation having inverse definite minimum time characteristics designed for the circuits.

The isolating switch shall be a quick break changeover type to isolate all conductors and it shall be possible to lock the switch in the isolated and earthed positions.

The labeling of fuses and links shall be to the approval of the Engineer. When required, approved code symbols shall be used on diagrams and on fuse and link labels.

Fusing of circuits shall be so arranged that, in the event of a fuse or fuses blowing, "sneak" circuits shall not occur and neither false indication nor operation shall result. In general, fuses shall be individual to each switchgear circuit or main function to be controlled and/or indicated. Tripping circuits shall not be provided with fuses.

3.7.4 Starter isolators

Each starter shall be complete with its own triple pole isolator. These shall be similar to those specified for the main switch, the type supplied depending on the full load current of the motor concerned.

3.7.5 Motor control equipment

3.7.5.1 General

If scheduled or specified in the Project

Specification, the control equipment for all motors associated with this Contract shall be supplied under this Contract.

The starters for all motors shall be of the contactor pattern with magnetically operated contractors, giving under voltage release protection.

The starters shall be applied with electro-magnetic overload relays, fitted with adjustable oil dashpot time lags and single phase protection.

With the approval of the Engineer, thermal overloads may be supplied as an alternative.

Contactors shall be of robust design, operate without undue noise and vibration and comply with BS 775 and BS 587)or such other standard as may be approved). Unless otherwise stated, they shall be of continuous rating, and mechanical duty Class III, and category A4 for a.c and D4 for d.c. operation. Enclosures shall be Type IP54 (dust and damp protecting) for contactors indoors and Type IP55 (hoseproof) for outdoor installation. Motor control gear shall have a continuous current rating of at least 50 per cent more than the full-load current of its associated motor and, unless otherwise approved, no motor control gear shall have a continuous rating of less than 25 amperes. Contactors shall be capable of making and breaking the starting current of the motor and of carrying this current without damage for a period of one minute. They shall also be capable of withstanding without damage the passage of the maximum fault MVA of the circuit until such time as the fault can be cleared by the operation of the back-up fuses. The Contractor shall submit for approval details of making, breaking and current carrying tests covering the control gear.

Contactors of the hold-in type shall be capable of operating satisfactorily without overheating for a period of 10 minutes if the supply voltage falls to two thirds normal. Contactors shall not chatter when operated at two thirds voltage, and at a frequency 10 per cent below normal.

All contactors shall be fitted with arc shields and magnetic blowouts, and all parts which may require renewal, adjustment or inspection shall be readily accessible. Contacts shall be of the self cleaning pattern and designed so as to prevent welding in. The Contractor shall give full details of any special features incorporated to achieve this.

Cast iron shall not be used for parts subject to mechanical stress, unless approved by the Engineer.
Thermal protective devices shall be so designed as to follow closely the characteristics of the motors with which they are associated.

Where two or more contactors are contained in the same cubicle they shall be separated by metal barriers and each contractor shall be provided with isolating devices. Normal access shall be provided at the front by means of hinged doors, but the construction shall be such that the rear panel of floor mounting cubicles can be removed. The cubicles shall be complete with "on" and "off" mechanical indicators, interlock isolators, fuses, locks, cable sealing boxes, bus bars, internal wiring, terminal boards and accessories. All copper connections shall be wrapped with two layers of half lap varnish cambric tape in addition to the major insulation provided for these connections, and all secondary wiring shall be so arranged and protected as to prevent its being damaged by arcing.

Each contactor equipment in the switchboard shall be so screened from adjacent units and current carrying parts, that it is possible to carry out, in safety, work on its outgoing cable whilst other contactor equipments remain alive and on load.

Each main circuit contactor shall be connected to the bus bars at the supply terminals through an isolating device which may be of the load making and breaking, or off-load type, but in either case shall be capable of withstanding without damage the passage of the maximum fault MVA if the

circuit until such time as the fault may be cleared by the operation of the back-up fuses. Isolating devices of the load-making and breaking type shall be electrically interlocked with the contactor, so that the action of the switch without prior tripping of the contact initiates the tripping of the contactor before the contacts of the isolating device open.

Contactors shall be complete with the necessary auxiliary contacts for interlocks, alarms and indication circuits and for switching off the cubicle heaters when the contactor is closed.

Isolating devices of the off-load type shall be mechanically interlocked with the contactor so that it is possible to open or close the device only when the contactor is open. Contactor equipment incorporating off-load isolating devices shall be provided with means for opening a welded-in contactor, and such means shall be operable from the outside of the contactor enclosures and shall not involve the use of tools.

The isolating devices shall interrupt all secondary circuits, but means shall be provided for temporarily reinstating the contactor control supply for testing purposes while the front cover of the door of the equipment is open. Where isolation is carried out by withdrawal, the contactor shall move easily and smoothly and provision shall be made for rigidly locating the contactor in the service, isolated and test position. Plug connections including those for auxiliary wiring shall be of substantial design and construction and shall be provided with self-aligning contacts. The design of the fixed portion of plug connections shall be such that access can be readily obtained for maintenance purposes.

Where isolators are provided in a common cubicle with the associated contactor, the contactor shall be mounted on a separately insulated panel, thus allowing the removal of the complete contactor panel with its associated relays etc., without disturbing the isolators.

Each starter shall be provided with an ammeter, "on" and "off" mechanical indicator, "start" and "stop" push buttons and when required by the engineer, a control selector switch for transferring the control of the starter from "local" to "automatic" or "remote" control.

3.7.5.2 Pushbuttons

Pushbuttons shall be coloured as follows:
START Green
STOP Red
All other buttons shall be black.

"Start" pushbuttons shall be effective only in selected circuits; primarily hand control circuits.

"Stop" pushbuttons for motors controlled by circuit-breakers may be arranged to close a circuit, and in this case, shall have an additional contact to break the circuit-breaker close circuit.

Emergency stop pushbuttons shall be provided and positioned in the immediate vicinity of the associated motor drive in all cases where:

1. there is no direct line of sight between the motor and the controlling starter, or
2. where the distance between the motor and the controlling starter exceeds 5 meters.

Emergency stop pushbuttons shall be connected in control circuits such that they are effective under all conditions, and shall have red mushroom headed pushes of the stay-put pattern. A deliberate reset action shall be required before the drive can be put back into service but re-setting of the pushbutton shall not restart the drive.

3.7.5.3 Operating coils

Where practicable, all fine wire operating coils and wire wound resistors shall be vacuum impregnated with an approved insulating varnish.

3.7.5.4 Class of intermittent duty

Unless otherwise approved or specified elsewhere, the rating of all motors and associated control equipment shall be Class 1 as specified in BS 775 and they shall be capable of up to thirty starts per hour equally spaced, and also two consecutive starts with the motors initially at approximately ambient temperature.

3.7.5.5 Direct-on-line starters

Motors rated at less than 7,5 kW shall, unless otherwise specified, be supplied with direct-on-line starters capable of at least 30 starts per hour.

3.7.5.6 Star delta starters

Motors rated between 8,0 kW and 75 kW shall be supplied with Star delta starters, provided the starting current does not exceed that prescribed by the supply authority.

3.7.5.7 Auto transformer starters

Where required by the supply authority, auto transformer starters shall be supplied.

3.7.5.8 Stator rotor starters

Where starting currents are such that the supply authority requires slip ring motors, automatic, air cooled, heavy duty, grid resistance, stator rotor starters shall be supplied.

The control gear shall be so arranged that the motor can only be started with the regulator in the starting position and shall automatically be returned to this position when the motor is switched off.

Unless otherwise specified, the run-up time to maximum speed of the motor and driven plant shall not exceed 10 seconds and, during starting, the line current shall not exceed full load current unless otherwise approved.

3.7.5.9 Solid state starters

Solid state starters will be considered by the Engineer provided they offer substantial advantages in reduced starting current but retain sufficient starting torgue to start the equipment satisfactorily. Starters shall be protected against phase loss, over-current, starting over-temperature, excessive starting time, fuse failure and under-voltage.

3.7.6 Instruments, gauges and meters

All instruments, gauges and meters shall be approved by the Engineer and those which perform similar duties shall be of uniform type and manufacture. They shall be flush pattern, dust and moisture proof and suitable for the environment in which they are installed. Where hinged covers are necessary, they shall be provided with locks. Indicating instruments shall be of the dial type fitted with zero adjuster externally accessible from the front, have no parallax error, and normal maximum reading at approximately 69% full scale. Dials shall be white with black scales and lettering not subject to fading. Scales shall be of such material that no peeling or discoloration will take place with age under humid conditions.

Ammeters and voltmeters shall be industrial grade accuracy to BS 5685. Ammeters shall be calibrated to 120 % of rated current. The overload capability shall be 10 x rated current for 1,0 seconds.

3.7.7 Indicating instruments

All indicating instruments shall be to BS 89, Industrial Grade, and shall be of approved type, make and size. Centre-pivot, flush instruments shall be provided unless otherwise specified or approved. They shall be of the dead-beat type and shall be capable of carrying their full-scale currents continuously without undue heating or impairing their accuracy. They shall have long, circular, clearly defined and indelibly marked scales of engraved or enameled metal and the pointers shall be of clean outline. The pointers and scales shall be to approval, and such that the scale is marked on a stepped section of the instrument face with the pointer operating in the recessed section to avoid the casting of shadows on the scale, and parallax effects. The markings on

the dials shall be restricted to the scale marketing. Instruments connected to double-ratio current transformers shall be provided with reversible scales. Instrument transformer ratios and makers' names shall not appear prominently on the dials but nay be marked in an approved position. Motor ammeter scales shall be marked with a red line to indicate the full load current. The glass covers of dials shall preferably be of non-reflecting glass. The instrument with associated circuits shall not be damages or have their accuracy impaired by the passage of fault current equivalent to 20 times full load current for not more than 0,5 sec. Through the primary of their corresponding instrument transformers. Approved means shall be provided for zero adjustment without dismantling the instrument or removing the instrument from the panel. The scales for all direct current instruments and of all alternating current indicating wattmeters shall be arranged so that the instruments will read 10 per cent of the full-scale reading below zero, and this part of the scale shall be marked in red. With reactive kVA meters and other duo-directional instruments, however, centre-zero scales shall be employed. Bus bar voltmeters shall be calibrated while hot. All voltage circuits to instruments shall be protected by a fuse on each pole of the circuit placed as close as possible to the instrument transformer terminal or, where instruments are direct-connected, as close as possible to the main connections. Except where main ammeters are triplicated, approved means shall be provided for connecting them to measure the current flowing in any one of the three phases. All instruments and apparatus shall be back connected and all instrument cases shall be earthed. Each starter shall be fitted with an ammeter with a dial not less than 75 mm square. The ammeter shall be of the pivot less, air damper, moving iron type. The ammeter shall be calibrated to at least twice full load current.

3.7.8 Hand-off-auto test switches

A hand-off-auto test switch shall be fitted to each starter.
Control selector switches shall be mounted and wired so as to facilitate the maintenance of contacts without the necessity for disconnecting wiring.

3.7.9 Hour meter

An hour meter of the digital type indicating the number of hours run by the particular drive shall be fitted for each motor. The maximum shall be at least 99999 hours, and shall be suitable for 240 V, single phase, 50 Hz, a.c. supply.

3.7.10 Pilot lights

All pilot lights on panels shall be transformer operated at 12 V with series dropping resistors. Green pilot lights shall be provided to indicate "starter closed". Red pilot lights shall be provided to indicate "circuit alive". Amber pilot lights shall, where required, be provided to indicate the operation of a protective device, which shall be of the manual reset type by means of an externally mounted push button. The minimum diameter of pilot lights shall be 25 mm. Neon or other approved lightning shall be used. Incandescent lamps are not acceptable.

Lamps shall be well ventilated and the design shall permit removal of lamp glasses and bulbs from the front of the unit.
A test button, which causes all indicating lamps to operate simultaneously shall be fitted to each panel.

3.7.11 Automatic duty selector

An automatic selector switch shall be installed on the main board which will ensure that the duty pump is changed every 48 hours. The rotation shall be such that each pump will in turn be No.1, No.2, etc., or the standby unit. It shall be possible to manually override this selector.

3.7.12 Power point

In each pump house one 15 amp single phase MCB, with 30 mA earth leakage unit, and a 16 amp switch socket suitable for three pin plugs in accordance with SABS 164 shall be provided. Where a separate lightni8ng sub-board is to be installed under a separate contract, a 30 amp double phase MCB shall be mounted on the main board to act as the main circuit breaker. Where no sub-board is specified, at least two single phase MCB's for the lightning circuits shall be provided.

3.7.13 Control transformers

Unless otherwise specified, all control circuit supplies for contactor starters shall be obtained from 1 110 volt 50 Hertz integral control transformer contained in the breaker or starter cubicle. In the case of multi-motor and composite boards comprising circuit-breakers and starters, one or more master control circuit transformers shall be provided for each section of

bus bars in the switchboard to feed a group of outgoing starters and/or outgoing breakers via bus wires in the board. Each control transformer shall be bus bar connected and be provided with isolation facilities, and primary and secondary HRC fuses. Transformers shall be of the double wound pattern and be provided with earth screen between primary and secondary windings. One end of the secondary winding shall be earthed.

3.7.14 Current transformers

Current transformers shall ne enclosed in chambers as shall be approved and their position in relation to the circuit breaker shall be approved by the Engineer. The primary windings shall be of the bar type unless otherwise approved and shall not, without special approval, have a short-circuit rating less than that of the associated circuit breaker. Unless otherwise approved, the section of the primary windings shall not be less than 100 mm². The precautions taken in the design of the wound type of transformer, to prevent the mechanical and thermal stresses set up on short-circuit causing a breakdown in the transformer, shall be as shown on the Contractor's drawings. The secondary winding of each set of current transformers shall be earthed. Current transformers shall be capable of withstanding for one minute without damage the effects of an accidental open circuit in the secondary circuit with full load flowing in the primary. All current transformers used only for energizing instruments shall have an accuracy not less than that specified in BS 3938 for Class 'C' transformers. The design, characteristics and construction of current transformers for protective gear circuits shall be to approval and shall comply with BS 3938. Each current transformer shall be of approved ratio and shall be capable of providing the necessary energy to operate the correlated protective devices and instruments. The method of securing the current transformers in position shall be such that undue pressure cannot be exerted on the transformer windings.

3.7.15 Alarm annunciators

Alarm functions shall be indicated on internally-illuminated annunciator units bearing appropriate legends, and arranged on the panel in groups to be agreed with the Engineer.

Each annunciator shall have provision for a number of spare ways for possible future alarms. It shall be as compact as possible without unnecessary decorative trim.

The alarm indication on each annunciator shall be logically arranged in a format to be agreed with the Engineer. The legend area of each indication shall not be more than 40 mm high and 75 mm wide. The wording of all legends shall be approved by the Engineer before manufacture.

"Alarm accept", "Lamp test" and "Alarm reset" push buttons shall be provided on or near to each annunciator.

A common audible alarm of approved type and intensity shall be mounted within the panel together with a muting switch for use during commissioning and testing.

3.7.16 Alarm system operation

Panel alarm annunciators and audible alarms shall operate as follows:

(i) When an alarm condition occurs, a light behind the appropriate legend shall flash on and off intermittently and the audible alarm shall sound.
(ii) On pressing the "alarm accept" push button, the audible alarm shall be silenced and the flashing light shall become steady. If not accepted manually, the alarm shall be accepted automatically two minutes after the condition, or any later condition arising within this period, occurs.
(iii) The alarm indication shall remain illuminated whether or not the alarm condition has returned to normal until the "alarm reset" push button has been operated, whereupon the light shall be extinguished if the fault condition no longer exists.
(iv) Operation of the "lamp test" push button shall cause all the alarm lamps to be illuminated simultaneously and the audible alarm to be sounded.
(v) The alarm system shall respond to any new condition that might arise while an existing condition is being indicated, whether accepted or not, and to any that might occur during a "lamp test" period. The alarm system shall be designed on the "fail safe" principle so that a fault in any circuit component causes an alarm to be given, and shall operate on a power supply not greater than 110 volts.

3.7.17 Interposing relays

Multi-contact interposing relays shall be incorporated into panel circuitry where only one pair of initiating contacts is provided for the operation of separate circuits performing different functions simultaneously, e.g. a control initiation with alarm annunciation and data logging. The relays shall be so connected that a failure in any one circuit shall have no effect on any other.

