

STEVE TSHWETE



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P.O. Box 14, Middelburg,
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Civic Centre, Wanderers
Avenue, Middelburg,
Mpumalanga

LOCAL MUNICIPALITY

REQUEST FOR FORMAL WRITTEN PRICE QUOTATIONS

GOODS

(R 30,000 to R 200,000)

SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND TESTING OF ELECTRICAL MOTOR CONTROL PANELS AT VAALBANK WATER TREATMENT PLANT

Kindly furnish me with a written quote for the supply of the goods as detailed in the enclosed schedule.

The following conditions will apply:

- Price(s) quoted must be valid for at least ninety (90) days from date of your offer.
- Price(s) quoted must be firm.
- A firm delivery period must be indicated.
- This quotation will be evaluated in terms of the 80/20 preference point system as prescribed in the Preferential Procurement Policy Framework Act (No 5 of 2000) and for this purpose the enclosed forms MBD 1, MBD 2, MBD 3.1, MBD 4, MBD 6.1, MBD 6.11, MBD 8 and MBD 9 must be scrutinized, completed and submitted together with your quotation.
- The successful provider will be the one scoring the highest points.
- The Council is not bound to accept the lowest or any quote.

Failure to comply with these conditions may invalidate your offer.

Yours faithfully

M. MNGUNI
ACTING MUNICIPAL MANAGER

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MBD 1: REQUEST FOR A FORMAL WRITTEN PRICE QUOTATION – FIRM FIXED PRICE

(Over R10 000.00 up to a transaction value of R200 000.00 VAT included)

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE STEVE TSHWETE LOCAL MUNICIPALITY

BID NUMBER: **Q32.04.17** CLOSING DATE: 28/04/2017 CLOSING TIME: 12H00.

DESCRIPTION **SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING
AND TESTING OF ELECTRICAL MOTOR CONTROL PANELS AT
VAALBANK WATER TREATMENT PLANT**

The successful bidder will be required to fill in and sign a written Contract Form (MBD 7.1)

Bid documents may be posted to:

The Senior Manager: Legal & Administration
Steve Tshwete Local Municipality
P.O. Box 14
Middelburg
1050

or deposited in the bid box situated at:

INFRASTRUCTURE SERVICES
1ST Floor, CIVIL ENGINEERING SERVICES
14 SADC STREET
Middelburg
Mpumalanga

Bidders should ensure that bids are delivered timeously to the correct address. If the bid is late, it will not be accepted for consideration.

The bid box is generally open 7H30 TO 16H00 hours Monday to Friday

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

THIS BID IS SUBJECT TO THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT

THIS BID WILL BE EVALUATED AND ADJUDICATED ACCORDING TO THE FOLLOWING CRITERIA:

1. Relevant specifications
2. Value for money
3. Capability to execute the contract
4. PPPFA and associated criteria

NB: NO QUOTATIONS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE

**THE FOLLOWING PARTICULARS MUST BE FURNISHED
(FAILURE TO DO SO MAY RESULT IN YOUR BID BEING DISQUALIFIED)**

Name of Bidder:

Postal Address:

Street Address:

Telephone Number:

Code.....Number.....

Cellphone Number:

.....

Facsimile Number:

Code Number.....

Vat Registration Number:

Has an original tax clearance certificate been attached (MBD 2)? Yes / No

Are you the accredited representative in South Africa for the services offered by you? Yes / No

SIGNATURE OF BIDDER:

DATE:

CAPACITY UNDER WHICH THIS BID IS SIGNED:

.....

TOTAL BID PRICE CARRIED OVER FROM MBD 3.1: R

ANY ENQUIRIES REGARDING THE BIDDING PROCEDURE MAY BE DIRECTED TO:

Municipality: Steve Tshwete Local Municipality.

Department: Finance – Supply Chain Management

Contact Person: Mr. P. Van der Merwe

Tel: (013) 249 7000

Fax: (013) 243 2550

ANY ENQUIRIES REGARDING TECHNICAL INFORMATION MAY BE DIRECTED TO:

Contact Person(s): Mr Davidson Machaka

Department: Civil Engineering

Tel: 013 249 7163

Fax: 013 249 2550

SPECIFICATIONS

1. Purpose

The Municipality intends to appoint a CIDB registered contractor to design, supply, deliver, install, commission and test electrical motor control panels for 500kW pumps at the Vaalbank Water Treatment Works.

2. Project Description

The principal features of the scope of works do not limit the responsibility of the *contractor*. He shall perform all work and furnish all labour, equipment and material to ensure the satisfactory operation of the substation. Material and devices, which are normally part of the supplied equipment and are essential for the proper operation of all equipment or are necessary for the proper functioning of the whole installation, shall be supplied even if not explicitly called for in these specifications.

The *contractor* will provide the following:

- a. All plant, material, transport and labour required for the construction and commissioning of the works.
- b. Operating manuals and training to the Municipal Staff.

The Works will consist of the following:

- c. Design, manufacture, deliver to site and install new motor control panels,
- d. Remove and make good where the existing motor control panels are standing in preparation for the new control panels,
- e. Re-terminate all cables to the new control panels,
- f. Testing, commissioning and handing over of the completed installation

3. Description Of The Site And Access

2.1 Location of site

The site is located at the existing Vaalbank Water treatment Works, accessible via dirt road off the R35 towards Middelburg.

2.2 Access to site

Tenderer's must allow for all conditions on site in their tenders, since extra claims arising from difficult site conditions in respect to transport, handling, loading, off-loading, labour, housing, etc., will not

be entertained. These include road entrances that may have to be kept closed overnight.

4. Details Of The Works

4.1 Brief description of works

The scope of works require the replacement of two 500kW motor control panels. It is stressed that the removal of the existing panels must be properly co-ordinated and planned to ensure that the changes are completed within one day. The maximum time period that pumping may be interrupted after the reservoirs have been filled to capacity is 24 hours.

4.2 Construction in confined areas

It may be necessary for the contractor to work within confined areas.

It will be necessary for the contractor to work in areas where additional work will be required to ensure that the existing plant keep up with the required production without interruption. Said work will be included in the pricing and will be described in the method statements prepared by the contractor.

Except where provided for in the specifications, no additional payment shall be made for work done in restricted areas.

5. Construction Programme

The submission of a construction programme as stated per clause 15 of the general conditions of contract is compulsory.

6. Time for completion

The maximum time allowed for the completion of the contract is 2 months (excluding special non-working days and the year-end break) from the date of letter of acceptance.

7. Facilities Required On Site

7.1 Facilities for the engineer

A site office for the engineer is not required.

7.2 Facilities for the contractor

The following facilities are required on the site for the contractor in addition to the facilities required by the contractor for his own purposes:

Ablution and sanitary facilities

Ablution and sanitary facilities are available on site. However, the contractor shall, if deemed fit, erect and maintain on the site proper ablution facilities. The contractor shall service and maintain the facilities in a clean and hygienic state for the duration of the contract period and on completion

of the works it from the site.

7.3 Site establishment

The engineer/employer shall indicate the location for the site office before the contractor establishes site.

8. Site Facilities Available

8.1 Water supply

Fresh water will be available for domestic and construction purposes, but the contractor must supply all necessary materials for the water connection at a position pointed out by the engineer. The availability of water cannot be guaranteed by the municipality and in the event of water no longer being freely available, the contractor must make his own arrangements to acquire it.

The rates tendered for the relevant items in the preliminary and general section of the schedule shall include all costs for the establishment and maintenance of water supply to the works and the contractor shall make his own arrangements for the possible conveyance and storage of water if necessary. The contractor will be held responsible for any wastage of water due to negligence.

8.2 Power supply

Electrical power cannot be guaranteed by the municipality. During power failures and shortages, the contractor must make his own arrangements for the provision of electricity.

The rates tendered for the relevant items in the preliminary and general section of the schedule shall include all costs for the establishment and maintenance of a power supply to the works.

9. Supply Of Materials

All material to be used in the works is to be supplied by the contractor.

The contractor shall ensure that the work is not delayed due to the lack of materials on site, by placing orders for material required under this contract as soon as possible. No extension of time will be allowed for any delay due to the supply of materials.

Although the quantities have been carefully calculated, it must be considered as approximate only and the contractor, before ordering any materials, should check the quantities required. The bill of quantities is provisional.

10. Execution Of The Works

The execution of this contract is primarily the Upgrading of the Vaalbank Water Treatment Work – Electrical motor control panels. The engineer or employer shall not be responsible or liable for any losses or damages incurred by the contractor irrespective if it is due to the execution of work as per

specifications or as directed in writing or verbally by the employer or engineer.

10.1 Inspection by the engineer

No portion of the work shall be proceeded with until the engineer/employer or his representative has examined and approved the previous stage. If any work is covered or hidden from view before the engineer or his representative has inspected the work, the contractor shall at his own cost expose the covered or hidden work for inspection. The contractor shall also be responsible for making good any work damaged during the uncovering.

10.2 Certificate of completion

When all the work under the contract have been completed to the entire satisfaction of the engineer, he will issue a certificate of completion to the contractor informing the contractor of the date the date at which the works are deemed to be completed and accepted by the employer.

11. Occupational Health and Safety Requirements

It is a requirement of this contract that the contractor shall provide a safe working environment and to direct all his activities in such a manner that his employees and any other persons who may be directly affected by his activities are not exposed to hazards to their health and safety.

To this end the contractor shall conform to all the stipulations of the Occupational Health and Safety Act (Act 85 of 1993) and the regulations applicable at the time of tender, which inter alia provide for the designation of a health and safety representative (or representatives) when an employer has more than 20 employees in his employ.

12. Works Not To Interfere

Vaalbank Water Treatment Works will be operational throughout the Contract. The Contractor shall ensure that his work does not affect operations without good reason and that there is access at all times. The Contractor will advise the Boskrans Wastewater Treatment Works Plant Supervisor minimum of 5 days prior to any activity that could disrupt the Works in any form.

13. Unauthorised Persons

The Contractor shall keep unauthorized persons away from his site at all times.

14. Information to be provided with the bid

Certified copy of a Valid B-BBEE Status Level Verification Certificates should be attached. Bidders who do not submit B-BBEE Status Level Verification Certificates or are non-compliant contributors to B-BBEE do not qualify for preference points and will score points out of 80 for price only and zero points out of 20 for B-BBEE.

15. Nature of Contract

The General Conditions of Contract (GCC) 2010 shall apply to this bid.

16. Information that will be provided by the Municipality

An official order would be supplied/sent to the bidder who collects more points.

17. Access to Site

Access to site prior to submission the bid document is possible and can be arranged on request, through the use of the contact details shown above.

18. Pricing Guidelines

The pricing schedules must be completed in full. Contractor are advised to read the pricing schedule carefully.

19. Compulsory Requirements

The following are compulsory, failure to submit will result in disqualification of the bid.

- Letter of Good Standing (COIDA)
- Record of experience in similar work with contact details of the Client, project value and contact details
- Registered as compliant service provider on the Central Supplier Database
- CIDB Registration Certificate (3ME/3EP or higher)
- Completed Annexure C and Initial at the bottom of each page in all Annexures.
- ECB registration certificate

20. Evaluation of Bids

All bids will be evaluated for functionality as per schedule below. The experience of the tenderer in similar projects or nature or similar areas and conditions in relation to the scope of work will be evaluated here.

Briefly describe company or individual experience in regard to the above scope of work and attach this to this schedule. Proof of previous work history must be attached for e.g. purchase order, appointment or reference letter etc.