Independent relays shall be employed for this purpose, and the use of spare contacts on interface relays fitted within annunciator units or other secondary circuit equipment, or any other form of cascade operation in which the performance of one circuit is dependent on the correct operation of another, will not be accepted.

3.7.18 Bus bars and primary connections

All bus bars and primary connections shall be liberally rated for continuous operation. The mechanical and di-electric strengths of bus bar and connection supports shall be able to withstand the worst conditions of electrical surge which can occur on the installation.

Bus bars and primary connections shall be housed in air-insulated enclosures or be insulated and provided with suitable warning labels, which shall be arranged such that no direct access to or contact with live conductors is possible via slots or apertures. Suitable baffles shall be provided to prevent the accidental entry of tools, etc., whilst maintenance work is being carried out in the vicinity of the bus bar chambers.

The bus bars and primary connections shall have a short time rating not less than that of the associated switchgear.

The conductors on systems up to but not including 3 300 volts and above shall be otherwise adequately insulated or encapsulated.

The conductors on systems at 380 volts and up to 1 000 volts shall be air-insulated and phases identified by colour.

3.7.19 Safety arrangements

All terminals, connections, relays and other components which may be "Live" when front access doors are open shall be adequately screened. It shall not be possible to obtain access to an adjacent cubicle when any door is opened.

3.7.20 Power factor correction capacitors

Unless otherwise specified in the Project Specification, power factor correction capacitors shall be connected to each other motor rated at 15 kW or over, so as to be continuously and directly connected to the terminals of each motor. The capacitor rating shall be such that at a supply voltage 7½ % less than the nominal supply voltage, and at the specified duty point of the driven machine, the power factor of the motor load shall be not less than 0,95 lagging, provided that under no circumstances shall the KVAr rating of the capacitor exceed 85 % of the magnetizing KVAr load of the machine or be such that over voltages may be set up by the self-excitation of the machine. Capacitors shall be continuously rated fixed capacitors for indoor use. HRC fuses and effective discharge resistance shall be provided integral with each capacitor, and the arrangement and mounting of capacitors in the switchboard shall be such that they are well ventilated. Capacitors shall comply with BS 1650 or equivalent specification.

3.7.21 Instrument components

Iron and steel parts shall in general be painted or galvanized as appropriate in accordance with SPEC : HP. Indoor parts may alternatively have chromium or copper-nickel plating or other approved protective finish.

Small iron and steel parts (other than stainless steel) of all instruments and electrical equipment, the poles of electro-magnets and the metal parts of relays and mechanisms, shall be chromium or copper-nickel plated or have some other approved finish to prevent rust. Cores, etc., which are built up of laminations or cannot for any other reason be anti-rust treated, shall have all exposed parts thoroughly cleaned and shall be heavily enameled, lacquered or compounded.

3.8 Earthing

All switchboards, control panels, cubicles and racks shall be provided with a continuous copper earth bar having a section area of not less than that recommended in Appendix D of BS 162, placed at a convenient position near the bottom of the board or panel. No earth terminals shall be less than 50 mm². The cases of the various instruments, relays, etc. on the panels shall be connected to this earth bar by copper connections of section not less than 2,9 mm². All metal

parts other than those forming part of any electrical circuit shall be earthed in approved manner and all earthing terminals shall be of adequate dimensions. The connections from the earth terminals of separately mounted starters, terminal boxes and other equipment to the station earthing system shall be provided.

3.9 Recording instruments

All recording instruments shall be of approved type and shall conform with the requirements of BS 90. Unless otherwise specified, they shall have a chart speed of 25 mm per hour or 12,5 mm per hour as may be approved and a test speed of 150 mm per hour. They shall be complete with sufficient charts for one year's working. The driving mechanism shall be electrically wound with an approved escapement of the lever type with Brequet hair spring and shall incorporate an electrically wound clockwork reserve capable of maintaining accurate timekeeping for 24 hours after loss of supply.

3.10 Samples

The cost of supplying any samples of standard items of equipment shall be borne by the Contractor and may be incorporated in the Contract Works at the discretion of the Engineer.

4. PLANT.

4.1 Setting out

The Contractor may use any acceptable device to control the alignment and installation of electrical plant and equipment.

4.2 Temporary supports

The Contractor shall provide such temporary supports as are necessary, in the vicinity of the permanent supports, to ensure that electrical plant and equipment is installed true to level and alignment.

4.3 Handling and rigging

The mechanical plant and rigging equipment used by the Contractor for the handling and placing of electrical plant and equipment shall be such that no electric motor, switchgear, instrumentation, panel and control board is overstressed or damaged during any operation covered by the specification.

4.4 Testing

The Contractor shall provide all the necessary testing equipment for the performance of the tests given in 7.1.

5. INSTALLATION AND OPERATING REQUIREMENTS.

5.1 Working in the vicinity of electrical equipment

Any permanent fencing or other safeguards, required to be erected around electrical equipment, shall be completed as far as practicable before connection is made to the electricity supply, but where this is not practicable the Engineer may permit the use of temporary fencing or other safeguards.

If the work in the vicinity of electrical equipment has to be carried out after connection has been made to the electricity supply the Contractor:

1. shall put into operation a "Permit to work" system to the approval of the Engineer; and
2. shall comply with any "Permit to work" system approved by the Engineer.

7. TOLERANCES.

The tolerances specified in BS 4999 : Part 69 shall apply to all rotating electrical machinery.

8. TESTING/COMMISSIONING.

Where applicable, the terms of Sub clause 7.1 of SPEC : SU shall apply.

9. MEASUREMENT AND PAYMENT.

The terms of Clause 8 of SPEC : AT : General shall apply.

APPENDIX A. APPLICABLE STANDARDS

BS 89 Direct acting indicating electrical measuring instruments and their accessories
90 Direct acting electrical recording instruments and their accessories
162 Electric power switchgear and associated apparatus
587 Motor starters and controllers
775 Contactors

1650 Capacitors for connection to power-frequency systems
3938 Current transformers
4999 Part 20 : Classification of types of enclosure
4999 Part 69 : Tolerances
5424 Part 1 : Control gear : Contactors
5486 Part 1 : General requirements for factory built assemblies of switchgear
and control gear for voltages up to and including 1000 V a.c. and 1200 V d.c.

5685 Specification for electricity meters - Class 0.5, 1 and 2 single phase and
polyphase, single rate and multi-rate watt - hour meters
6004 PVC - insulated cables (non-armoured) for electric power and lightning
6231 PVC - insulated cables for switchgear and control gear wiring
6500 Insulated flexible cords

SABS 150 Polyvinyl chloride (PVC) - insulated electric cables and flexible cords
156 Moulded-case circuit-breakers
164 Two-pole and earthing-pin plugs and socket-outlets

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SPECIFICATION SU : ELECTRICAL MOTORS (1 kW to 450 kW)

Clause

3.1.14 Terminal boxes
3.1.15 Interchange ability
3.1.16 Rotation
3.1.17 Double shaft extensions
3.1.18 Mounting
3.1.19 Nameplates for motors
3.1.20 Couplings

3.2 Type of motor

3.2.1 Squirrel cage induction motors
3.2.2 Slip ring induction motors
3.2.3 Borehole submersible electric motors
3.2.4 Portable submersible motors

3.3 Corrosion protection

14. **PLANT**

4.1 General

15. **INSTALLATION AND OPERATING REQUIREMENTS**

5.1 Insulation resistance
5.2 Borehole submersible electric motors
5.3 Erection and commissioning

5.3.1 Erection
5.3.2 Alignment

5.4 Drawings and information for approval

5.5 Inspection of manufactured equipment

5.5.1 General
5.5.2 Bearing Inspection

16. **TOLERANCES**

17. **TESTING/COMMISSIONING**

7.1 Works tests
7.2 Type tests
7.3 Routine tests
7.4 Test certificates

7.5 Cast iron
7.6 Noise level tests

18. MEASUREMENT AND PAYMENT

APPENDIX A. APPLICABLE STANDARDS

SPECIFICATION SU : ELECTRICAL MOTORS (1 kW to 450 kW)

1. SCOPE

This specification deals with constant speed, low voltage (up to and incl. 1 000 V), a.c., induction motors and in general terms, for variable speed motors from 1 kW up to 450 kW. Details of the motor and motor controls for variable speed motors are specified in the Project Specification.

2. INTERPRETATIONS

2.1 References

2.1.1 Supporting Specification

Where this specification is required for a project, the following specifications shall, inter alia, form part of the contract document :

(a)	Project Specification	
(b)	SPEC AT	:GENERAL
(c)	SPEC HP	:CORROSION PROTECTION OF STEEL AND CAST IRON FOR WATER AND WASTEWATER FACILITIES
(d)	SPEC PB	:WATER PUMPS : MEDIUM PRESSURE (if applicable)
(e)	SPEC PD	:WASTEWATER PUMPS (if applicable)

2.2 Application

This specification contains clauses that are generally applicable to mechanical and electrical engineering construction. Interpretations of and modifications to this specification are set out in Portion 2 of the project specification which precedes this specification in a contract document.

2.3 Definitions

For the purpose of this specification, the definitions and abbreviations given in 2.1.1 (b) and (c) and the following abbreviations shall apply:

a.c. Alternating current
d.c. Direct current
Hz Hertz
IEC International Electrotechnical Commission
ICA A symbol which, followed by two characteristics numerals, signifies the system of cooling and ventilating rotating electrical machinery as defined in BS 4999, Part 21.
kW Kilowatt
RTD Resistance temperature detector
TEFC Totally enclosed fan cooled
V Volt

3. DESIGN, MATERIALS AND MANUFACTURE.

3.1 Electric motors

3.1.1 General

Motors shall be designed and manufactured in accordance with this specification in the first instance, SABS 948 in the second instance and in the third instance other applicable standards as follows :

BS 2757	BS 4362
BS 96	BS 4999
BS 466	BS 5000
IEC 85	BS 587

Unless otherwise stated, all motors shall be wound for a three-phase, 50 Hertz, 380 volt, alternating current (a.c) supply.

Constant speed a.c. motors shall be of the induction type suitable for operation on a 3 phase supply and shall be capable of operating continuously, at rated torque, at any voltage between ± 5 per cent of the nominal value, nominal frequency ± 2 Hertz, and the altitude specified.

Variable speed motors shall be of a type to be approved by the Engineer and shall confirm to the details as stated in the tender.

Where possible, motor dimensions shall comply with SABS 948,

ICE Publ. 72-1 and 72-2, BS 4999 and BS 5000 Part 17.

Unless otherwise specified in the Project Specification, all motors of 110 kW rating or less shall be totally enclosed, fan cooled, and larger motors shall be standard protected, drip-proof.

3.1.2 Ratings

Motors shall have continuous maximum ratings not less than the following :

20 kW or under, not less than 33% in excess of the maximum likely to be drawn by the pumps within the operating range.

Over 20 kW and up to 50 kW, not less than 25% in excess of the maximum likely to be drawn by the pumps within the operating range.

Over 50 kW and up to 100 kW, not less than 15% in excess of the maximum likely to be drawn by the pumps within the operating range.

Over 100 kW, not less than 10% in excess of the maximum likely to be drawn by the pumps within the operating range.

Where operation at other than continuous running duty is required (i.e. short time or intermittent periods as for valve actuators, hoists, etc), motors shall have appropriate rating in respect of output, duty and starting class.

3.1.3 Windings

Windings shall be impregnated to render them non-hygroscopic and oil resistant, and shall be braced to prevent any movement of the coils during all conditions of service.

Motors operating in an ambient temperature range not exceeding -10º to + 40ºC with a 24 hour maximum ambient temperature of +35ºC with 95% relative humidity shall be insulated to BS 2757 Class F. Where the motor temperature may be appreciably affected by conducted heat, motors shall be designed to have a Class B temperature rise but shall have Class F insulation. Stator windings shall be delta connected for all motors of 3 kW and larger. The end of each phase winding shall be brought out to the stator terminal box.

Unless otherwise specified, the maximum continuous working temperatures of motors shall be as specified by SABS 948, BS 4999

Part 32 and BS 5000 Part 99 applying to the temperature rise of the windings, as determined by their increase in resistance.

The following maxima shall apply :

Class	Rise, ºC	Ambient, ºC	Total, ºC
B	80	40	120
F	100	40	140
H	125	40	165

3.1.4 Enclosures

Enclosures for indoor use shall afford a degree of mechanical protection not less than IP 44 to BS 4999 Part 20 and where applicable SABS 948, and be self-ventilating.

All motors required to operate out-of-doors shall be totally enclosed fan cooled with mechanical protection not less than IP54.
Cooling arrangements shall be in accordance with SABS 948, IEC 34-6 and BS 4999, and shall comprise two separate air circuits, to Code IC 01 41.

All motors shall be provided with suitable means of breathing and drainage to prevent accumulation of condensation.

3.1.5 Bearings

(a) Type

Bearings shall be plain ball or roller type as appropriate. Vertical shafts shall have approved thrust and guide bearings. Grease-lubricated bearings shall be sealed or re-greasable.

Ball or roller bearings shall be loaded conservatively in order that the grease may be renewed at intervals of not less than one year and they shall not be equipped with grease nipples or cups. If these are supplied, they shall be replaced with threaded plugs.

Care shall be taken that bearings are sealed properly in order to prevent ingress of bearing lubricant into windings and cores. For purposes of maintenance, end-shield bearings are preferred. A minimum bearing life of 40 000 hours is required. Unless otherwise approved in writing, motor bearings shall be designed to allow the motor to run indefinitely when uncoupled from the driven machine.

Sub-clauses 3.3.12.1, 3.3.12.3, and 3.3.12.4 of SPEC/PB shall apply where relevant.

(d) Insulation

When necessary, to prevent damage by any shaft currents which may be produced, the bearings and their lubricating and cooling systems shall be insulated from the bedplate or frame.

(f) Flow indicator

A flow indicator and/or pressure switch shall be provided on forced lubricating systems to indicate failure of the system. Adjustable alarm and cut-out contacts shall be provided.

(e) Thermometers

Dial type bearing thermometers with adjustable alarm and cut-out contacts shall be provided as detailed in the Project Specification. Refer also to 3.1.11. Where such thermometers are also provided on the pump, they shall be of the same type and manufacture.

3.1.6 Anti-condensation heaters

Anti-condensation heaters shall be provided on all motors. The heaters shall be suitable for use on a single phase 220 Volt 50 Hertz a.c. supply and wired to a separate terminal box.

Unless otherwise specified, anti-condensation heaters shall operate continuously whenever the motor is at standstill.

3.1.7 Earthing

All motors shall be provided with a machined boss tapped for a bolt of suitable size for earthing purposes.

3.1.8 Power factor correction

The motor control equipment will incorporate capacitors for power factor correction which will be connected to the control gear via cables and fuses. The motors shall be capable of meeting all the requirements of these specifications with the capacitors connected, as well as with one or more of the capacitors disconnected. The motor shall exhibit no adverse effects when starting or running continuously at any load up to the name plate rating with one or more of the

capacitors disconnected.

The Contractor shall liaise with, and make all necessary data available to the electrical contractor, to enable the capacitors to be correctly sized.

Whether or not the capacitors and/or the motor control gear is included in this Contract is stated in the Project Specification.

3.1.9 Noise levels

Equipment or a combination of equipment shall not exceed the maximum noise limits in decibels, in each octave band of the 85 dBA sound pressure level as given below.

Frequency, Hz	63	125	250	500	1 000	2 000	4 000	8 000
dBA	104	94	87	92	79	78	78	80

Measurements of equipment and equipment train sound pressure levels shall be taken at a horizontal distance of 1 m from all major surfaces and at a height of 2 m above the equipment. Sound pressure measurement procedures shall be guided by the provisions of SABS 083 and as applicable of ANSI SI.1 : "Physical Measurement of Sound." (Alt. Refer to BS 4999, Part 51 Test Method II.)

3.1.10 Balance and critical speed

Motors and couplings shall be accurately and efficiently balanced statically and dynamically so that there will be no unbalanced end thrust, when either new or worn, and to eliminate noise nd vibration when running. Where end thrust arises, adequate long-wearing thrust bearings shall be provided. Dynamic balancing shall be done by the removal of parent metal in a manner which does not affect the structural strength of the rotating element. The use of solder or similar deposits for balancing will not be accepted. The operating speed of rotating elements shall be below, and as far removed as possible from, the critical resonant speeds thereof.

Operating vibration levels of all rotating equipment installed shall be to the satisfaction of the Engineer. Strict attention shall be paid to this aspect of the installation.