A summary of the relevant work experience in line with the scope of work should be indicated in the table below: (Any additional information regarding previous work experience can be attached to this schedule).

Employer, contact person and telephone number, where available	Description of work (service)	Value of work (i.e. the service provided) inclusive of VAT (Rand)	Date completed

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The scoring of the tenderer's experience will be as follows:

Non-responsive (score 0)	Tenderer has no experience or no information has been provided
Poor (max score 20)	Tenderer has previous work experience but not relevant to scope of work.
Satisfactory (max score 50)	Tenderer has limited relevant experience and has not dealt with the critical issues specific to the assignment.
Good (max score 70)	Tenderer has relevant experience in relation to the project and has worked previously under similar conditions and circumstances
Very good (score 100)	Tenderer has outstanding work experience in projects of a similar nature.

Only bidders who score a minimum of 70/100 points in this schedule will be further evaluated on price and BBBEE.

MBD 2: TAX CLEARANCE CERTIFICATE REQUIREMENTS

It is a condition of bid that the taxes of the successful bidder must be in order, or that satisfactory arrangements have been made with South African Revenue Service (SARS) to meet the bidder's tax obligations.

1. In order to meet this requirement bidders are required to complete in full form TCC001 "Application for a Tax Clearance Certificate" and submit it to any SARS branch office nationally. The Tax Clearance Certificate Requirements are also applicable to foreign bidders / individuals who wish to submit bids. Copies of the TCC 001 "Application for a Tax Clearance Certificate" form are available from any SARS branch office nationally or on the website www.sars.gov.za.
2. SARS will then furnish the bidder with a Tax Clearance Certificate that will be valid for a period of 1 (one) year from the date of approval.
3. The original Tax Clearance Certificate must be submitted together with the bid. Failure to submit the original and valid Tax Clearance Certificate will result in the invalidation of the bid. Certified copies of the Tax Clearance Certificate will not be acceptable.
4. In bids where Consortia / Joint Ventures / Sub-contractors are involved, each party must submit a separate Tax Clearance Certificate.
5. Applications for the Tax Clearance Certificates may also be made via eFiling. In order to use this provision, taxpayers will need to register with SARS as eFilers through the website www.sars.gov.za.
6. Exemption to the provision of a Tax Clearance Certificate will be granted provided that:
 - a) The bidder is registered on the vendor database of the municipality and a valid tax clearance certificate was submitted together with the application for registration
 - b) If the closing date of the price quotation or bid falls within the expiry date of the tax clearance certificate that is in the municipality's possession.

MBD 3.1: PRICING SCHEDULE – FIRM PRICES (PURCHASES)

NOTE:

ONLY FIRM PRICES WILL BE ACCEPTED. NON-FIRM PRICES (INCLUDING PRICES SUBJECT TO RATES OF EXCHANGE VARIATIONS) WILL NOT BE CONSIDERED IN CASES WHERE DIFFERENT DELIVERY POINTS INFLUENCE THE PRICING, A SEPARATE PRICING SCHEDULE MUST BE SUBMITTED FOR EACH DELIVERY POINT. ALL AMOUNTS IN RAND

Name of Bidder:.....	Bid Number: Q32.04.17
Closing Time: 12:00	Closing Date: 28/04/2017

ITEM No.	DESCRIPTION	AMOUNT
A1	Preliminary & General	R
B	Electrical Installations (Motor control panel installation)	R
SUB TOTAL		R
CONTIGENCIES (10%)		R
TOTAL		R
VAT (14%)		R
GRAND TOTAL TO FORM OF OFFER		R

SCHEDULE A1: PRELIMINARY AND GENERAL

Item	Pay Ref	Description	Unit	Tender	Rate	Amount
A.1	S1200A 8.3	FIXED CHARGED ITEMS				
A.1.1	8.3.1	contractual requirements	sum	1		
	8.3.2	ESTABLISH FACILITIES ON THE SITE	sum	0		
	8.3.2.1	FACILITIES FOR THE ENGINEER				
A.1.2	PSAB 3.1	name board	no	0		Rate Only
A.1.3	PSAB 3.2	engineer's office and facilities	sum	0		Rate Only
A.1.4	PSAB 4.1	telephone	sum	0		
A.1.5		contractor's mark up on Item A.1.4	%			
	8.3.2.2	FACILITIES FOR CONTRACTOR				
A.1.6		office and storage sheds	sum	1		
A.1.7		living accommodation	sum	1		
A.1.8		ablution and toilet facilities	sum	0		
A.1.9		tools and equipment	sum	1		
A.1.10		access	sum	1		
A.1.11		other fixed charged obligations(specify separately in detail)	sum	1		
A.1.12		remove engineer's and contractor's site establishment on completion of contract	sum	1		
A.2	8.4	TIME RELATED ITEMS				
A.2.1	8.4.1	contractual requirements	sum	1		
	8.4.2	OPERATION AND MAINTENANCE OF FACILITIES ON SITE FOR DURATION OF CONSTRUCTION				
	8.4.2.1	FACILITIES FOR ENGINEER				
A.2.2	PSAB 3.1	name board	sum	0		Rate Only
A.2.3	PSAB 3.2	engineer's office and facilities	sum	0		Rate Only
A.2.4	PSAB 4.1	telephone	sum	0		
A.2.5		contractor's mark up on Item A.2.4	%			
	8.4.2.2	FACILITIES FOR CONTRACTOR FOR THE DURATION OF CONSTRUCTION				
A.2.6		offices and storage sheds	sum	1		
A.2.7		living accommodation	sum	1		
A.2.8		ablution and toilet facilities	sum	0		
A.2.9		tools and equipment	sum	1		
A.2.10		access	sum	1		
A.2.11		supervision for duration of construction	sum	1		
A.2.12	8.4.4	company and head office overhead costs for the duration of the contract	sum	1		
A.2.13	8.4.5	other time related obligations (specify separately in detail)	sum	1		

A.3	8.5	PROVISIONAL ITEMS				
A.3.1		community liaison officer	sum	0	R0.00	R0.00
A.3.2		contractor's mark up on Item A.3.1	%	20 000	%	
A.4	PSA 8.4.6	STANDING TIME COSTS				
A.4.1	a	labour (Rate only)	sum	1		Rate only
A.4.2	b	other resources (Rate only)	sum	1		Rate only
A.4.3	PSA 8.7	daywork (provisional)	sum	1	5 000.00	5 000.00
A.5	8.6	SUMS STATED PROVISIONALLY BY ENGINEER				
A.5.1	a	additional tests required by the Engineer	sum	1	30 000.00	30 000.00
A.5.2	b	overheads, profit and charges on A.5.1 above	%	30 000	%	
A.6	PSA 8.9	OCCUPATIONAL HEALTH AND SAFETY MEASURES				
A.6.1	PSA 8.9.1	cost of health and safety measures required in terms of the Construction Regulations (2003) of the Occupational Health and Safety act	sum	1		
A.6.2	PSA 8.9.2	compilation and maintenance of a Health and Safety Plan, including Risk Assessments, Safe Work Procedures and Method Statements	sum	1		
A.6.3	PSA 8.9.3	compilation and maintenance of a Health and Safety File	sum	1		
A.7	PSA 8.10	ENVIRONMENTAL MANAGEMENT PLAN				
A.7.1	PSA 8.10.1	providing a Method Statement on compliance with client's Environmental Management Plan Specification	sum	1		
A.7.2	PSA 8.10.2	complying with requirements of the Environmental Management Plan	sum	0		
A.8		COMPLIANCE WITH THE REQUIRED CONTRACT ADMINISTRATION				
A.8.1		Completing monthly labour returns	Sum	0		
A.8.2		Other (specify)	Sum	0		
A.9	8.8	TEMPORARY WORKS				
A.9.1	8.8.3	Protection of existing structures and pipelines until completion	sum	1		
TOTAL FOR SECTION A1 (CARRIED FORWARD TO SUMMARY)						

SCHEDULE B: ELECTRICAL INSTALLATION						
ITEM NO	PAYMENT REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1		SWITCHBOARDS				
		Supply and installation of the following distribution boards, as specified, complete with all installation accessories, etc.				
1.1	E3	MCC - Pump 1	ea	1		
1.2	E3	MCC - Pump 2	ea	1		
2		REMOVAL OF EXISTING SWITCHBOARDS				
		Removal of the existing distribution boards, as specified				
		complete with all equipment necessary to repair damages to existing building. This would include all filling of holes and painting where the size of the new control panel differs				
2.1		Provisional Amount	sum	1	10 000.00	10 000.00
3	E6	Supply and installation of the following cable terminations to re-terminate any loose or damaged terminations onto the new control panels.				
3.1		300mm ² x 4 Core	No	12		
3.2		240mm ² x 4 Core	No	6		
3.3		185mm ² x 4 Core	No			Rate Only
4	E6	Supply and installation of the following equipment control cables as specified, installed on cable trays and in conduit				
4.1		1,5mm ² , 5 Core PVC.SWA.PVC Cable	m			Rate Only
4.2		1,5mm ² , 7 Core PVC.SWA.PVC Cable	m	25		
5		LOCAL CONTROL STATIONS				
5.1	E6.3	Supply and install local control				

		stations as per specification and commissioning of the electrical installation, to include for the issuing of a COC for each and every control panel	No	2		
5		GENERAL ITEMS				
6.1		The contractor shall allow for the complete testing and commissioning of the electrical installation, to include for the issuing of a COC for each and every control panel	No	2		
6.2		The provision of as build documentation including as build Drawings, O&M manuals for all equipment.	set	3		
6.3		Provision of training to the end users	sum	1		
6.4		Labelling of the new installation	sum	1		
7		Sub-Total				R
8		Contingency (10%)				R
9		Total				R
10		VAT (14%)				R
11		Grand Total Bid Price				R

MBD 4

DECLARATION OF INTEREST

1. No bid will be accepted from persons in the service of the state¹.
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, hareholder²):.....
- 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.
.....

¹MSCM 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?* **NO** **YES /**

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

.....
Date

.....
Signature

.....
Capacity

.....
Name of Bidder

CERTIFICATION

I, _____ THE _____ UNDERSIGNED _____ (NAME)

.....
**CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS
CORRECT. I ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD THIS
DECLARATION PROVE TO BE FALSE.**

.....
Signature

.....
Date

.....
Position

.....
Name of Bidder

MBD 6.1: PREFERENCE CERTIFICATE

PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2001

Note: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF EQUITY OWNERSHIP BY HISTORICALLY DISADVANTAGED INDIVIDUALS (HDI's), AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT REGULATIONS, 2001.

1. GENERAL CONDITIONS:

The following preference point system are applicable to all bids:

the 80/20 system for requirements with a Rand value of up to R 500 000; and

the 90/10 system for requirements with a Rand value above R 500 000.

Failure on the part of a bidder to fill in and/or sign this form may be interpreted to mean that preference points are not claimed.