Peak-to-peak vibration limits shall apply to all horizontal drive machines with anti-friction bearings. These limits shall apply to

cover rotor vibration during shop tests, and after installation with the associated pipe work, and shall be measured at rated speed and at a capacity of within 10 per cent of the rated capacity.

Peak-to-peak vibration limits shall be in accordance with SABS 948, Table 25 or the relevant part of BS 4999.

Notwithstanding the acceptance of the vibration limits during the works test, the Engineer reserves the right to call for a vibration test on the installed equipment, if he considers it necessary, and the Contractor shall be responsible for reducing the vibrations to within the specified peaks.

3.1.11 Temperature detectors

All motors > 50 kW and < 150kW rating shall have, embedded in their stator windings, one PTC thermistor per phase suitable for Class B temperature rise. All motors rated 150 kW and over shall have, embedded in their stator windings and bearings, one platinum RTD of type PT100 per phase and per bearing. The bearing detectors shall touch the outer bearing race, shall be spring loaded and shall be of the screw type. The characteristics of these temperature detectors shall match the thermal limitations of the motor electrical insulation.

The wires of all detectors shall be wired to a terminal strip in a suitable terminal box.

3.1.12 Cast Iron

Cast iron shall be to BS 1452, Grade 14, or better.

3.1.13 Mild steel

Mild steel plate for fabricated parts shall be of weldable quality in accordance with BS 4360. No welding, burning in, filling, plugging up or metal deposition to correct defects in any component will be permitted, unless agreed to by the Engineer, in writing, following an inspection of the defect.

3.1.14 Terminal boxes

The terminal box for the supply cables shall be suitable for the cables specified and shall be oversized. It shall have a removable cover and gland plate. The degree of protection shall not be less than IP 55. (Hoseproof)

Cable outlets shall be capable of pointing to any four directions at 90 degree intervals.

Heaters and embedded temperature detectors shall be wired up to separate secondary terminal boxes. These boxes shall be suitable for an armoured multi-core cable and shall be oversized.

All terminals shall be properly and permanently marked for easy identification.

3.1.15 Interchangeability

All similar parts shall be made accurately to dimensions, and shall be interchangeable with each other, so that a spare part, or any part of another similar motor, can be used satisfactorily in the relevant position on a motor without recourse to additional machining or filling.

3.1.16 Rotation

The standard direction of rotation shall be clockwise looking on the shaft, as required by SABS 948.

All a.c. motors shall be capable of having their direction of rotation reversed, merely by interchanging the supply leads. A.c. motors fitted with unidirectional fans, and therefore not capable of being easily reversed, shall where necessary be supplied with a double-ended shaft, and the holding-down bolt holes shall be symmetrical about both centre lines. This will permit the motor to be rotated through 180 degrees and coupled up to the load, giving an opposite drive. The above arrangement also requires that two motor terminal boxes are provided diametrically opposite each other. The correct direction of rotation of a unidirectional motor shall be indicated in a permanent manner on the frame.

The normal rotation of the motors shall be co-ordinated by the Contractor with the supplier of the driven equipment.

3.1.17 Double shaft extensions

The unused shaft extensions of a double-ended shaft motor shall be covered with an approved rust preventative after the motor is commissioned. A suitable cover shall be provided for

the unused bare shaft extension.

3.1.18 Mounting

The motors shall be mounted as required by the driven equipment supplied.

Horizontally mounted motors shall be mounted on a common base-plate with the driven equipment. When uncoupled from the load, it shall be possible to lift the motor clear without withdrawing the rotor and with the minimum amount of dismantling.

3.1.19 Nameplates for motors

The nameplates shall be made of corrosion-resistant metal and shall be permanently attached to the motor.

In addition to the information required by SABS 948 the following shall also be marked on the nameplates of motors $\geq$ 110 kW:

Year of manufacture
The order number
Total mass of motor in kg
Diagram indicating the number, type and positions of heaters and temperature detectors
Bearing type and sizes
Bearing grease interval or bearing replacement interval where pre-packed bearings are used

3.1.20 Couplings

Refer to Sub clause 3.3.15 of SPEC : PB, or Sub clause 3.2.13 of
SPEC : PD as relevant.

3.2 Type of motor

3.2.1 Squirrel cage induction motors

Squirrel cage induction motors shall be suitable for direct-on-line starting at full voltage. The starting current of motors shall not exceed the limits specified in SABS 948. For two speed motors, the starting current shall not exceed six times the full load current of the high

speed
rating. All motors shall be capable of starting against the associated load
with a minimum accelerating torque of not less than 5 per cent of full
load torque when the voltage at the motor terminals during starting is
reduced to 80 per cent of the nominal value.

3.2.2 Slip ring induction motors

The slip ring and brushgear shall be separately ventilated; brush dust shall not be drawn into the machine windings. The brushgear shall be of substantial design constructed with a view to minimizing maintenance. Brush holders shall be designed so that adjustment of brush pressure are easily made and so that brushes can be easily removed and replaced. Removable covers shall be fitted to provide safe and easy access to the brush gear.

3.2.3 The motors shall be of the three phase squirrel cage wet type suitable for a 380 V, 3 phase, 50 Hz, a.c. supply. The motor casing shall be of steel double surface protected. The bolts and nuts shall be 316 stainless steel. The stator windings shall be completely surrounded by water. The insulation shall be very reliable, as thin as practicable, and manufactured in either polyamide or polyethylene. The resistance shall be at least 100 megohms and shall be tested at 2 x Uop + 1000 V. (Uop = Operating potential). Unless otherwise specified the motor shall be wired for direct-on-line starting.

The connections between the single windings shall be absolutely watertight.

The stator and rotor shall have special protection against corrosion.

The two leads from each thermistor element (six leads per motor) shall be separately brought out to one terminal box on the outside of the motor where the three thermistors shall be connected in series.

The bearings shall be of the journal type made of bronze or rubber adequately sized for the motor to operate in a vertical position to take the axial thrust and shall be water-lubricated.

The thrust bearing shall be made of special synthetic material and shall have mechanical and electrical properties of at least 316 stainless steel.

The motor shall be protected against sand and dirt by means of a mechanical seal in the coupling casing. The shaft shall be of at least 316 stainless steel.

To compensate for change in volume with different temperature in the lower part of the motor, compensating devices shall be fitted.

The pump and the motor shall be direct coupled.

3.2.4 Portable submersible motors

The stator shall be designed at least to temperature Class F (140ºC). The insulation material employed shall be extra moisture-resistant. At least two thermo contacts arranged in series shall be embedded in the stator windings to interrupt the control circuit and switch off the motor in the event of overheating. All motors 45 kW and over shall be sensed by one thermistor on each of the three phases. The temperature of the lower motor bearing shall also be sensed by a thermistor. A leakage detector shall also be fitted to the stator casing. All three systems shall be connected to an external monitoring unit, in which over temperature of the motor excess bearing temperatures or leakage shall cause the motor to trip and trigger an alarm.

The motor shall be completely sealed by an oil bath lubricated, double, self-adjusting, mechanical seal on the shaft. The seal shall preferably be of tungsten carbide or other material possessing great resistance to abrasion (refer to Sub clause 3.3.14 of Spec: PB or Sub clause 3.2.11 Spec T/PD, whichever is relevant). The motor enclosure shall be at least IP68 and the cable entry shall be triple sealed.

3.3 Corrosion protection

Painting of the motors shall be in accordance with Sub clause 5.5.6 of SPEC: HP for motors specified in 3.2.1 and 3.2.2. The motors specified in 3.2.3 and 3.2.4 shall either be made of non-corrodible materials, or shall be painted in accordance with Sub clause 5.5.1 (b) of SPEC : HP.

6. PLANT

4.1 General

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

7. INSTALLATION AND OPERATING REQUIREMENTS.

5.1 Insulation resistance

Before energizing any of the motors covered by this Specification for the purpose of commissioning, the Contractor shall measure the insulation resistance of each motor between phases and to casing by means of a 500 Volt "megger" instrument and the values shall be recorded and forwarded to the Engineer for information. If any of the readings for a particular motor are lower than 1,5 megohms that motor shall not be energized until it has been dried out by the Contractor by a method to the Engineer's prior approval. Until the lowest of the insulation resistance measurements on that motor exceed 1,5 megohms the motor shall not be energized.

The method adopted for drying-out shall be by applying heat, preferably by circulating current through the windings or, alternatively, by means of space heaters located in and around the machine.

Insulation resistance measurements and temperature readings shall be taken regularly every half hour at the start of dry-out until the motor attains an even temperature and thereafter every hour. The characteristics dry-out curve of insulation resistance versus temperature shall be plotted and dry-out may be considered complete four hours after the resistance readings have started to rise from the steady minimum value, providing that the winding temperatures have remained steady during this period.

All equipment, and the personnel required for the drying-out operation, shall be provided by the Contractor. The onus remains on the Contractor to satisfy himself that a motor is dry before it is connected to the supply. Any motor which fails as a result of being commissioned in a damp condition shall be repaired free of charge by the Contractor.

The Contractor shall liaise with the contractor commissioning the motor control equipment.

5.2 Borehole submersible electric motors

The motor shall be filled with clean filtered water as part of the installing operation.

5.3 Erection and commissioning

5.3.1 Erection

Where practicable, motors of 110 kW or larger shall be erected by the motor supplier. Care shall be taken to ensure that adequate tolerance margins are made available to ensure interchangeability with replacement motors. In particular a minimum of 10 mm of packers shall be provided under the motor frame of motor bed-plate to allow for adjustments in height.

Before holding-down bolts are grouted in, the motor shall be lined up and the bolts shall be properly centered in the hole of the bed-plate.

The Contractor shall satisfy himself that the motors are properly installed, aligned and sufficiently protected, and shall check the settings of all motor protection gear before any motor is switched on.

The Engineer shall be notified at least 7 days in advance of any commissioning or testing to enable him to be present.

5.3.2 Alignment

After erection, the alignment of the half-coupling between the motor and the driven machine shall be measured. In the case of pedestal bearing motor, the air gap clearance between the rotor and the stator shall also be measured. A record shall be kept of these figures and they shall be submitted to the Engineer for approval.

A horizontal sleeve bearing or limited end-float roller bearing motor shall be run uncoupled from its load to ensure that it rotates at the axial position indicated on the shaft and that the rotor is free to move to either side of this position. Particular attention shall be paid to ensure that the free running position and the rotor end-float are in agreement with the axial movement of the flexible coupling.

Refer also to Sub clause 5.1.1 of SPEC: PB or SPEC: PD as relevant.

5.4 Drawings and information for approval

The following drawings and information shall be submitted for approval before manufacture of motors of 150 kW or larger commences:

1. Dimensioned outline and required foundation drawings of the motors. (Shaft diameter, shaft height and motor mass to be clearly shown).
2. Cross-sectional dimensioned drawings of the cable boxes.
3. Detailed drawings of the motor base plate showing full constructional details with dimensions.

5.5 Inspection of manufactured equipment

5.5.1 General

The Engineer, or his appointed representative, reserves the right to inspect the motors or associated parts at any stage of manufacture.

The Contractor shall ascertain whether inspection is required and the Contractor shall then give the Engineer not less than seven days notice of when the inspection may be undertaken.

5.5.2 Bearing Inspection

Motors having ball/roller bearings shall be inspected by the Engineer. The grease shall be examined to ensure that it is not hard. Providing that no roughness is felt when the shaft is rotated by hand, and that the motor runs without undue noise or vibration, the bearing will be considered acceptable. Should the bearings fail or exhibit symptoms of brinelling during the guarantee period, they shall be changed by the Contractor, free of charge, without delay.

10. TOLERANCES

The tolerances specified in BS 4999 : Part 69 shall apply, where relevant.

11. TESTING/COMMISSIONING

7.1 Works tests

Motors shall be tested at the maker's works, and test certificates shall be endorsed to the effect that the motors are properly balanced and

free from vibration and comply where applicable with BS 5000 Part 99. Tests shall include a locked rotor test to establish the maximum starting current.

7.2 Type tests

Type test certificates for identical motors will be acceptable in lieu of these tests for motors smaller than 59 kW. Should type tests certificates for motors smaller than 50 kW not be available then the first motor of each size manufactured shall be tested. All motors larger than 150 kW shall be fully performance tested as specified in this specification. At least one motor in four of every type of 50 kW and up to 150 kW shall be tested for temperature rise, efficiency and pull-out torque.

The measurement of the temperature rise of the stator windings of the motors shall be by the increase in resistance method.

In addition to the type test specified in SABS 948 the following shall be carried out:

1. Vibration test : The amplitude of vibration (peak to peak) is to be measured in micrometers.
2. Efficiency Test : The efficiency shall be measured for full load and rated duty load.
3. Temperature detector readings shall be taken at all intervals of test.

7.3 Routine tests

The following test shall be carried out in addition to the routine test specified in SABS 948.

All the resistances of temperature detectors and heaters shall be measured.

7.4 Test Certificates

Four copies of all test certificates, showing the results of all tests performed, shall be supplied at a date not later than the delivery date of the motors.

7.5 Cast iron
CI shall be tested in accordance with BS 1452.

7.6 Noise level tests

Refer to 3.1.9.

12. MEASUREMENT AND PAYMENT

8.1 General

Measurement and payment shall be in accordance with Clause 8 of SPEC : AT.

APPENDIX A. APPLICABLE STANDARDS

ANSI S1.1		Physical measurement of sound
BS 96		Carbon brushes (parallel-sided) for use on Commutator and slip-ring machines.
BS 466		Specification for power-driven overhead travelling cranes, semi-goliath and goliath cranes for general use.
BS 587		Motor starters and controllers
BS 2757		Classification of insulating materials for electrical machinery and apparatus on the basis of thermal stability in service.
BS 4362		Rotating electrical machinery
4999	Part 20:	Classification of types of enclosure
	Part 21:	Classification of methods of cooling
	Part 32:	Limits of temperature rise and methods of temperature measurements
	Part 69:	Tolerances
5000	Part 99:	Machines for miscellaneous applications
	Part 17:	Machines for flameproof enclosure
	Part 11:	Small-power electric motors and generators
IEC 85		Thermal evaluation and classification of electrical insulation
SABS 948		Three-phase induction motors

SPECIFICATION T/AT : GENERAL

Contents

SPECIFICATION T/AT : GENERAL

1. SCOPE

This specification covers the procedures and requirements for the supply, delivery, installation, testing and commissioning of mechanical and electrical equipment, that are generally applicable to all mechanical and electrical construction works forming part of civil engineering construction works.

NOTE

b) Terminology used throughout the standard specifications is explained because, in terms of the conditions of contract, the Employer, the Contractor, and the Engineer have certain rights and obligations which can be exercised most equitably when all parties have a clear understanding of the operations that are covered by each item in the schedule of quantities.

b) The standards referred to in the specification are listed in Appendix A.

10. INTERPRETATIONS

2.1 Application

This specification contains clauses that are generally applicable to mechanical and electrical works forming part of civil engineering construction works. Interpretation and variations of this specification are set out in Portion 2 of the Project Specification which precedes this specification in a contract document.

2.2 Applicable edition of standards

Unless a specific edition is specified (see the List of Applicable Specifications), each standard referred to in a standard specification shall be deemed to be the latest edition, including all amendments issued by the relevant body, published 28 days or more before the closing date for the receipt of tenders.

2.3 Definitions

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

General

Acceptable/Approved (Approval). Acceptable to /approved (approval) by the Engineer.
Act No 6. Machinery and Occupational Safety Act No 6 of 1983, as amended and including any regulations made thereunder.
Adequate. Adequate in the opinion of the Engineer.
Agreed. Agreed in writing.
As detailed. As detailed on drawings.
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.
Indicated. Indicated in or reasonably to be inferred from the contract, or indicated by the Engineer in writing.
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.

Tolerances

Deviation. The difference between the actual (i.e. measured) size or position and the specified size or position.
Permissible deviation (PD). The specified limit(s) of deviation (see Clause 6).
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.

Measurement and payment

Schedule. The schedule of quantities.
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.

2.4 Abbreviations

For the purposes of this specification the following abbreviations shall apply and shall have the meanings given :

a. Abbreviations relating to standard documents.

AISI :	American Iron and Steel Institution
ANSI :	American National Standards Institute
API :	American Petroleum Institute
ASME :	American Society of Mechanical Engineers
ASTM :	American Society for Testing and Materials
AWWA :	American Waterworks Association
BS :	British Standard
CP :	British Standard Code of Practice
GCC :	"General Conditions of Contract" as bound in the Contract documents
IEC :	International Electrotechnical Commission
ISO :	International Standards Organisation
SABS :	South African Bureau of Standards
SIS :	Swedish Institute of Standards

b. Other abbreviations

ADWF :	Average dry weather flow
AWWF :	Average wet weather flow
CSIR :	Council for Scientific and Industrial Research
DDL :	Draw-down level
FSL :	Full-supply level
HFL :	High-flood level
HWOST :	High water ordinary spring tide
IL :	Invert level
LWOST :	Low water ordinary spring tide
MSL :	Mean sea level
NGL :	Natural ground level
PD :	Permissible deviation

PWWF : Peak wet weather flow
RL : Reduced level (relative to specified datum level)

2.5 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.

2.6 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.

2.7 Specification drawings

Where reference by number to a specification drawing is used in place of a written requirement, the drawing shall be deemed to be the drawing that bears that number and forms part of the specification.

2.8 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 stated in the relevant subclause of Clause 8 of the applicable standard specification or in the measurement and payment clause of the Project Specification, in addition to the cost to the Contractor of carrying out such ancillary and associated activities as the Contractor deems necessary for the completion of the Works in accordance with the said specifications, the conditions of contract, and the drawings.

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.

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

3.1 Standards

The materials and workmanship throughout shall be of the highest quality generally accepted in the manufacturing and/or construction industry, as applicable, and consistent with the type of work to be executed under this Contract. 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. If material carrying a relevant standard mark is not available the Contractor shall obtain a certificate stating that the items comply with the appropriate standard.

3.2 Machinery and Occupational Safety Act

All apparatus and material supplied and all work carried out shall comply in all respects with the Machinery and Occupational Safety Act No. 6 of 1983, as amended.

3.3 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 - SABS 0142.
b. The Post Office Act No 44.
c. The Standard Electricity Supply By-Laws of Local Authorities and appropriate additional By-Laws or Regulations.

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

Unless otherwise specified, the Contractor shall supply and deliver all

holding down bolts, pipes and other metal work that are to be concreted in.

3.5 Packing and crating

3.5.1 Packaging and corrosion protection

The Contractor shall pack equipment for storage and/or delivery in soundly constructed crates or other packages fitted with removable lids and openings for inspection and maintenance. All parts of the equipment prior to packaging shall have been thoroughly greased, painted or otherwise protected to preclude corrosion during storage.

3.5.2 Small items

Fixing bolts, lugs, brackets and the like shall be packaged separately for each item of equipment and a schedule of contents shall be included inside each such package.

3.5.3 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.

3.5.4 Ownership of packaging

Packing cases and packing material shall be and remain the property of the Employer except where the Contractor delivers to Site in his own vehicle, unloads, installs and commissions.

3.6 Consignment

The Contractor shall submit to the Engineer an advice note in duplicate immediately any consignment of goods ordered has been dispatched.

Such advice note shall fully describe the goods so dispatched and shall state the date of dispatch and provide full information of the anticipated date of arrival at the point of delivery. If the goods are to be dispatched by sea the date of arrival at a South African port and the name of the ship shall be stated. The Contractor shall remain responsible until the goods are delivered to the delivery point stated in the Project Specification.

3.7 Delivery of goods

3.7.1 Items to be concreted in by others

Items such as holding down bolts, pipes, etc. that are to be cast in concrete by others (see 3.4, 3.5.2, 501(a) and 5.2.2(a)) shall be delivered to the relevant contractor on the Site well ahead of the dates agreed in terms of 5.3.1(b) and 5.3.2.

3.7.2 Notice of intention, and authorization of delivery

Except as provided for in 3.7.1, shortly before the tendered delivery date(s) as computed from the delivery periods given in the Appendix to the Tender or, in the case of anticipated delay, as soon as practicable, the Contractor shall give notice to the Engineer that goods to be supplied are ready or are about to be ready for delivery (as tendered). The Engineer will thereafter give the Contractor notice either : -

a) that delivery at the point stated in the Project Specification is authorised, or
b) that in his opinion physical delivery to the point stated in the Project Specification is temporarily inadvisable and that the matter is to be dealt with under 3.7.3.

The Engineer may substitute notice given under (a) with notice given under (b) and vice versa provided that the Contractor has not already dealt with the goods as contemplated in notice previously given under either (a) or (b) above.

3.7.3 Interim Storage

3.7.3.1 General

If the Engineer gives notice under 3.7.2(b) that physical delivery to the point stated in the Project Specification is temporarily inadvisable, delivery shall be delayed until authorised 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 (see 3.7.3.4), 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 (see also 3.7.3.3),

   or

b) order the Contractor to store the goods for the Employer in suitable premises provided by the Contractor and approved for the purpose by the Engineer, in which event the Contractor shall so store the goods for the Employer at the Contractor's risk.

3.7.3.2 Labelling and packing

When any goods are stored in accordance with orders given by the Engineer under 3.7.3.1(a) or (b), the Contractor shall -

a) label and mark the goods or the packaging or crates in which they are

packed so as to identify the goods as the property of the Employer;

b) be responsible for packing such goods, as specified in 3.5.1, so as to ensure that no deterioration thereto takes place whilst the goods are in storage and shall be fully responsible for making good at his own expense, to the satisfaction of the Engineer, any deterioration or damage which, in the opinion of the Engineer arises from any cause other than the fault of the Employer (or its servants) and for the purposes of this subclause, any opinion or decision of the Engineer in regard to the question of the fault or otherwise of the Employer or its servants shall be final and binding on all the parties to this Contract notwithstanding anything to the contrary stated elsewhere in this Contract.

3.7.3.3 Insurance

When any goos are stored in accordance with orders given by the Engineer under 3.7.3.1(a) or (b), the Contractor shall insure the goods for the benefit of the Employer against all risks whilst they are in storage unless the goods, upon delivery in accordance with an order given under 3.7.3.1(a) , become covered by insurance taken out by the Employer in respect of the contents from time to time of the store to which the goods are so delivered, and shall produce evidence to the satisfaction of the Engineer that the goods are so insured, upon request.

The Contractor shall be responsible for ascertaining whether or not any goods delivered in accordance with an order given under 3.7.3.1(a), become covered by insurance taken out by the Employer as mentioned above.

3.7.3.4 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 under 3.7.3.1(b), ownership therein shall pass to and vest in the Employer upon payment therefor being made by the Employer as provided under Clause 8.

3.7.3.5 Transport

Notwithstanding that payment may have been made in terms of 8.4 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.

3.8 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.

3.9 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 spare, if any, ordered by the Engineer from those listed in the Spares Schedule that forms part of the Detail Sheets.

12. PLANT

4.1 Silencing of plant

The Contractor's attention is drawn to Regulation B17 of Chapter III of the regulations framed under Act No 6. 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 SABS 083, 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

5.1 Penalties and stages of work

The work is divided into the following stages:

a) Submission of drawings to enable the civil works and electrical installation to be designed (see 5.2.2 and 5.2.3) and supply and delivery of holding down bolts and other items that are to be concreted in by the civil works contractor(s) (see 5.5.3 and 5.5.4 (a)),
b) Manufacture and delivery of the equipment,
c) Installation of equipment, and
d) Testing and commissioning of equipment.

Stage (a) shall be completed within the time period stated 5.2.2. 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.

Unless otherwise prescribed in the Project Specification of the Appendix to the Tender, the periods for the completion of each of the above stages will be calculated as follows:

a) for (a) above - from the date of award of the Contract.
b) for (b) above - from date of receipt by the Contractor of the order to commence the Works.
c) for (c) above - from the date of instruction to install the particular equipment.
d) for (d) above - from the date of handing over by the civil contractor for testing and commissioning.

Penalties will be applied at the rate stated in the Appendix to the Tender per day per section of Schedule of Quantities per stage as specified above.

5.2 Contractor's drawings and instructions

5.2.1 General

The Contractor shall provide drawings and instructions as set out in 5.2.2, 5.2.3, 5.2.4 and 5.2.5, 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 the preferred size.

The supply of the original printed or typed documents on good quality bond paper 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, (sepias excluded), instruction manuals, etc. shall be separately bound in a hard cover folder.

5.2.2 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 sized 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.

5.2.3 Equipment to be handled, installed and/or operated by others before commissioning

At the time of delivery of any equipment which is to be handled, installed and/or operated by others before commissioning of the Works, the Contractor shall provide detailed dimensioned drawings and installation instructions, and operating instructions as set out in 5.2.5 (a) to (g) as necessary, all in triplicate. The drawings and instructions shall be sufficiently detailed, in the opinion of the Engineer, to enable others to handle, transport and install the equipment and to operate and maintain it, as applicable.

5.2.4 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 (current and torque/speed curves, etc.) and power points,
b) full schematic diagrams indicating the interconnection of and the electrical operation of the equipment and details of the electrical motors, etc.

5.2.5 Permanent operating and maintenance instructions for all equipment supplied under the Contract.

The Contractor shall, at the time of delivery of all equipment supplied under the Contract, 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 instruction 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 "Generalised" 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. (See 5.6.1).

5.3 Contractor's programme

5.3.1 Draft programme

Within 14 days of receipt by the Contractor of the instruction to commence work in terms of Clause 40 of the General Conditions of Contract, the Contractor shall submit to the Engineer for approval a draft proposed programme for the manufacture, installation, testing and commissioning of his equipment. Such programme shall be based on the lengths of time required normally to construct the necessary buildings, structures and foundations and must take cognisance of the need to co-ordinate installation and construction for specific operations. The programme shall highlight such specific operations.

An indication is given in the Project Specification as to the

date on which :

a) the order to commence execution of the contract will be given,
b) the civil structures will be sufficiently advanced to allow installation of the equipment to commence, and
c) the projected commissioning will take place.

These anticipated dates are given as a guide and may be varied by the Engineer as circumstances require.

5.3.2 Agreed programme

Three months prior to the commencement of installation of the equipment 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.

The time periods used in this programme for installation, testing and commissioning of equipment provided under this Contract shall be those stated in the Appendix to the Tender and appearing in the Contractor's draft programme (see 5.3.1) and those used for the civil and other, if any, parts of the construction shall be those provided by such other contractors three months prior to commencement of installation of the equipment.

5.4 Water, light and power

Unless otherwise specified, the Contractor shall, at his own cost, make his own arrangements with the proper authorities for adequate supplies, at all times, of water, light and power as may be necessary for every part of the work and he shall bear all costs for openings, connections, meter hire, and any other work necessary for providing such supplies.

5.5 Installation of equipment

5.5.1 Safety

The Contractor shall at all times observe proper and adequate safety precautions on the Site in terms of the Contract and the Machinery and Occupational Safety Act No 6 of 1983 as amended.

The Contractor shall employ watchmen to ensure that barricades and lights are effective at all times.

5.5.2 General

The Contractor shall commence installation within two weeks of notice being received by him from the Engineer that building work is sufficiently advanced to permit installation being commenced. A skilled erector 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 of 10 mm minimum thickness machined to size 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 properly assembled and mounted

to avoid the setting up of initial stresses in the materials and to ensure perfectly free running of all moving parts.

5.5.3 Concrete pedestals and grouting of holding down bolts, baseplates, etc.

The construction of the concrete pedestals and foundation blocks for all the equipment will form part of the civil contract but, unless otherwise specified, the Contractor shall supply (see 3.4) the holding down bolts, nuts and washers, templates and/or all dimensions (see 5.2.2(b)) and other details necessary for the construction of the pedestals, foundation blocks, holding down bolt pockets, etc. The Contractor shall supervise the grouting up of the anchor bolts and baseplates which will be done by the civil contractor in accordance with the details given for each item of equipment in the relevant specification and in accordance with the Contractor's requirements. 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 baseplates.

5.5.4 Pipes through walls

The building in of, or boxing out for, pipes will form part of the civil contract but the Contractor shall in terms of 5.2.2(b) provide positioning of the pipes or boxed out holes.

a. Where pipes are to be built in, the Contractor shall, in good time, (see 3.7.1) provide the pipes and specials which are to be built in, as scheduled.
b.
c. Where holes have been boxed out for pipework, the civil contractor will be responsible for the grouting in of the pipework under the supervision of the Contractor.

Before the positioning of the pipework through the holes is commenced the Contractor shall :

i) arrange for the civil contractor to remove all formwork and boxing remaining in the holes.
ii) make any alterations required to the position and shape of the holes.

iii) remove all coatings from the outer surfaces of the section of thepipes 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 civil contractor will then grout in (or concrete in where appropriate) the pipes.

5.6 Testing and commissioning

5.6.1 General

The equipment shall be tested in accordance with Clause 7 and shall be commissioned as specified in 5.6.2 and 5.6.3.

Commissioning of the Works shall not commence until the Contractor has met the requirements specified in 5.2.12 to 5.2.4 and the three bound copies detailed in 5.2.5(a) to (g) have been approved, bound and lodged in their final form with the Engineer.

The equipment will not be taken over by the Employer until it has been satisfactorily tested and commissioned.

5.6.2 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 under all sections of the Contract. The Contractor shall also train the Employer's staff regarding the operation and maintenance of the equipment. When all these operations have been carried out and, in the opinion of the Engineer, the installation is operating satisfactorily it will be considered to have been commissioned.

5.6.3 Commissioning of equipment installed by others

The Contractor shall check that the equipment supplied by him but installed by others has been properly installed as specified in 5.5.2 and thereafter he shall test and commission it as specified in 5.6.1 and 5.6.2. He shall remain responsible for the equipment until it has been taken over by the Employer.

5.7 Servicing

Without limiting in any way the liability of the Contractor for remedying defects, the Contractor shall make regular quarterly visits to the installation during the Defects Liability Period to service and supervise the operation and maintenance of the 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 Contrator shall submit to the Engineer a report on :

i) the condition of the equipment and the servicing work carried out,
ii) any adjustments which may have been made,
iii) any further instruction to the operator, and
iv) the degree to which the operator has become conversant with the equipment.

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

The Final Certificate will not be issued in accordance with Subclause 64(1) of the General Conditions of Contract until the last servicing visit has been carried out to the satisfaction of the Engineer.

6. TOLERANCE

6.1 Method of specifying

Tolerance are specified by way of permissible deviations (PD) from the

designated line or level or standards, as may be applicable.

6.2 Degree of accuracy

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

7. TESTING

7.1 General

The Contractor shall be responsible for the completed installation passing any tests specified or required by the relevant Local Authority or Act No. 6. Where test certificates are required in terms of any clause of the Specifications or Act no 6 such certificates shall be submitted to the Engineer immediately the relevant tests have been completed and before the tested equipment is delivered, installed or commissioned as the case may be.

7.2 Approved laboratories

The testing laboratories of the SABS, CSIR, relevant government departments, local authorities and the Engineer will be deemed to be approved laboratories in which tests or design work required in terms of a specification may be carried out.

7.3 Methods of testing

Unless otherwise prescribed in a specification that forms part of this Contract, all testing shall be carried out and interpreted in strict accordance with the methods specified in the relevant SACS, IEC, ISO or BS specification(s). The Engineer will be entitled to be present at all tests and the Contractor shall give the Engineer reasonable notice of the dates of the tests.

7.4 Factory tests

The Contractor shall carry out tests in accordance with the requirements of the recognized SABS, IEC, ISO or BS standards. Comprehensive details of the standards used and to which equipment applicable shall be supplied. Such additional tests in the

manufacturer's works, which in the opinion of the Engineer are necessary to determine that the equipment complies with the requirements of the specification, whether under test conditions or in normal service, may be called for at no additional cost to the Employer.

7.5 Tests on site

All site tests shall normally be carried out in the presence of, but always to the satisfaction of, the Engineer and at such times as he may reasonably 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 to the Contractor's account should tests fail due to lack of care by the Contractor in ensuring that the equipment conforms to the specifications.

8. MEASUREMENT AND PAYMENT

8.1 General

Payment for particular 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 in terms of 5.2.

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, (eg 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. No claims whatsoever for extras 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.

c. With reference to Subclause 62(1) of the GCC the Contractor will not be entitled to any payment until the three copies of the Progress Statement have been submitted by him to the Engineer. The Statement shall contain an invoice of all items as scheduled in the Schedule of Quantities and reflect the progress made on each item. If a pro forma is enclosed in the Contract

Documents the Contractor's Progress Statement shall conform to it. If there is no pro forma in the document the form of the Progress Statement used by the Contract will be subject to the approval of the Engineer.

8.2 Preliminary and general items

Unit or 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, unless otherwise provided for, 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 int eh Specification together with all responsibilities in terms of the GCC.