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

2. GENERAL DEFINITIONS:

- 2.1. **“Acceptable bid”** means any bid which, in all respects, complies with the specifications and conditions of bid as set out in the bid document.
- 2.2. **“Bid”** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the provision of goods, works or services.
- 2.3. **“Comparative price”** means the price after the factors of a non-firm price and all unconditional discounts that can be utilised have been taken into consideration.
- 2.4. **“Consortium or joint venture”** means an association of persons for the purpose of combining their expertise, property, capital, efforts, skills and knowledge in an activity for the execution of a contract.
- 2.5. **“Contract”** means the agreement that results from the acceptance of a bid by an organ of state.
- 2.6. **“Specific contract participation goals”** means the goals as stipulated in the Preferential Procurement Regulations 2001. In addition to above-mentioned goals, the Regulations [12.(1)] also make provision for organs of state to give particular consideration to procuring locally manufactured products.
- 2.7. **“Control”** means the possession and exercise of legal authority and power to manage the assets, goodwill and daily operations of a business and the active and continuous exercise of appropriate managerial authority and power in determining the policies and directing the operations of the business.
- 2.8. **“Disability”** means, in respect of a person, a permanent impairment of a physical, intellectual, or sensory function, which results in restricted, or lack of, ability to perform an activity in the manner, or within the range, considered normal for a human being.
- 2.9. **“Equity Ownership”** means the percentage ownership and control, exercised by individuals within an enterprise.
- 2.10. **“Historically Disadvantaged Individual (HDI)”** means a South African citizen.
 - (1) who, due to the apartheid policy that had been in place, had no franchise in national elections

prior to the introduction of the Constitution of the Republic of South Africa, 1983 (Act No 110 of 1983) or the Constitution of the Republic of South Africa, 1993, (Act No 200 of 1993) (“the interim Constitution); and/or

- (2) who is a female; and/or
- (3) who has a disability:

provided that a person, who obtained South African citizenship on or after the coming to effect of the Interim Constitution, is deemed not to be a HDI;

- 2.11. **“Management”** means an activity inclusive of control and performed on a daily basis, by any person who is a principal executive officer of the company, by whatever name that person may be designated, and whether or not that person is a director.
- 2.12. **“Owned”** means having all the customary elements of ownership, including the right of decision-making and sharing all the risks and profits commensurate with the degree of ownership interests as demonstrated by an examination of the substance, rather than the form of ownership arrangements.
- 2.13. **“Person”** includes reference to a juristic person.
- 2.14. **“Rand value”** means the total estimated value of a contract in Rand denomination that is calculated at the time of bid invitations and includes all applicable taxes and excise duties.
- 2.15. **“Small, Medium and Micro Enterprises” (SMMEs)** bears the same meaning assigned to this expression in the National Small Business Act, 1996 (No 102 of 1996).
- 2.16. **“Sub-contracting”** means the primary contractor’s assigning or leasing or making out work to, or employing another person to support such primary contractor in the execution of part of a project in terms of the contract.
- 2.17. **“Trust”** means the arrangement through which the property of one person is made over or bequeathed to a trustee to administer such property for the benefit of another person.
- 2.18. **“Trustee”** means any person, including the founder of a trust, to whom property is bequeathed in order for such property to be administered for the benefit of another person.

3. ESTABLISHMENT OF HDI EQUITY OWNERSHIP IN AN ENTERPRISE:

- 3.1 Equity ownership shall be equated to the percentage of an enterprise which is owned by individuals classified as HDI’s, or in the case of a company, the percentage shares that are owned by individuals classified as HDI’s, who are actively involved in the management and daily business operations of the enterprise and exercise control over the enterprise, commensurate with their degree of ownership.
- 3.2 Where individuals are not actively involved in the management and daily business operations and do not exercise control over the enterprise commensurate with their degree of ownership, equity ownership may not be claimed.

4. ASSESSMENT USING A POINT SYSTEM:

- 4.1 The bidder obtaining the highest number of points will usually be awarded the bid.
- 4.2 Preference points shall be calculated after prices have been brought to a comparative basis.
- 4.3 Points scored will be rounded off to 2 decimal places.
- 4.4 In the event of equal points scored, the bid will be awarded to the bidder scoring the highest number of points for specified goals. If, however the bids are equal in all respects, then the award shall be decided by the drawing of lots.

5. POINTS AWARDED FOR PRICE/FUNCTIONALITY:

5.1. THE 80/20 PREFERENCE POINT SYSTEM

5.1.a. The following formula must be used to calculate the points for price in respect of bids with a Rand value equal to, or above R 30 000 and up to a Rand Value of R500 000. Organs of state may however, apply this formula for bids with a value less than R30 000, if and when appropriate:

5.1.b. Points Awarded for Price/Functionality (Ps):

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

$$Ps = 80 \left[1 - \frac{(Pt - P_{min})}{P_{min}} \right]$$

Where

Ps = Points scored for price/functionality of bid under consideration

Pt = Rand value of bid consideration

P min = shall be a bid price.

A maximum of {insert points} points may be awarded to a bidder for being an HDI and or subcontracting with an HDI and / or achieving any of the specified goals stipulated in regulation 17.

A maximum of {insert points} points may be awarded to a bidder being a woman.

A maximum of {insert points} point may be awarded to a bidder being disabled

A maximum of {insert points} point may be awarded to a bidder in respect of the locality of his office

The bidder with the highest number of points scored may be selected.

5.2. The 90/10 preference point system

5.2.a. The following formula must be used to calculate the points for the price in respect of bids with a Rand value above R 500 000

5.2.b. Points Awarded for Price/functionality (Ps)

A maximum of 90 points is allocated on the following basis:

$$Ps = 90 \left[1 - \frac{(Pt - P_{min})}{P_{min}} \right]$$

Where

Ps = Points scored for price of bids under consideration

Pt = Rand value of offer bid consideration

A maximum of {insert points} points may be awarded to a bidder for being an HDI and or subcontracting with an HDI and / or achieving any of the specified goals stipulated in regulation 17.

A maximum of {insert points} points may be awarded to a bidder being a woman.