8.3 Supply

Unit : No or Sum

The tendered rate or sum shall cover the cost of complying with 5.2.2 to 5.2.5, as applicable, supply of the goods, testing as required by Act NO. 6, provision of test certificates certifying compliance of the goods with SABS, IEC, ISO or BS standards, corrosion protection, if designated and not scheduled separately, and supply of all special tools and keys (see 3.9).

Payment for supply of the relevant equipment will not be effected until the draft copies of 5.2.5 (a) to (g) have been submitted.

8.4 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 3.7.3, the Engineer at his sole discretion 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.

8.5 Installation

Unit : No or Sum

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

8.6 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 personnel and their gear.

8.7 Commissioning (where scheduled separately)

Unit : No or Sum

The tendered rate or sum shall cover the cost of commissioning as specified in 5.6.2 and 5.6.3, including all costs of transport to and from the Site, and site accommodation of personnel ant their gear.

8.8 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 in 5.7.

Payment of 95 % of the tendered amount will become due monthly on a pro rata basis or after each visit, as the case may be. The remaining 5 % will be regarded as Retention Money and paid at the end of the Defects Liability Period.

8.9 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 relevant equipment (see 8.3).

Payment for standard spanners and 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 labelling where applicable, and delivery to the Site of the relevant items.

8.10 Interim storage (see 8.11)

Unit : 3 month period

The tendered rate shall cover the cost of providing storage in the ordered or approved store, protecting and maintaining the goods in storage for 3 months or part thereof, handling the goods in and out of the said store, and labelling and packing. Payment will be made quarterly.

No separate payment for storage will be made where normal delivery is effected, nor where storage is ordered in terms of 3.8.

8.11 Insurance for goods stored (see 8.10)

Unit : 3 month period

The tendered rate shall cover the cost of insuring the goods while in storage for the 3 month period or part thereof.

Payment will be made quarterly.

8.12 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 perations.....Unit : Day

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

APPENDIX A. APPLICABLE STANDARDS

ISO 216	Writing paper and certain classes of printed matter - trimmed sizes - A and B series
SABS 083	The assessment of noise exposure during work for hearing conservation purposes
SABS 0142	The wiring of premises

C3.5.17 ANNEXURES

ANNEXURE A OHS SPECIFICATION

ANNEXURE B DRAWINGS

C3.5.18 CONTACT PERSON ON PROJECT

The contact person on this project is as follows:

Contact Person: Nkosiyabo Noto
Contact Number: 047 501 6400/6425

ANNEXURE A OH&S SPECIFICATION

OHS SPECIFICATION

Compiled by Trapro SHE Consulting

ABBREVIATIONS
AIA: Approved Inspection Authority
CHSO: Construction Health & Safety Officer
CC: Compensation Commissioner
CR: Construction Regulations 2014
DME: Department of Mineral and Energy
DMR: Driven Machinery Regulations
DoL: Department of Labour
FEMA: Federated Employers Mutual Association
GAR: General Administration Regulations
GSR: General Safety Regulations
HIRA: Hazard Identification & Risk Assessment
H&S: Health and Safety
OHSA: Occupational Health and Safety Act No. 85 of 1993 (as amended)
OHSS: Occupational Health and Safety Specification
PSHSS: Project Specific Health and Safety Specification
PC: Principal Contractor
PPE: Personal Protective Equipment
PPC: Personal Protective Clothing
ER: Engineer's Representative
RHCS: Regulations for Hazardous Chemical Substances
SANS: South African National Standards (Authority)
SMME: Small, Micro, Medium Enterprise
SWP: Safe Work Procedure
HCS: Hazardous chemical substances

CS1 General Statement and Interpretations

Occupational Health and Safety Act, Act 85 of 1993 shall apply to this Contract. The Construction Regulations promulgated on 7 February 2014 and incorporated into the said Act by Government Notice R. 84, published in Government Gazette 37305 apply to any person involved in construction work. These regulations are hereinafter referred to as "the Construction Regulations" and the said Act as "the Act".

Definition as the Construction Regulations 2014 applicable to this Health and Safety Specification:

"agent" means a competent person who acts as a representative or 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 workplace 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-

1. the construction, erection, alteration, renovation, repair, demolition or dismantling of or addition to 5 a building or any similar structure; or
2. 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, including drawings, calculations, design details and specification
- "designer" means a competent person who:-

1. prepares a design;
2. checks and approves a design;
3. 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
4. designs temporary work, including its components;
5. an architect or engineer contributing to, or having overall responsibility for a design;
6. a building services engineer designing details for fixed plant;
7. a surveyor specifying articles or drawing up specifications;
8. a contractor carrying out design work as part of a design and building project; or
9. 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, inducing 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 -

1. all risks relating to working from a fall risk position, considering the nature of work undertaken;
2. the procedures and methods to be applied in order to eliminate the risk of falling;
3. 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;
"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 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-

1. 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;
2. any falsework, scaffold or other structure designed or used to provide support or means of access during construction work; or
3. 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;

"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);

Refer to Occupational Health and Safety Act, Act 85 of 1993 and regulations for more definitions

CS1.1 Health and Safety Specifications and Plans

(a) Employer's Health and Safety Specification

The Employer's Health and Safety Specification will be included in the tender documents as part of the Project Specifications.

PURPOSE:

The Employer is obligated to implement measures to ensure the health and safety of all people and properties affected under its custodianship or contractual commitments, and is further obligated to monitor that these measures are structured and applied according to the requirements of these Health and Safety Specifications.

The purpose of this specification document is to provide the relevant Principal Contractor (and his /her contractor) with any information other than the standard conditions pertaining to construction sites which might affect the health and safety of persons at work and the health and safety of persons in connection with the use of plant and machinery; and to protect persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work during the carrying out of construction work. The Principal Contractor (and his /her contractor) is to be briefed on the significant health and safety aspects of the project and to be provided with information and requirements on inter alia:

1) safety considerations affecting the site of the project and its environment;
2) health and safety aspects of the associated structures and equipment;
3) submissions on health and safety matters required from the Principal Contractor(and his /her contractor); and
4) the Principal Contractor's (and his /her contractor) health & safety plan.

Serve to ensure that the Principal Contractor (and his /her contractor) is fully aware of what is expected from him/her with regard to the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the Regulations made there-under including the applicable safety standards, and in particular in terms of Section 8 of the Act.

To inform the Principal Contractor that the Occupational Health and Safety Act, 1993 (Act 85 of 1993) in its entirety shall apply to the contract to which this specification document applies.

(b) The Contractor's Health and Safety Plan

The successful Tenderer shall, on receipt of notification that he has been awarded the contract, submit without delay his own documented Health and Safety Plan for the execution of the work under the contract. His Health and Safety Plan must at least cover the following:

(i) a proper risk assessment of the works, risk items, work methods and procedures in terms of Construction Regulations 2014;

(ii) Pro-active identification of potential hazards and unsafe working conditions;

(iii) Provision of a safe working environment and equipment;

(iv) Statements of methods to ensure the health and safety of subcontractors, employees and visitors to the site, including safety training in hazards and risk areas; monitoring health and safety on the site of works on a regular basis, and keeping of records and registers as provided for in the Construction Regulations;

(v) Details of the Construction manager, alternate construction manager, Construction Supervisor, Risk assessor, Construction Safety Officer, First aider and other competent persons he intends to appoint for the construction works in terms of Construction Regulation and other applicable regulations; and details of methods to ensure that his Health and Safety Plan is carried out effectively in accordance with the Construction Regulations 2014.

The Contractor's Health and Safety Plan will be subject to approval by the Employer, or amendment if necessary, before commencement of construction work. The Contractor will not be allowed to commence work, or his work will be suspended if he had already commenced work, before he has obtained the Employer's written approval of his Health and Safety Plan.

Time lost due to delayed commencement or suspension of the work as a result of the Contractor's failure to obtain approval for his safety plan, shall not be used as a reason to claim for extension of time or standing time and related costs

CS1.1.1 The Contractor shall, in submitting his tender, demonstrate that he has made provision for the cost of compliance with the specified health and safety requirements, the Act and the Construction Regulations.

CS1.1.2 The Contractor shall consistently demonstrate his competence and adequacy of resources to perform the duties imposed on the Contractor in terms of this Specification, the Act and the Construction Regulations.

CS1. 2 Indemnity of Employer and his Agents (Mandatory agreement OHS Act 37(2))

a) The annexures to this Contract Document contain a "Mandatory Form of Authority and Agreement in terms of Section 37(2) of the Occupational Health and Safety Act, No. 85 of 1993" which agreement shall be entered into and duly signed by both the Employer and Contractor prior to commencement with work. A copy of the signed agreement shall be included in the Contractor's health and safety plan.

b) Any acceptance, approval, check, certificate, consent, examination, inspection, instruction, notice, observation, proposal, request, test or similar act by either the Employer, any of his agents or the Engineer (including absence of disapproval) shall not relieve the Contractor from any responsibility he has under the Contract, the Act and the Construction Regulations, including responsibility for errors, omissions, discrepancies and non-compliances.

CS1. 3 Scope

The scope of this Occupational Health and Safety Specification is to address the reasonable and foreseeable aspects of occupational health and safety management which will be affected by the contract work.

The specification will provide the requirements that the Principal Contractor and other contractors shall comply with in order to reduce the risks associated with the contract work which may lead to incidents causing injury and/or ill health or degradation of the environment, to a level as low as reasonably practicable and possible.

The Contractor shall ensure that it is fully conversant with the requirements of this Specification.
This Specification is not intended to supersede the Act nor the Construction Regulations. Those sections of the Act and the Construction Regulations, which apply to the scope of work to be performed by the Contractor in terms of this Contract, continue to be a legal requirement of the Contractor. The principal Contractor will be appointed in writing to be in overall control of the Construction site.

Extent of works

a) A rectangular reinforced concrete biological reactor complete with reinforced concrete aerator bridges and stainless steel hand railing, access stairs and platforms where necessary. The capacity of biological reactor calculated based on the flow. The tank is rectangular in shape, 5m deep, 32.250m long and has a value of 48.75m³
b) Once circular reinforced concrete settling tank with nominal diameter of 14.20m and depth of 3.4m.
c) 7 days water tight test for two concrete structure
d) Roads and bulk earthworks
e) Pavement for parking
f) Sludge drying beds access road
g) All necessary bulk earth works
h) Pipe work to connect the new structures to existing (HDPE)
i) Landscaping of the treatment plant
j) Hand railing of the treatment plant
k) Concrete palisade fence
l) Guard house

CS1.4 Responsibilities

CS1.4.1 Client

- The Client or his appointed Agent on his behalf will appoint each Principal Contractor for this project or phase/section of the project in writing for assuming the role of Principal Contractor as intended by the Construction Regulations and determined by the Bills of Quantities.
- The base line risk assessment will be issued to the appointed contractor on request
- The Client or his appointed Agent on his behalf shall discuss and negotiate with the Principal Contractor the contents of the health and safety plan of the both Principal Contractor and Contractor for approval.
- The Client or his appointed Agent on his behalf will take reasonable steps to ensure that the health and safety plan of both the Principal Contractor and Contractor is implemented and maintained. The steps taken will include periodic audits at intervals of at least once every month and such visits may be done without any form of notification to the PC to ensure continuous compliance.
- **The Client or his appointed Agent on his behalf will prevent the Principal Contractor and/or the Contractor from commencing or continuing with construction work should the Principal Contractor and/or the Contractor at any stage in the execution of the works be found to**:

• have failed to have complied with any of the administrative measures required by the Construction Regulations in preparation for the construction project or any physical preparations necessary in terms of the Act;
• have failed to implement or maintain their health and safety plan;
• have executed construction work which is not in accordance with their health and safety plan; or
• act in any way which may pose a threat to the health and safety of any person(s) present on the site of the works or in its vicinity, irrespective of him/them being employed or legitimately on the site of the works or in its vicinity.

Note: Trapro SHE Consulting as the Client SHE agent reserves the right to stop any construction activities which may pose a threat to the health and safety of persons on site.

CS1.4.2 Principal Contractor:

- The Principal contractor is urged to conduct its base line risk assessment during the briefing session/clarification meeting.
- The Principal Contractor shall accept the appointment under the terms and Conditions of Contract. The Principal Contractor shall sign and agree to those terms and conditions and shall, before commencing work, notify the Department of Labour of the intended construction work in terms of Regulation 4 of the Construction Regulations. Annexure 2 of the Construction regulations 2014 contains a "Notification of Construction Work" form. The Principal Contractor shall submit the notification in writing prior to commencement of work and inform the Client or his Agent accordingly.
- The Principal Contractor shall ensure that he is fully conversant with the requirements of this Specification and all relevant health and safety legislation. This Specification is not intended to supersede the Act nor the Construction Regulations or any part of either. Those sections of the Act and the Construction Regulations which apply to the scope of work to be performed by the Principal Contractor in terms of this contract (entirely or in part) will continue to be legally required of the Principal Contractor to comply with. The Principal Contractor will in no manner or means be absolved from the responsibility to comply with all applicable sections of the Act, the Construction Regulations or any Regulations proclaimed under the Act or which may perceivable be applicable to this contract.
- The Principal Contractor shall provide and demonstrate to the Client a suitable and sufficiently documented health and safety plan based on this Specification, the Act and the Construction Regulations, which shall be applied from the date of commencement of and for

the duration of execution of the works. This plan shall, as appendices, include the health and safety plans of all Sub-contractors for which he has to take responsibility in terms of this contract.
- The Principal Contractor shall provide proof of his registration and good standing with the Compensation Fund or with a licensed compensation insurer prior to commencement with the works.
- The Principal Contractor shall consistently demonstrate his competence and the adequacy of his resources to perform the duties imposed on the Principal Contractor in terms of this Specification, the Act and the Construction Regulations.
- The Principal Contractor shall ensure that a copy of his health and safety plan is available on site and is presented upon request to the Client, an Inspector, Employee or Sub-contractor.
- The Principal Contractor shall ensure that a health and safety file, which shall include all documentation required in terms of the provisions of this Specification, the Act and the Construction Regulations, is opened and kept on site and made available to the Client or Inspector upon request. Upon completion of the works, the Principal Contractor shall hand over a consolidated health and safety file to the Client.
- The Principal Contractor shall, throughout execution of the contract, ensure that all conditions imposed on his Sub-contractors in terms of the Act and the Construction Regulations are complied with as if they were the Principal Contractor.
- The Principal Contractor shall from time to time evaluate the relevance of the Health and Safety Plan and revise the same as required, following which revised plan shall be submitted to the Client and/or his/her Agent for approval.

CS1.5 Policies and Procedures

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 company operations. The PC shall also ensure that the following policies and procedures but not limited to, are included in the OHS file:

- Substance abuse policy
- Disciplinary procedure
- Smoking policy
- HIV/AIDS policy
- PPE & PPC policy

CS1.6 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.

CS1.7 Compensation Commissioner

The Contractor shall provide **a valid** proof of registration and good standing with the Compensation Fund or with a licensed compensation insurer prior to commencement of construction activities.

CS1.8 Notification of Construction Work – CR 4

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 dwelling he 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.

CS1.9 During the construction period

Continuous/Issue-based Risk Assessments shall be done during the construction period as and when the scope of work changes indicating new introduced hazards.
Additional appointments shall follow as required by the Risk Assessment.
The Employer's H & S Agent will take reasonable steps to ensure that the Contractor's Health and Safety plan is implemented and maintained. The steps taken will include periodic audits at mutually agreed intervals at least once every month, however, **if the Employer's Agent determines that the Principal Contractor does not comply with the provisions of the ACT or only complies when the Audit date approaches, HE/SHE reserves the right to visit the site without any form of notification to verify continuous compliance on site.**
Protective clothing as determined by the Risk Assessment shall be issued and the employees shall sign the issue register to indicate the type and number of equipment received by each employee
Proof of training in the form of a register signed by the trained employees shall be kept in the H&S file. The contents of the training shall also be displayed in the H&S file.
Please note: The SHE agent may randomly select employees on site and assess their knowledge against the material they have been trained on.
Appointments of people/workers related to Health and Safety as required by law and the Risk Assessment shall be done prior to the commencement of any work. Letters of appointment shall be kept in the H&S file for inspection by the Client, Agent or any Inspector.
Prior to builder's holiday PC shall develop a shutdown procedure and submit it to the Client agent for approval

CS1. 10 Health and Safety Program/File

The following documentation shall be included in the Health and Safety File but not limited to:

a) Copy of OHSAct and applicable Regulations.
b) Copy of Client Health and Safety specification, Principal contractor's Health & Safety Plan.
c) Copy of all Drawings – Schematics, Detail Drawings, etc.
d) Copy of Notification of Construction work to the Department of Labour.
e) Company Safety Policies (OHS policy, smoking policy, substance abuse policy, PPE policy, HIV/AIDS policy etc.) – To be signed by the Chief Executive Officer of the Company.
f) Organogram indicating site specific organizational structure with reference to requirements of the construction regulations.
g) Proof of Registration with Compensation Fund of Principal Contractor and Contractors.
h) Method statements, risk Assessments and safe work procedures for all activities on site as per construction works programme (project scope of work).
I) Letters of Appointment and proof of competence.
j) Inspection registers
k) Material safety data sheets
l) The contents of all Training Material e.g. Formal training, Informal training, induction, DSTI's Toolbox talks, HIV/AIDS etc.
m) Emergency preparedness and response plan with site specific telephone numbers
n) Section 37(2)/Mandatory agreement
o) Site specific Fall protection plan
P) Waste management Plan
q) List of Contractors (Sub-Contractors)
r) List of Local Labours with ID copies
s) Environmental management plan
t) All applicable permits
u) Disciplinary procedures
v) H & S budget
w) Scope of work
x) Committee meetings and SHE audit reports

CS1. 11 Appointments

The following appointments are required for the project. Deviations will only be allowed with the approval of the Agent. Appointment of an employee for more than one responsibility may be allowed on approval by the Agent.

Basic Appointments:

- Appointment of Principal Contractor by Client.
- Appointment of Contractors (Sub Contractors) by Principal Contractor (where applicable)
- Appointment of Construction manager (Full time)
- Appointment of Alternate construction manager
- Appointment of Construction Work Supervisor (Full time)
- Appointment of Assistant Construction Work Supervisor
- Appointment of Health & Safety Officer (Full time)

Appointments of Specialists (Refer to a Specialist Company):

- Appointment of Safety Manager
- Appointment of Risk Assessor and plan developer
- Appointment of a Health and Safety Induction Trainer
- HIV/AIDS trainer
- Traffic Safety Officer (where applicable)
- Fall protection plan developer
- Troxler operator
- Blasting competent person

Appointments of full time employees on site:

- Appointment of a SHE Representative (Competent employee to control/monitor all H&S activities).
- Appointment of Emergency co-ordinator
- Appointment of an Accident and Incident Investigator.
- Appointment of the Safety Committee Members (Employees actively involved in H&S).
- Appointment of an Excavation Inspector.
- Appointment of Construction Vehicle and Mobile Plant Inspector.
- Appointment of Construction Vehicle and Mobile Plant Operators.
- Appointment of batch plant/Concrete Mixer Operator (if required).
- Appointment of Hand Tool Inspector.
- Appointment of a Portable Electrical Equipment Inspector (If required).
- Appointment of a Fall protection supervisor
- Appointment of a Ladder Inspector (If ladders are used).

- Appointment of scaffold inspector.
- Appointment of scaffold erector
- Appointment of formwork supervisor
- Appointment of demolition supervisor
- Appointment of hazardous chemical controller
- Appointment of stacking and storage supervisor
- Appointment of Flagmen
- Appointment of a Hygiene and Facility Inspector (Ablutions and eating places).
- Appointment of Fire Equipment Inspector.
- Appointment of Fire Team Members (employees trained in firefighting awareness).
- Appointment of First Aid Equipment Inspector.
- Appointment of First Aid Team Members (employees trained in first aid awareness)

CS1.11.1 Safety Officer (CR 8.7)
Due to the nature of the activities on site it is required to appoint a full-time competent Health and Safety Officer with at least 2 years' experience in SHE management. The Safety Officer shall be in possession of a minimum qualification of SAMTRAC or any other equivalent safety management programmes

The Safety Officer shall be employed by the Principal Contractor on a full time basis for the duration of the project.
The functions of the Safety Officer will be to monitor all H&S Activities on site on a daily basis.
CS1. 11.2 Contractor's SHE Representative - OHSAct 17
The Contractor shall designate a competent Safety, Health and Environmental representative (SHE Rep) who shall be acceptable to the Agent, to represent and act for the Contractor. The Contractor shall inform the Agent in writing of the name and address of the Contractor's SHE Rep and of any subsequent changes in the name and address of the SHE Rep, together with the scope and limitations of the SHE Rep's authority to act for the Contractor. The Contractor's SHE Rep shall make available to the Employer an all-hours telephone number at which the SHE Rep can be contacted at any time in the event of an emergency involving any of the Contractor's employees, or other persons at the Works.

CS1.11.3 Health & Safety Committee- OHSAct 20

Where two or more health and safety representatives have been elected and 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.

CS1. 8.4 Supervision of Construction Work– CR 8 (5)
The Principal Contractor as well as his Contractors (Sub Contractors) shall appoint competent full time employees in writing as the construction supervisors.

CS1. 12 Training and Competence

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.

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. A copy of attendance registers of all employees who attend inductions shall be kept.

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.

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.

CS1. 13 Risk Assessment – CR 9

The Principal Contractor as well as all other Contractors shall appoint a competent person in writing to carry out a risk assessment before any construction work is started.
The Risk Assessment shall form part of the Health and Safety Plan.
The Risk Assessment shall include:

- Risk assessment procedure
- Identification of hazards and risks.
- Rating matrix
- Control measures to mitigate risks.
- A monitoring and review plan

Copies of the risk assessment shall be available on each site for inspection.
All employees shall be informed, instructed and trained by an appointed competent person regarding all hazards and work related procedures.

CS1. 14 Existing Services

Contractor must establish all local services in area of excavations.
Plan of local services shall be documented in the Health and Safety file.
Local services include:
Pipe lines, Electricity Supplies and other similar services.

CS1. 15 Safe Working Loads

The Contractor shall ensure that -

a) The safe working loads of hoists, load-bearing beams and cranes are prominently displayed at all times.
b) The safe working loads are not exceeded under any circumstances.
c) All lifting gear is marked with a unique identity number and recorded in register.

CS1. 16 Machine Guarding

All power tools and machinery driven by belts, gears, ropes, chains, couplings and similar drives shall be adequately guarded. The Contractor shall prohibit the use of any equipment with a damaged, missing or inadequate guard.

CS1. 17 Construction Vehicles and Mobile Plant – CR 23

The Contractor shall ensure that drivers of motor vehicles are in possession of a driver's licence, valid for the class of vehicle which they are required to drive, and shall produce the licence on request.
The Contractor shall not permit any driver to be in control of a vehicle at the Works while under the influence of alcohol, drugs or other substance.
All vehicles of the Contractor shall display a name board bearing the Contractor's name. Hired vehicles shall bear an identifying sticker.
A register shall be kept of workers operating construction vehicles and mobile plant.
The register shall contain proof of training of operators to operate construction vehicles and mobile plant, certification of competency and authorization of operators to operate machinery, vehicles or plant.
Names of operators and their relevant training with date and time stamps together with name of course instructor shall be kept in the Health and Safety File on site.
Physical and psychological fitness shall be proved by way of a medical certificate of fitness of the said operators before allowing operators to operate machinery, vehicles or plant. Medical fitness certificates shall only be issued by a registered occupational medical practitioner.

The Health and Safety File shall include the written training material offered to operators for the different construction vehicles and mobile plant.

Each and every driver shall be trained on risks involved and safety procedures.
All Construction vehicles and mobile plant must be of acceptable design and construction and used according to their design.
All construction vehicles and mobile plant must be maintained in good working order.
A register of all vehicles and plant shall be kept on site together with names of operators responsible for each.
The register shall report all maintenance activities performed on these vehicles and plant as well as signatures certifying the condition of the vehicles as in a good working order.
All requirements on the vehicles and mobile plant with regard to safety and health shall be inspected and certified.
These requirements include:

a) Portable fire extinguishers mounted in specified positions on construction vehicles – 4kg dry powder fire extinguisher
b) Inspection for leaking fuel or gasses which can cause a fire hazard
c) Safe and suitable means of access
d) Adequate signalling or other control arrangements to guard against the dangers relating to movement of vehicles and plant.

Attention must be paid to

i) Turn indicators
ii) Stop lights x 2 – where poor visibility conditions warrant
iii) Reverse siren or acoustic device
iv) Tail lights
v) Reflectors
vi) Head lights x 2 – where poor visibility conditions warrant
vii) Rotating amber flashing light with lens heights of at least 200mm and an Output of at least 100Watt on roof or other visible position
viii) Warning boards mounted at least 1.5m above ground level to be clearly visible.
ix) Inspections of appropriate structures fitted to protect the operator from falling material or from being crushed should the vehicle or mobile plant overturn
x) Appropriate seats must be firmly secured and adequate in number on vehicles used to transport employees

During use of Construction vehicles or mobile plant the following rules shall be adhered to:

1. Construction vehicles or mobile plant must be prevented from falling into excavations, water or any other area lower than the working surface. This protection must consist of adequate edge protection e.g. guard rails and/or crash barriers.
2. No person shall be allowed to or require to ride on any Construction Vehicle or Mobile Plant in a position otherwise than a safe place provided for on the construction vehicle or mobile plant as designed for that purpose.
3. The construction site must be organized in such a way that as far as is reasonable practical, pedestrians and vehicles can move safely and without risks to health and safety.
4. Traffic routes shall be of sufficient size, sufficient in number and in suitable positions to be used safely by construction vehicles, mobile plant and pedestrians.
5. Each and every traffic route shall be indicated by suitable signs for reasons of safety and health.
6. No tools and/or material shall be transported in the same compartment as the operators/drivers/employees unless the said are secured against movement during transportation.
7. All Construction Vehicles and Mobile Plant left unattended at night adjacent to a public roads in normal use or adjacent to construction areas where work is in progress, shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, in order to identify the location of vehicles or plant.
8. TLB's, Excavators and other similar mobile plant are, when being repaired or when not in use, fully lowered or blocked with controls in a neutral position, motors stopped and brakes set.
9. Reflective indicators must be provided to workers in the form of reflective yellow jackets or vests as specified and worn by workers working on/or adjacent to public roads.
10. No major plant repairs may be carried out on site

CS1. 18 Signs and Notices

The use of colour codes, symbolic signs and notices are means of communication whereby information is visually conveyed to people and also provides early warning of dangers.

Safety signs provide for immediate recognition of danger, information, actions allowed or not allowed and procedures that have to be done.

There are 5 types of safety signs:

1. Black triangle on yellow background=> WARNING
2. Red (round) on white background => PROHIBITORY
3. White on blue background => MANDATORY
4. White on green background => INFORMATION
5. Red (square) on white background => FIRE

The following signs shall be provided for on the site:

Warning signs - DANGER - MEN AT WORK
Prohibitory signs - NO ENTRY, NO SMOKING
Fire - POSITION OF EQUIPMENT ARROWS
First Aid - INFORMATION SIGNS
Emergency Signs - ASSEMBLY POINT, ESCAPE ROUTES SIGNS

All signs shall be new or in good condition and approved by the Engineer.
All temporary signs shall be mounted on portable supports to facilitate moving.
Defective or missing items shall be replaced immediately.
All signs shall be inspected at least twice a day.
Signs to be displayed will be determined by the H&S Plan and the Risk Assessments.
Compulsory signs will include:
Prohibited area
Men at work
A H&S board shall be displayed at the entrance with all the relevant H&S instructions and symbols eg:
Construction Site – No Entry
Hard hat area
Safety shoes shall be worn
The size of the board shall be at least 1.5m wide by 1.2m high

CS1.19 Excavation Work – CR 13

Excavation:
Definition: A space made by digging.

1. An excavation could be a hole or trench of any size and shape.
2. A Risk Assessment must be done prior to making an excavation.
3. The following must be taken into consideration when doing the Risk Assessment:
   - ⇨ Depth of the excavation
   - ⇨ Length of the excavation
   - ⇨ Existing services
   - ⇨ Barricading and demarcation

Depth of the excavation:

1. Should an excavation be more than chest deep (1.5m), it must be adequately shored or braced.
2. Slopes or trenches shall be as flat as possible, 1 x vertical to 2 x horizontal must be considered maximum for dry conditions. In wet conditions either a much lower slope shall be used, or if space is a constraint, shoring and de-watering shall be applied.

A competent person shall be appointed to supervise excavation work.
Stability evaluation of ground must be done by the Principal contractor and a consulting Engineer shall be notified in writing for certification.
A plan for prevention of persons being trapped due to collapse shall be provided by Contractor.
The design of shoring shall be documented by Contractor in the Health and Safety file as provided by the competent designer of shoring.
The maximum loading of sides of an excavation must be documented in a usable format.
If adjacent structures and buildings are present and can be affected a design and construction of supporting details shall be represented.
Provision shall be made for access routes to the excavation. Routes must not be more than 6 meters away from worker.
Contractor must establish all local services in area of excavations.
Plan of local services shall be documented in the Health and Safety file.
Local services include:
Telkom, Water, Electricity Supplies and other similar services.
Inspection shall be done on all bracing and shoring on a

- daily basis
- prior to each shift
- after every blasting operation
- after an unexpected fall of ground
- after substantial damage to supports
- after rain

An inspection register shall be completed by the Excavation Inspector during each and every inspection.
Excavations must be provided with clearly visible boundary indicators and illuminated at night or where/when visibility is poor.
Excavations must be adequately barricaded and such barricading material shall be periodically maintained.
It is advised to use 1.2m high PVC net (barrier netting) and erected as close to the excavation as possible, when accessible by public or other employees, or adjacent to public roads or thoroughfares, **NO danger tape shall be used**.
Explosives regulations must be adhered to if explosives are required to carry out the excavation. Competent persons with blasting certificates must be in charge.
Warning signs must be posted next to an excavation in which persons are working or carrying out inspections or tests.

CS1.20 Blasting

PC shall appoint a competent person approved by relevant Departments to perform blasting operation.
Transportation, storage and use of explosives shall be shall be carried out as per explosive regulations.
PC to obtain all permits applicable to explosive regulations prior to commencement of blasting activities.

CS 1.21 Radiation (Troxler)

PC shall apply for an authority from the Dept. of health, Radiation control, Radioactive nuclides in terms of section 3A of hazardous substances Act, 1973 (Act 15 of 1973) to use convey, process and cause to convey radioactive nuclides.
The operation, storage and transportation of radioactive nuclides shall be carried out as per Hazardous substance Act of 1973 and manufacture's specification.
Only trained personnel shall use, store or transport radioactive nuclides
Inspections shall be carried out as per manufacturer's specification

CS1. 22 Barricading and Demarcation

The construction site shall be sealed off with a fence of at least 2 m covered with mash nett to contain dust. Signage must be displayed in all four corners of the site to prevent unauthorized entry by members of the public and vehicles.

CS1. 23 Ladders – GSR 13A

You are only to use ladders that are undamaged and are of sound construction.

Ladders must be placed on a register and inspected on a monthly basis by an appointed person.

Ladders are to be secured during use. If it is necessary to use a ladder before it can be secured, a second person must hold it steady at all times. Place the ladder's feet on a level base. (wooden blocks or bricks are not to be used).

Ladders are not to be used as scaffolds or work platforms.

When used as access to trenches and work areas, the ladder must extend one meter above the step off point and be placed at an angle where the base of the ladder is one quarter of the ladder height away from the base of the structure, and must be fitted with non-skid devices.

Ladders must not be used nearer than 3m to any exposed electrical power source and never in substations or on electrical installation work.

Ladders are not to be used in a horizontal position.

Maintain 3-point contact by keeping two hands and one foot or two feet and one hand on the ladder at all times.

Do not carry objects in your hands while on a ladder.

Ladders must be fitted with non-skid devices at the bottom ends and hooks or similar devices at the upper ends.

Ladders with damaged stiles, or damaged or missing runs should never be used.

Ladders must never be fastened together to increase the reach.

Wooden ladders must never be painted.

CS1. 24 Bulk mixing/Concrete Mixers – CR 20

The Contractor shall ensure that all concrete mixers are operated and supervised by a competent person who has been appointed in writing.

The Contractor shall ensure that all devices to start and stop the concrete mixers are provided and that these devices are:

1. Placed in an easily accessible position; and
2. Constructed in such a manner to prevent accidental starting

All dangerous moving parts of a mixer must be placed beyond the reach of persons by means of covers.

No person shall be permitted to remove or modify any guard or safety component unless authorized to do so by the appointed person

A Contractor shall ensure that all persons authorized to operate the concrete mixers are fully:

1. Aware of all dangers involved in the operation thereof
2. conversant with the precautionary measures to be taken in the interest of health and safety

No person supervising or operating a concrete mixer shall authorize any other person to operate the plant, unless such a person is competent to operate such machinery.