A maximum of {insert points} point may be awarded to a bidder being disabled

A maximum of {insert points} point may be awarded to a bidder in respect of the locality of his office

5.3. In terms of Regulation 13 (2) preference points for HDI's are calculated on their percentage shareholding in a business, provided that they are actively involved in and exercise control over the enterprise. The following formula is prescribed in Regulation 13 (5) (c):

$$N_{EP} = N_{OP} \times \frac{E_P}{100}$$

Where

- N_{EP} = Points awarded for equity ownership by an HDI
- N_{OP} = The maximum number of points awarded for equity ownership by an HDI in that specific category
- E_P = the percentage of equity ownership by an HDI within the enterprise or business, determined in accordance with the definition of HDI's.

- 5.4. Equity claims for a trust will only be allowed in respect of those persons who are both trustees and beneficiaries and who are actively involved in the management of the trust.
- 5.5. Documentation to substantiate the validity of the credentials of the trustees contemplated above must be submitted.
- 5.6. Listed companies and tertiary institutions do not qualify for HDI preference points.
- 5.7. Consortium or joint venture may, based on the percentage of the contract value managed or executed by their HDI-members, be entitled to preference points in respect of an HDI.
- 5.7(a) A person awarded a contract as a result of preference for contracting with, or providing equity ownership to an HDI, may not subcontract more than 25% of the value of the contract to a person who is not an HDI or does not qualify for the same number or more preference for equity ownership.

6. BID DECLARATION

- 6.1. Bidders who claim points in respect of equity ownership must complete the Bid Declaration at the end of this form.

7. EQUITY OWNERSHIP CLAIMED IN TERMS OF PARAGRAPH 2.10 ABOVE. POINTS TO BE CALCULATED FROM INFORMATION FURNISHED IN PARAGRAPH 9

	Maximum points (A)	Percentage equity owned (B)	Points claimed (AxB)
7.1. Equity ownership by persons who had no franchise in the national elections	{insert point}	%	points
7.2. Equity ownership by women	{insert point}	%	points
7.3. Equity ownership by disabled persons	{insert point}	%	points
Total points – sum of 7.1 to 7.3			

8. DECLARATION WITH REGARD TO EQUITY

Name of firm:	
VAT registration number:	
Company registration number :	

Type of firm (Tick applicable box):

<input type="checkbox"/> Partnership	<input type="checkbox"/> One person business/sole trader	<input type="checkbox"/> Close corporation
<input type="checkbox"/> Company	<input type="checkbox"/> (Pty) Limited	

Describe principal business activities:

COMPANY CLASSIFICATION (<i>Tick applicable box</i>):	
<input type="checkbox"/> Manufacturer	<input type="checkbox"/> Supplier
<input type="checkbox"/> Professional service provider	<input type="checkbox"/> Other service providers.

Total number of years this has been in business?	
---	--

9. List all Shareholders by Name, Position, Identity Number, Citizenship, HDI status and ownership, as relevant. Information to be used to calculate the points claimed in paragraph 7.

Name	Date/Position occupied in Enterprise	ID Number	Date RSA Citizenship obtained	HDI Status			% of business / enterprise owned
				No franchise prior to elections	Women	Disabled	
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%
				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	%

10. CONSORTIUM / JOINT VENTURE

In the event that preference points are claimed for HDI members by consortia / joint ventures, the following information must be furnished in order to be entitled to the points claimed in respect of the HDI member:

Name of HDI member (to be consistent with table 10)	Percentage (%) of the contract value managed or executed by the HDI member

11. I/we, the undersigned, who warrants that he/she is duly authorised to do so on behalf of the firm certify that points claimed, based on the equity ownership, indicated in paragraph 8 of the foregoing certificate, qualifies the firm for the preference(s) shown and I / we acknowledge that:

- a) The information furnished is true and correct.
- b) The Equity ownership claimed is in accordance with the General Conditions as indicated in paragraph 1 of this form.
- c) In the event of a contract being awarded as a result of points claimed as shown in paragraph 8, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct.
- d) If the claims are found to be incorrect, the Employer may, in addition to any other remedy it may have -
 - i. recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - ii. cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - iii. impose a financial penalty more severe than the theoretical financial preference associated with the claim which was made in the bid; and

Name of Bidder	Signature	Date

Witness Signature:	Witness signature:

TENDER NO.					
	BIDDER	WITNESS	EMPLOYER	WITNESS	

MBD 6.11: PROMOTION OF ENTERPRISES LOCATED IN THE STEVE TSHWETE MUNICIPAL AREA

REFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2001

NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES SPECIFIED IN CLAIM FORM MBD 6.1 AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2001.

1. Regulation 17(3) (g) of the Preferential Procurement Regulations makes provision for the promotion of enterprises located in a specific municipal area for work to be done or services to be rendered in that municipal area.
2. The promotion of this goal can be achieved by acquiring goods and services from enterprises located within the **Steve Tshwete Local Municipality**. This includes an enterprise whose head office may be situated in elsewhere, but has established a fully-fledged branch within this municipal area. Enterprises located outside the borders of this Municipality and who only appoint agents and/or commission warehouses in this municipal area are expressly excluded from claiming points for this goal.

SPECIFIC GOAL

POINTS ALLOCATED

The stimulation of the local economy by procuring from enterprises located within the borders of the **Steve Tshwete Local Municipality**

{insert points}

3. Preference points may only be claimed by enterprises located within the **Steve Tshwete Local Municipality**. (See paragraph 2 above).

4. BID DECLARATION

Bidders who wish to claim points in respect of this specific goal must complete the declaration part of this form.

5. POINTS CLAIMED

Bidder to indicate whether the point(s) allocated for enterprises situated within the **Steve Tshwete Local Municipality** is/are claimed. Yes / No

6. DECLARATION WITH REGARD TO LOCALITY

State full particulars of locality of enterprise as well as that of Head Office:

Address of local enterprise:

Physical:

Postal:.....

.....

.....

.....

.....