In case the concrete is supplied by the an external service provider PC shall ensure that there are fully inducted and compliant with the provisions of the OHS act and its regulation. Furthermore, PC's employees shall not be allowed to operate the ready mix truck chutter in any circumstances

CS1. 25 Scaffolding – CR 16

All scaffolding must be in compliance to SANS 10085.

A competent person shall be appointed in writing to supervise the erection of all scaffolding operations. The Scaffolding erecter shall have the required accredited qualifications for scaffold erecting.

A competent scaffold inspector shall be appointed in writing to inspect the erected scaffolds and shall not be the same person as the erector.

An Inspection Register on scaffolding shall be kept in the Health and Safety File.

A copy of SANS 10085 as amended shall be available on site and kept in the Health and Safety File.

CS1. 26 House Keeping and Construction Sites – CR 27

The Contractor shall at all-time carry out the Works in a manner to avoid the risk of bodily harm to persons or risk of damage to any property. The Contractor shall take all precautions, which are necessary and adequate to eliminate any conditions, which contribute to the risk of injury to persons or damage to property. The Contractor shall continuously inspect all work, materials and equipment to discover and determine any such conditions and shall be solely responsible for the discovery, determination and elimination of such conditions.

During the period of this Contract, the Contractor shall be responsible for the safe storage of all materials and equipment required for execution of the Contract, and for disposal of all non-usable waste material in an orderly manner.

All materials, whether stored on the construction site or within the Contractor's designated area, shall be stored neatly and safely to prevent possible injury to any personnel. The material shall be stored to facilitate safe access to, and removal of the material from the storage area.

Any flammable material, such as paint, diesel fuel and oil, shall be stored in lockable non-combustible structures, which shall be clearly marked to indicate the hazardous nature of the materials stored within. The flammable materials stores shall be located in safe areas away from hazardous surroundings and adequate and suitable fire-fighting equipment shall be provided within easy reach of the materials stores.

Loose material need for use shall not accumulate so as to obstruct means of access to and egress from the workplace.

Scrap and waste shall not be allowed on site and must be removed daily.

The construction sites adjacent to build up area or public way shall be effectively fenced and controlled with access points.

HCS stored on site shall be stored in containers located in a dedicated area. The area shall be surrounded by a band wall.

CS1. 27 Stacking and Storage on Construction Sites – CR 28

A competent person shall be appointed in writing with the duty of supervising all stacking and storage of material on site.

Adequate storage areas shall be provided which includes demarcated areas.

All storage areas shall be kept neat and under control.

CS1. 28 Fall Protection – CR 10

A contractor shall cause-

a) The designation of a competent person, responsible for the preparation of a fall protection plan;
b) The fall protection plan contemplated in paragraph (a) to be implemented, amended where and when necessary and maintained as required;
c) Steps to be taken in order to ensure the continued adherence to the fall protection plan.

The fall protection plan contemplated in sub-regulation (1), shall include-

a) Scope
b) A risk assessment of all work carried out from an elevated position which shall include the procedures and methods used to address all the risks identified per location;
c) Fall prevention outlook: Fall elimination, fall prevention, fall arrest equipment
d) Emergency response and fall rescue plan
e) Appointments and training need analysis
f) Site activities/conditions e.g. open holes, excavations, ladders, scaffolds, lifting equipment etc.
h) Monitoring and review

l) Medical surveillance procedure
j) Accident/incident reporting, investigation and record keeping
k) Approvals and reviews
l) fall protection training register

NOTE:

The wearing of an approved type of safety harness fitted with a shock absorber and correctly secured to any approved anchorage is compulsory for personnel working at heights.
Safety harnesses must be worn where a leaning bar cannot be installed, where handrails are not available, in instances where there is a risk of injury due to falling, and generally whenever work is undertaken at a height of more than "a person's height".
It is the contractor's responsibility to train his employees on the correct use of harnesses.
Safety belts may only be used as a fall restraint and not as a fall protection device.
On windy/rain days, special precautions are to be taken when working at.
No workers are to be allowed to work at height during inclement weather

CS1. 29 Structures – CR 11

1. A contractor shall ensure that:
   a) all reasonable practicable steps are taken to prevent the uncontrolled collapse of any new or existing structure or any part thereof, which may become unstable or is in a temporary state of weakness or instability due to the carrying out of construction work: and
   b) No structure or part of a structure is loaded in a manner which would render it unsafe.
2. A contractor shall ensure that all drawings pertaining to the design of the relevant structure are kept on site and are available on request by an inspector, contractors, client, client's agent or employee.
3. Any owner of a structure shall ensure that inspections of that structure upon completion are carried out periodically by competent persons in order to render the structure safe for continued use: Provided that the inspections are carried out at least once every six months for the first two years and thereafter yearly and records of such inspections are kept and made available to an inspector upon request.
4. Any owner of a structure shall ensure that the structure upon completion is maintained in such a manner that the structure remains safe for continued use and such maintenance records shall be kept and made available to an inspector upon request.

CS1.30 Temporary Works – CR 12

A competent person shall be appointed in writing to supervise all formwork and support work.
The name and address of such a person shall be included in the Health and Safety Plan of the Principal Contractor.
The contractor must ensure that all formwork and support work structures are adequately designed, erected, supported, braced and maintained so that they will be able to support all anticipated loads.
All drawings pertaining to formwork and support work must be kept on site and available for inspection by an inspector, contractor, client, client's agent or employee.
All formwork and support work must be inspected and checked for suitability by a competent person under the following conditions:

1. Before use
2. During placement of concrete or any other imposed load
3. After placement of concrete or any other imposed load
4. On a daily basis after placement of concrete until the structure is removed.
5. Ensure that concrete gains sufficient strength before the support work is removed.

Record must be kept of these inspections.
Weakened formwork or support work must be immediately reinforced.
Persons must be prevented from slipping on support work.
Persons must not be affected by the use of solvents or any other similar substances.
Safe access must be provided for all support work.
Employees involved must be adequately trained and instructed to perform the work in a safe manner.
Foundations of formwork must be adequate to sustain the applied load.

C1.31 Material Hoisting – CR 19

A contractor must ensure that every material hoist and its tower have been constructed in accordance with the generally accepted technical standards and are strong enough and free from defects.
A contractor must ensure that the tower of every material hoist is

- erected on firm foundations and secured to the structure or braced by steel wire guy ropes, and extends to a distance above the highest landing to allow a clear and unobstructed space of at least 900 mm for over travel;
- enclosed on all sides at the bottom, and at all floors where persons are at risk of being struck by moving parts of the hoist, except on the side or sides giving access to the material hoist, with walls or other effective means to a height of at least 2100 mm from the ground or floor level; and
- Provided with a door or *gate* at least 2100mm in height at each landing, and that door or gate must be kept closed except when the platform is at rest at such a landing.

A contractor must cause-

- the platform of every material hoist to be designed in a manner that it safely contains the loads being conveyed and that the combined mass of the platform and the load does not exceed the designed lifting capacity of the hoist;

- the hoisting rope of every material hoist which has a remote winch to be effectively protected from damage by any external cause to the portion of the hoisting rope between the winch and the tower of the hoist; and
- Every material hoist to be provided with an efficient brake capable of holding the platform with its maximum load in any position when power is not being supplied to the hoisting machinery.

No contractor may require or permit barrows or material to be conveyed on the platform of a material hoist and no person may so convey barrows or material unless those articles are secured or contained in a manner that displacement thereof cannot take place during movement.
A contractor must cause a notice, indicating the maximum mass load which may be carried at any one time and the prohibition of persons from riding on the platform of the material host, to be affixed around the base of the tower and at each landing.
A contractor of a material hoist may not require or permit any person to operate unless a hoist, person is competent in the operation of that hoist. .
No contractor may require or permit any person to ride on a material hoist. A contractor must ensure that every material hoist-

- is inspected on daily basis by a competent person appointed in writing by the contractor and such competent person must have the experience pertaining to the erection and maintenance of material hoists or similar machinery;
- inspection contemplated above, includes the determination of the serviceability of the entire material hoist, including guides, ropes and their connections, drums, sheaves or pulleys and all safety devices;
- inspection results are entered and signed in a record book by a competent person, which book must be kept on the premises for that purpose;
- Is properly maintained and the maintenance records in this regard are kept on site.

CS1. 32 CRANES - CR 22

Where tower cranes are used:

- PC shall ensure that they are designed and erected under the supervision of a competent person
- All relevant risk assessments and method statements are developed and applied
- account must be taken of the effects of wind force on the crane and a wind speed device is fitted that provides the operator with a audible warning when the wind speed exceeds the design engineer's specification;
- account must be taken of the bearing capacity of the ground on which the tower crane is to be erected;
- the bases for the tower crane and tracks for rail mounted tower crane must be firm and level and secured;
- shall be erected at a safe distance from excavations;
- clear space must be provided and maintained for erection, operation, maintenance and dismantling;
- Tower crane operators must be competent to carry out the work safely;
- Tower crane operators must be in possession of a valid medical certificate testifying that the holder is physically and psychologically fit.

A competent person shall plan all lifting operations where the lift will exceed 2000 kg and the plan submitted to the Client for approval and permission to carry out the lift.

CS1.33 Temporal Electrical Installations on Construction Site office – CR 24

Electrical installations shall be carried out by a competent installer in possession of **registration certificate** issued by the Dept. of labour.
COC's shall be issued on completion of electrical installations in site offices
Before construction commences or any other related works and during the progress thereof adequate steps must be taken to establish the presence of and guard against any danger to the workers in respect to electrical cables or apparatus.
Any temporary electrical installation set up by the principal contractor or contractor must be inspected at least once a week by a competent person. The inspections shall be recorded in a register and kept in the Health and Safety File.
When working on or next to live electrical Machinery the Principal Contractor or Contractor must provide insulated stands, trestles and mats.
When Distribution Boards are removed the incoming power supplies shall be cut by the client's authorized Electrician. The incomer electricity supply feeder shall be earthed by a suitable earth wire or spike to prevent cable of becoming live during the installation of new Distribution Boards.
A register shall be kept on site in which all daily checks of portable electric tools are performed and signed by the responsible person. Checks shall include condition of plug top, power cord, on-off switch and insulation condition of electric tool. All tools shall be numbered and entered accordingly into the register. Condition of tools as listed in the register shall be inspected and signed by the construction supervisor at regular intervals as required by the nature of the equipment.

CS1. 34 First Aid - GSR 3

- **Safety Notice Board**

The Contractor shall provide a Safety Notice Board where safety notices, site regulations concerning safe working practices and information on the location of the nearest first aid station, can be conspicuously displayed to all staff. The size of the notice board shall be at least 600 mm x 800 mm.

- **First Aid Equipment**

The Contractor shall provide for its employees a stretcher for emergencies and an approved first aid box. The first aid box shall be checked monthly by a responsible person, who shall be appointed by the Contractor, and a record shall be kept of the contents. Any deficient medical supplies shall be promptly replenished by the Contractor.

- **Hazard Notices**

The Contractor shall display hazard notices in all areas where hazardous conditions prevail or may occur.

- **Reporting of Incidents and/or Injuries**

All incidents in respect of damage to Works, property or machinery, or injury to persons, shall be reported by the Contractor's SHE Rep by the quickest means possible.
A mandatory incident report form, containing full details of the incident, shall be completed and submitted to the Site Agent within twenty four (24) hours of the occurrence of the incident.

CS1. 35 Fire Precautions on Construction Sites – CR 29

A register shall be kept on all Acetylene and Oxygen cylinders used on the site.
Condition of components, sub-components and safety components (e.g. Flame back arrestors) shall be listed in the register and signed by the construction supervisor at regular intervals as required with time and date stamp.
Acetylene, Oxygen and LP Gas cylinders shall be stored in suitable places to minimize the risk of fire.
Suitable storage to be provided for flammable liquids, e.g. petrol, diesel, paraffin.
Smoking shall be prohibited in the workplace and notices posted accordingly.
Suitable and sufficient firefighting equipment shall be placed in strategic positions in the work place.

(On vehicles and other positions as deemed necessary).

A register shall be kept on type and number of equipment for each site in the Health and Safety File.
A competent person shall inspect all firefighting equipment.
A sufficient number of employees shall be trained in the use of firefighting equipment.
A register shall be kept in the Health and Safety File on site with names of employees and type of firefighting training completed with date.
Suitable signs shall be erected in work places indicating escape routes.
Escape routes shall be kept clear. Evacuation plans shall be in Health and Safety File as part of Induction Training.
Combustible materials shall not accumulate on site.

CS1. 36 Construction Welfare Facilities – CR 30

PC shall provide clean drinking water for its workers
On each site where existing facilities are not present, at least one sanitary facility shall be erected for every 30 workers, a changing facility for each sex and sheltered eating areas.
Separate toilets shall be erected for each sex.
Mobile toilets with bucket system shall be installed at the site.
Cleaning of buckets shall be arranged with an approved service provider approved by the municipality. To be at least once every week and disposal certificate shall be kept in the file.

CS1. 37 Portable electrical tools & equipment - EMR 9

Portable electrical tools and equipment includes every unit that takes electrical power from a 15 amp. plug point and is moved around for use in the workplace i.e. drills, saws, grindstones, portable lights, etc. In addition electrical appliances such as fridges, hotplates, heaters, etc. shall be inspected and maintained to the same standards as portable electrical tools and appliances.
The use, inspection and maintenance of portable electrical tools and equipment must be governed by the following:

- Regular inspections by a competent person appointed in writing;
- Inspection results must be recorded in a register;
- Only competent authorized persons are allowed to use portable electrical tools and equipment;
- The correct protective equipment is worn/used whilst operating portable electrical tools and equipment.

PORTABLE ELECTRICAL TOOLS shall be maintained in good condition at all times to prevent an electrical shock to the user.
The main source shall incorporate an earth leakage protection device.
All equipment shall be fitted with a switch to allow for safe & easy starting and stopping.

CS1. 38 Use & storage of flammables & HCS - CR 25

The Principal Contractor / Contractor to ensure that:

- No person is required or permitted to work in a place where there is the danger of fire or an explosion due to flammable vapors being present unless adequate precautions are taken;
- The workplace is effectively ventilated. Where this cannot be achieved:
    - Employees must wear suitable respiratory equipment
    - No smoking or other sources of ignition is allowed in the area
    - The area is conspicuously demarcated as "flammable"

- Flammables stored on a construction site are stored in a well-ventilated, reasonably fire-resistant container, cage or room that is kept locked with access control measures in place and sufficient fire-fighting equipment installed and fire prevention methods practiced e.g. proper housekeeping;
- Flammables stored in a permanent flammables store are stored so that no fire or explosion is caused i.e.:
  - stored in a locked well-ventilated reasonably fire resistant container, cage or room conspicuously demarcated as "Flammable Store – No Smoking or Naked Lights";
  - the flammables store to be constructed of two-hour fire retardant walls and roof and separated from adjoining rooms or workplaces by means of a two-hour fire retardant fire wall;
  - Adequate and suitable fire-fighting equipment installed around the flammables store and marked with the prescribed signs;
  - All electrical switches and fittings to be of a flameproof design;
  - Any work done with tools in a flammables store or work areas to be of a non-sparking nature;
  - No Class A combustibles such as paper, cardboard, wood, plastic, straw etc. to be stored together with Flammables;
  - The flammable store to be designed and constructed to, in the event of spillage of liquids in the store, to contain the full quantity + 10% of the liquids stored;
  - A sign indicating the capacity of the store to be displayed on the door;

- Containers (including empty containers) to be kept closed to prevent fumes/vapors from escaping and accumulating in low lying areas;
- Metal containers to be bonded to earth whilst decanting to prevent build-up of static;
- Welding and other flammable gases to be stored segregated as to type of gas and empty and full cylinders.

Hazardous Chemicals and Materials

a) The Contractor shall provide suitable and adequate protective equipment when work in an area where hazardous chemicals and materials are being used.
b) The Contractor shall ensure that its employees have familiarised themselves with the hazardous material data sheets applicable to the specific site as well as the location of firefighting equipment, safety showers/baths and other washing facilities, prior to commencement of work
c) Hazardous chemical substances shall be stored in a well ventilated area.
d) Spillage procedures shall be developed and spill kits shall be provided.
e) All HCS containers shall be labelled
f) Where HCS are stored PC to ensure that there are serviced fire extinguisher in close proximity

CS1. 39 Public H & S

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 onsite activities and the precautions to be observed to avoid or minimize those dangers. Appropriate health and safety signage shall be posted at all times.