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	BIDDER	WITNESS	EMPLOYER	WITNESS	

Telephone:

Fax:

Municipal Account No:

Stand No:

Address of Head Office:

Physical:

Postal:.....

.....

.....

.....

.....

Telephone:

Fax:

I/we, the undersigned, who warrants that he/she is duly authorised to do so on behalf of the enterprise certify that the enterprise is entitled to the points allocated in paragraph 2 of this form and I / we acknowledge that:

- (i) The information furnished is true and correct.
- (ii) In the event of a contract being awarded as a result of points claimed, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claim is correct.
- (iii) If the claim is found to be incorrect, the purchaser may, in addition to any other remedy it may have-
 - (a) recover all costs, losses or damages it has incurred or suffered as a result of wrong information furnished; and
 - (b) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation.

WITNESSES:

1.

SIGNATURE (S) OF BIDDER (S)

2.

DATE:

TENDER NO.					
	BIDDER	WITNESS	EMPLOYER	WITNESS	

MBD 8: DECLARATION OF BIDDER’S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

1. This Standard Bidding Document forms part of all bids invited.
2. It serves as a declaration to be used by institutions 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 disregarded if that bidder, or any of its directors have-
 - a) abused the institution’s supply chain management system;
 - b) committed fraud or any other improper conduct in relation to such system; or
 - c) failed to perform on any previous contract.
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 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 National Treasury after the <i>audi alteram partem</i> rule was applied).	Yes <input type="checkbox"/>	No <input type="checkbox"/>
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)? To access this Register enter the National Treasury’s website, www.treasury.gov.za, click on the icon “Register for Tender Defaulters” or submit your written request for a hard copy of the Register to facsimile number (012) 3265445.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
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 outside of the Republic of South Africa) for fraud or corruption during the past five years?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.3.1	If so, furnish particulars:		

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	BIDDER	WITNESS	EMPLOYER	WITNESS	

Item	Question	Yes	No
4.4	Was any contract between the bidder and any organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.4.1	If so, furnish particulars:		

CERTIFICATION

**I, THE UNDERSIGNED (FULL NAME).....
 CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS 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

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	BIDDER	WITNESS	EMPLOYER	WITNESS	

MBD 9: CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

_____ (Bid Number and Description)

in response to the invitation for the bid made by the **Steve Tshwete Local 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

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	BIDDER	WITNESS	EMPLOYER	WITNESS	

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 consortium³ 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.

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.

.....

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	BIDDER	WITNESS	EMPLOYER	WITNESS

Signature Date

.....

Position Name of Bidder

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.

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	BIDDER	WITNESS	EMPLOYER	WITNESS	

GENERAL CONDITIONS OF CONTRACT

The General Conditions of Contract is not included in this document and may be downloaded from the following website:

<http://www.treasury.gov.za/legislation/pfma/public%20entities/PFMA%20GCC%20July%202010.pdf>

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		BIDDER	WITNESS	EMPLOYER	WITNESS



STEVE TSHWETE LOCAL MUNICIPALITY

UPGRADING OF THE VAALBANK WATER TREATMENT PLANT

ELECTRICAL MOTOR CONTROL PANELS

ANNEXURE A

DETAIL SPECIFICATION - ELECTRICAL INSTALLATION

E1 SCOPE OF ELECTRICAL INSTALLATION

This section and following relevant sections of the contract covers the electrical installation for the Works consisting of switchboards, control gear, cables and all electrical equipment necessary to complete the installation in full working order.

All equipment and work carried out must be in accordance with the particular specification PMA in this document, unless stated otherwise in this Scope of Works.

The work comprises in short:

E1.1 NEW DISTRIBUTION BOARDS

New main LV motor control panels (MCC's) shall be provided in the switch room from where power shall be taken to the Motors.

The new MCC's shall be equipped as indicated on the relevant schematic diagram.

The following MCC's shall be provided:

- MCC 1 – 500 kW Pump 1
- MCC 2 – 500 kW Pump 2

E1.2 ELECTRICAL INSTALLATION ASSOCIATED WITH THE FOLLOWING

a) Pumping Station

i. MCC 1

- Re-connection of the power supply cable between the Main LV Panel and MCC 1.

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- Supply and installation of all interconnecting cables between MCC 1 and the following equipment:
 - Pump 1
 - Re-connection of Flow Meters and all interconnecting cables to MCC 1.
 - Re-connection of all Emergency Stop Buttons with interconnecting cables to MCC 1.
- ii. MCC 2
- Re-connection of the power supply cable between the Main LV Panel and MCC 2.
 - Supply and installation of all interconnecting cables between MCC 2 and the following equipment:
 - Pump 2
 - Re-connection of Flow Meters and all interconnecting cables to MCC 2.
 - Re-connection of all Emergency Stop Buttons with interconnecting cables to MCC 2.
- b) Remote control stations, instrumentation, power, control and instrumentation cabling between the MCC's, motor driven equipment and remote control stations.
- c) Any other item not specifically mentioned above or hereafter, which is nevertheless required for the correct operation of the electrical installation for this plant.

E2 **SWITCHBOARDS**

E2.1 **GENERAL**

Switchboards shall conform to PMA.4.2.

- Switchboards rated at more than 10 kA, must comply with SANS 1973-1 and the switchboard must be certified to comply with the relevant type tested assembly provided for within SANS 1973-1. (TTA, PTTA) and SANS 1973-8 (MTTA).

Ratings given for equipment are based on the estimated power requirements of new driven equipment, but must be determined according to the specific motors as installed. Starters may not be rated at less than the motor rating.

Starters must conform strictly to clauses PMA.4.3 unless specified otherwise in this project specification and must be equipped to auxiliaries, as stated. Comprehensive motor protection shall include, overload, underload, phase fail/under voltage and phase rotation.

Note: That all drives, including ancillary equipment e.g. motor driven grease pumps etc. associated with the relevant equipment must have a separate starter included in the switchboard, even if not mentioned below.