CS1. 40 Night work

The Contractor shall not undertake any night work without prior arrangement and a written permit from the Client. The Contractor shall ensure that adequate lighting is provided for all night work and failure to do so shall result in' work being stopped.

CS1. 41 Environmental Conditions

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.

Furthermore the Contractor shall ensure that the environmental specification is adhered to at all times.

CS1. 42 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 four ways:
- Inhalation through breathing e.g. cements dust;
- Ingestion through swallowing maybe through food intake;
- Absorption through the skin (pores) e.g. hazardous chemicals.

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 survey has been conducted.

- 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.

CS1. 43 Commissioning and Safety Precautions
The Contractor shall ensure that wherever repairs, adjustments or any other work are undertaken on any plant or machinery, the power supply is switched off, disconnected or the plant / machinery disengaged until the work or repairs have been completed.

CS1. 44 Monitoring and Review: Registers Required on Site
PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

- Personal Protective Clothing and Equipment issued, PPE condition Monthly checklist

MACHINERY

- Daily Checklist - Compaction Machinery
- Daily Checklist – Concrete mixer
- Daily Checklist – Generator/pump
- Daily checklist (before and after use) – Troxler (If applicable)
- Daily Construction Vehicle Pre-ignition Checklist – Excavator (If applicable)
- Daily Construction Vehicle Pre-ignition Checklist – TLB
- Daily Construction Vehicle Pre-ignition Checklist – Truck
- Daily Construction Vehicle Pre-ignition Checklist – LDV
- Operators on Construction Vehicles and Mobile Plant Training and Fitness Register

EQUIPMENT

- Ladder Inspection Register
- Daily Stacking Inspection Register
- Daily Scaffold Inspection Register
- Daily Formwork Inspection Register

TOOLS

- Monthly Checklist on Hand Tools
- Monthly Checklist on Portable Electrical Equipment

GENERAL

- Monthly Environmental Checklist and Deviation
- Weekly Hygiene Facility Inspection Register – Mobile Ablutions and Eating areas
- Stacking & Storage inspection registers
- Housekeeping inspection registers

FIRE

- Fire Extinguishing Equipment Register
- Register of Trained Employees in Fire Fighting
- Fire Awareness Attendance Training Register

EMERGENCY

- First Aid Box and Equipment Checklist

- Register of Trained Employees in Basic First Aid
- First Aid Awareness Attendance Training Register
- Incident Register (Injury/ occupational disease record book (Recording and investigation of incidents)
- Motor Vehicle Accident Register

TRAINING

- Induction Training Attendance Registers
- Toolbox talks Training Attendance Registers
- Community Training Attendance Registers
- Fall protection plan training attendance register
- Risk assessment & Safe work procedure attendance register
- Emergency/evacuation Training attendance register

PERMITS

- Blasting
- Bulk fuel storage
- Lock-out Permits (Water and Electricity)
- Radiation equipment (troxler)

INSPECTIONS

- Daily Excavations Inspection Register with specific reference to barricading
- Safety officer internal audit - Monthly
- SHE Rep Inspection Register – Monthly checklist and deviations
- Minutes of Safety Committee Monthly meetings

CS1. 45 Safe Work Procedures Required in Health and Safety File

- Stacking of material
- Working with Portable electrical equipment
- Working with cement and concrete mixers
- Scaffolding activities
- Formwork activities
- Working at heights
- Working in inclement weather
- Excavating of trenches
- Steel fixing
- Use of Troxler
- Blasting
- Loading and transportation of material
- Transportation of workers
- Operation of construction vehicles
- Refuelling of Plant
- Use of hand tools
- Electrical installations
- Use of Ladders
- Public safety
- Ergonomics

CS1. 46 Written Training Course Material to be filed in Health and Safety File and presented

- Induction Training (Workplace awareness)
- Training of operators on Construction Vehicles and Mobile Plant
- First Aid Awareness
- Fire Fighting Awareness
- HIV/AIDS Training
- Toolbox talks on Hand Tools
- Toolbox talks on Stacking of material
- Toolbox talks on working at heights
- Toolbox talks on Maintaining Scaffolding
- Toolbox talks on Traffic management
- Toolbox talks on Driving company vehicles
- Toolbox talks on Working with cement and concrete mixers
- Toolbox talks on working with portable electrical equipment

- Toolbox talks on Excavating of trenches
- Toolbox talks on Machine Guarding
- Toolbox talks on Hand Tool Accidents
- Toolbox talks on Ten Commandments of Safety
- Toolbox talks on Fire prevention
- Toolbox talks on Ergonomics
- Toolbox talks on lifting materials by hand
- Toolbox talks on safe loading
- Toolbox talks on substance abuse
- Toolbox talks on public safety
- Toolbox talks on facilities and hygiene
- Toolbox talks on Environmental influences

CS1. 47 Emergency Equipment to be kept on site but not limited to:
First Aid Kits with splinters and the minimum required contents
Stretcher
Fire Extinguishers
Emergency Siren
Emergency contact details
Cell phone with airtime of at least R20

CS1. 48 Personal Protective Clothing
The Contractor shall provide the necessary personal protective clothing free of charge for its employees in hazardous areas, appropriate to the nature of the hazard. PPE must be maintained and kept in a good condition.
Proposed Personal Protective Equipment & Clothing required on this project but not limited to:

	TYPE	WHEN TO WEAR
1.	Hard Hats	When there is work carried above 2m from ground level or in deep excavations
2.	PVC Gloves	Working with cement, steel
3.	Reflective clothing	Working adjacent to public roads or in close proximity to construction vehicles
4.	Safety Goggles	Grinding, Cutting Cement, mixing cement
5.	Gumboots	Working in water, concrete casting
6.	Safety shoes	Offloading, working with heavy loads, positioning of materials etc.
7.	Dust Masks	Working with HCS, windy conditions, cement
8.	Ear protection	Grinding, compaction etc.
9.	Safety harness	Working at heights
10.	Life-line	Working at heights
11.	Kidney belts	Plant operators

CS1. 49 Sub-Contractor Management
Contractor control

PRINCIPAL CONTRACTOR shall enter into a Contractors Agreement in terms of Section 37(2) of the Occupational Health and Safety Act, 85 of 1993, with all appointed contractors.

PRINCIPAL CONTRACTOR shall take reasonable steps as are necessary to ensure co-operation between all contractors to enable each of those contractors to comply with the provisions of these regulations.

This would include the following:

- to appoint each contractor contemplated in writing for the part of the project on a construction site;
- ensure that contractors comply to the directives of the PRINCIPAL CONTRACTOR health and safety plan;
- to stop any contractor from executing construction work, which is not in accordance with the health and safety plan, and or the clients health and safety specification;
- to ensure that where changes are brought about to the design and construction, sufficient health and safety information and appropriate resources are made available to the contractor to execute the work safely;
- to ensure that every contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer prior to work commencing on site;
- to ensure that potential sub-contractors have made provision for the cost of health and safety measures during the construction process;
- ensure that a comprehensive and updated list of all the contractors accountable to PRINCIPAL CONTRACTOR is maintained and that the section 37.2 agreements between the parties and the type of work being done are included and available;

- Ensure that the contractors to be used have the necessary competencies and resources to perform the construction work safely;
- Ensure that all other contractors are warned of hazardous or potentially hazardous situations, which may prevent them from effectively performing their duties, which includes the placement of adequate warning signs.
- As far as reasonably practicable, PRINCIPAL CONTRACTOR is to audit contractors at least once for the duration that the contractors are on site. Should the contractor be on site for longer than a month, then the audit must be conducted at least once every month.

CS1. 50 Medical surveillance procedures

All employees:
- Working at heights,
- Operators of plant/machinery,
- Exposed to noise,
- Exposed to cement and dust,
- General labour,
- Handling Hazardous Chemicals

Are to undergo pre-employment and exit medical assessments performed by a registered occupational medical practitioner.

CS1. 51 Incident reporting

Reporting of accidents and incidents - OHSACT, Sec. 24 & GAR 8

The Principal Contractor shall report all reportable incidents to the Dept. of Labour (in terms of the Act and Regulations) and shall provide the Client with copies of all statutory reports required in terms of the Act within 7 days of the incident occurring.

The Principal Contractor shall provide the Client with copies of all internal and external accident / incident investigation reports including the reports contemplated above and below within 7 days of the incident occurring.

CS1. 52 ACCIDENT AND INCIDENT INVESTIGATION - GAR 9

The Principal Contractor / Contractor shall investigate all accidents / incidents where employees and non-employees were injured to the extent that he / she / they had to be referred for medical treatment by a doctor, hospital or clinic and results recorded on file.

The Principal Contractor / Contractor shall investigate all minor and non-injury incidents as described in Section 24 (1) (b) & (c) of the Act and keep a record of the results of such investigations including the steps taken to prevent similar incidents in future.

The Principal Contractor / Contractor shall investigate all road traffic accidents and keep a record of the results of such investigations including the steps taken to prevent similar accidents in future.

The Client reserves the right to hold its own Investigation into any incident or call for an independent external investigation.

CS1. 53 Emergency preparedness, Contingency planning & response

The Principal Contractor / Contractor shall appoint a competent person to act as Emergency Controller/Coordinator.

The Principal Contractor / Contractor shall conduct an emergency identification exercise and establish what emergencies could possibly develop. He/she shall then develop detailed contingency plans and emergency procedures, taking into account any emergency plan that the Client may have in place.

The Principal Contractor / Contractor shall hold regular practice drills of contingency plans and emergency procedures to test them and familiarize employees with them **(every 3 months).**

CS1. 54 Security and access control

The Principal Contractor / Contractor shall establish site access rules, implement and maintain these throughout the construction period. Access control procedure shall ensure that non-employees do not proceed on to work areas unaccompanied by a senior site responsible person or other.

Construction site shall be adequately hoarded (fenced) with temporary gate manned to prevent unauthorised access.

Warning signage shall be displayed on all four sides of the construction site

CS1. 55 Public Safety

The Principal Contractor / Contractor shall be responsible for ensuring that non-employees affected by the construction work are made aware of the dangers likely to arise from said construction work as well as the precautionary measures to be observed to avoid or minimize these dangers. This includes:

- Non- employees entering the site for whatever reason;
- The surrounding community;
- Passers-by.

Appropriate signage shall be posted to this effect and all employees on site shall be instructed on ensuring that non-employees are protected at all times.

All non-employees entering the site shall receive induction into the hazards and risks and the control measures for these.

All unattended excavations are to be backfilled, if not possible, they are to be adequately barricaded with PVC orange net of at least 1.2m high (NO DANGER TAPE)

CS1. 56 Audit, Reporting & Corrective actions

Monthly audit by the Client SHE agent

Occupational Health and Safety Audits will be conducted monthly to comply with Construction Regulation 4(1) (*d*) to ensure that the Principal Contractor / Contractor has implemented and is maintaining the agreed and approved OH&S Plan.

Contractor's audits and inspections

The Principal Contractor / Contractor shall conduct monthly internal audits to verify compliance with his own occupational health and safety management systems and procedures.

CS1. 57 Consultation, Communication and Liaison

All occupational health and safety liaison between the Client, the Principal Contractor, other Contractors, the Designer and other concerned parties shall be through the OH&S committee.

In addition to the above, communication may be directly to the Client or his appointed Agent, in writing, as and when the need arises.

Consultation with the workforce on OH&S matters shall be through their Supervisors, OH&S Representatives, the OH&S committee and their elected Trade Union Representatives, if any.

The Principal Contractor / Contractor shall be responsible for the dissemination of all relevant OH&S information to other Contractors e.g. design changes agreed with the Client and the Designer, instructions by the Client and/or his/her Agent, exchange of information between Contractors, the reporting of hazardous/dangerous conditions/situations etc.

CS1. 58 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.

CS1. 59 Close-out

Upon completion of the Works (at zero man hours), the Contractor shall hand over a consolidated Health and Safety file (Hard & Soft copy) to the Client SHE agent.

Health and Safety close out SHE file requirements include:

a) Client H&S Specification
b) Principal Contractor's OHS Plan(s)
c) Organograms
d) Legal Appointments
e) Notification to Department of Labour of commencement of work
f) Letters of Good Standing for the Project
g) Full files for all Contractors as well as their close out reports
- List of Contractors
- Letters of Approval of Contractors
- Mandatory Agreements
- Letters of Good Standing
- Appointments

h) Incident Records
i) Non- Conformance records
j) Agent's Audits
k) Method Statements
l) Risk assessments
m) Safe work procedures
n) Medical surveillance certificates of fitness. Medical records are to be kept according to the OH&S Act as amended.
o) All drawings for temporary structures (suspended beams/scaffolds etc.)
p) Copies of test results, policies and procedures for environmental monitoring (silica, noise, dusts etc.)

CS1. 60 Penalty Enforcement

Penalties may be imposed on Contractors who do not comply with this health and safety Specification.

The list of offences that attract penalties and how much it would cost per offence is listed on the below table and such fines will be deducted from the contractors payment certificate.

Note: In the event whereby the contractor has completed construction work and there are still outstanding critical non-conformances, the Employer reserves the right not to release an amount of not less than 5% of the final payment certificate or retention amount.

LIST OF OFFENCES AND PENALTIES

NON-CONFORMANCES	FIRST TRANSGRESSION	SECOND TRANSGRESSION
1. Expired Letter of goodstanding	Written warning	R 5000 or Site closure
2. Notification of Construction work	Written warning	R 500
3. Mandatory agreement	Written warning	R 500
4. Accident/incident management	Written warning	R 2000 – R 10000/Site closure

5. Pollution	Written warning	R 500 – R 5000
6. Inspections	Written warning	R 50 per item
7. Appointments & Competence	Written warning	R 50 per appointment
8. Risk assessment & safe work procedure	Written warning	R 200 per activity
9. Training (induction, toolbox talks etc.)	Written warning	R 50 per employee
10. PPE	Written warning	R 50 per employee
11. Unsafely working at heights	Written warning/Halt activity	R 500 – R 5000
12. Pre-employment Medicals	Written warning	R 100 per employee
13. Faulty/sub-standard tool	Written warning	R 50 per tool
14. Unsafe use & storage of Troxler	**Site closure**	**Site closure + minimum of R10 000**
15. Blasting (permits/notification)	**Halt operation**	**Minimum of R5 000**
16. Exit medicals	Written warning	R 250 per employee
16. File consolidation/ close out report	Written warning	5% of retention

ANNEXURE B DRAWINGS

The tender drawings are used as a separate volume 2 to the tender document

O. R. TAMBO DISTRICT MUNICIPALITY

PROJECT: MIS 315 995 B PHASE 6

PORT ST JOHN'S REGIONAL WATER SUPPLY SCHEME PHASE 6

SUPPLY AND INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT FOR PUMP STATIONS

C4 SITE INFORMATION

C4.1 Scope

The documentation included in this section describes the site at the time of tender to enable the tenderer to price his tender and decide upon his method of working and programming.

Only actual information about physical conditions on the site and its surroundings have been included in this section and interpretation is a matter for the tenderers.

C4.2 Subsoil Conditions

A geological investigation was undertaken in the project area to determine conditions of the underlying soil and rock structures. The geotechnical report is attached as Annexure A

C4.3 Existing Services

The positions of the services, based on the information supplied by the relevant authorities have been shown on the drawings. However, the accuracy of the information is not known. The Contractor will be required to establish the positions and depths by hand expose services that could possibly affect the proposed works.
This operation must commence immediately upon handover of the site so that any design changes required can be made and that any interface with the relevant service departments can be arranged to prevent any delays to the contract. The Contractor will be required to interface with the relevant departments directly to arrange for services to be moved if necessary.

C4.5 Existing Development

The project falls substantially within a built up area, and such impacts on existing roads and traffic, and is close to existing dwellings in certain sections.

C4. 6 Sources of material

Other than materials used for partial backfilling of trenches, material shall be obtained from commercial sources.

C4.7 Drawings

A list of drawings that are included with this document given in Annexure B as volume 2

Contractor	***Witness 1***	***Witness 2***	***Employer***	***Witness 1***	***Witness 2***

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PROJECT: MIS 315 995 B PHASE 6

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C5 DRAWINGS

Drawing No	Description
1415-0-0	Locality Plan
1415-0-10	Schematic Layout
1415-0-1202-A	Raw water abstraction pump station
1415-0-1240	Booster Pump Station 1 and 2
1415-0-1241	Booster 1 and 2 Building Layout

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2