The switchboards and all switchgear must be rated for the specified fault level as specified under the relevant switchboard. Single pole circuit breakers on switchboards with a fault level in excess of 10 kA, may be rated at 10 kA with suitable HRC backup fuses.

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Fault levels given at the relevant switchboards are based on the position of switchboards as shown on the drawings and cable sizes in the schedule of cables. Should there be any deviation, the fault levels must be re-evaluated.

Sufficient space must be provided between the base of the panel, the gland plate and the main circuit breaker to allow easy connection of the supply cable. In the case of free-standing switchboards, there must be at least 300 mm clearance between the base and gland plate with additional space below in a trench to allow for the cable bending radii. In absence of a trench, the additional height must be provided by means of a raised platform from angle iron. Suitable terminals must be provided for the incoming cable if the main circuit breaker terminals are inadequate.

All connections, including motor connections, must be extended to terminals above the gland plate, within dedicated terminal compartments with own doors. Connections to starter panels situated at the bottom of a tier may be accommodated within that starter panel, but no others.

Tiers with enclosed starter compartments, must be provided with separate vertical wiring compartments between tiers, for wiring to terminals in the terminal compartments, of minimum width 250 mm. Terminals to signal and control cabling may be installed within such tiers.

Air entry openings must be fitted with filters in a removable frame for easy removal for cleaning. Screens must be fitted to air exits to prevent ingress of foreign bodies.

Switchboards must be manufactured from 1,6 mm (min) 3CR-12 sheet steel.

A label must be provided at the main circuit breakers depicting the point of supply and cable size.

Important: The completed installation will be supplied by an overhead bus-bar trunking system of 2500A. From the bus-bar a connection to the motor panel will be made. The panels that will be supplied must be compatible to add a bus-bar connection from the top into the panel. Details to provide the bus-bar connection must be submitted with the tender proposal.

Note: That all supporting structures for freestanding switchboards, such as over cable trenches, must be provided under this contract and included in the switchboard price.

E2.2 PROTECTION DEVICES

Unless stated to the contrary, motor protection devices must be of the following type:

- a) Overload : Thermal overload relay
- b) Overheat : Motor winding embedded thermal protection device
- c) Phase fail : Phase fail relay with AUTO reset (300 s time delayed, adjustable) for protection against phase loss, phase rotation and under voltage. (This protection must include control equipment such as contactor coils).

Where comprehensive motor protection is specified as a separate electronic protection relay, it must have at least the above facilities. The specific fault must be identified on the unit by means of a LED or LCD display and a single trip contact must also be provided for a common TRIP indication light on the external panel door.

Comprehensive motor protection relays may be offered, even if not specifically specified.

E2.3 ALARM AND STATUS INDICATION

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	BIDDER	WITNESS	EMPLOYER	WITNESS

The plant status and fault/alarm conditions must be identified on the panel as described for each switchboard, by means of indication lights of the cluster LED type. These lights must stay on until the alarm/fault condition has been rectified **and the protection/alarm device reset operated**. All protection/alarm devices must have manual resets, unless specified to the contrary elsewhere in this project specification. It must be possible to reset an alarm as soon as the alarm detection unit is in the normal state again.

An alarm generated at a specific switchboard and relayed to another switchboard by means of a telemetry/cable system, must be reset at the switchboard of origin, resulting in an automatic reset at the secondary switchboard, due to absence of the alarm.

A lamp test pushbutton must be provided to switch on all indicating lights simultaneously. Switchboards comprising more than three tiers, must have a test pushbutton for each panel.

A continuous duty audible and flashing strobe type alarm must be provided at each switchboard. The flasher must be in a clearly visible position. All alarm and fault (protection) conditions derived from equipment served by the switchboard must activate this alarm. An ALARM ACCEPT pushbutton must be provided on the control panel of the switchboard, to cancel this alarm.

In the case of indoor switchboards, the alarm light must be installed on the building outside wall and in the case of outdoor switchboards the alarm must be fitted to a bracket attached to the side of the roof canopy, that ingress of water into the switchboard at this point is not possible. Alarm lights must be protected against vandalism with a stainless steel wire grid enclosure.

E2.4 REMOTE MONITORING

Provision must be made for the necessary signals for the plant status to be remotely monitored by a SCADA system to be installed in future under a separate contract. The points to be monitored and controlled are as stated below and under each switchboard, description, wired to terminals as described below.

E2.4.1 Switchboard Enclosure

A separate, totally enclosed, compartment with its own door must be provided for each switchboard, fitted with terminals wired to the relevant equipment to be monitored and controlled by the remote monitoring and control system as described below and under the relevant equipment.

All terminals for digital signals (output) to the monitoring system, must be wired to voltage free contacts of interposing relays (fitted within this panel). Similarly, all digital signals (input) from the remote control system shall be from corresponding voltage free contacts of interposing relays within the remote system. I.e. no direct voltage transfer may be done between the motor control circuitry and monitoring and control I/O.

Voltage for the interposing relay coils within the switchboard, must be taken from the control voltage. Relay contacts must be suitable for 230 V AC.

The following points must be monitored:

- a) Motor status (each):
 - Motor circuit breaker ON/OFF status : Auxiliary switch on motor circuit breaker wired to interposing relay (open in OFF);
 - Mode selector switch MANUAL and AUTO positions wired to interposing relays (closed in monitored position; open in OFF);

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- Motor RUN status: Auxiliary switch on starter wired to interposing relay (closed in RUN);
- Equipment TRIP status: All driven equipment protection devices wired to a common interposing relay (closed in TRIP).
- All other **alarm and status indication** as per the control description of the driven equipment in the relevant project specification.

E3 SCHEDULE OF SWITCHBOARDS:

E3.1 SWITCHBOARD (MCC 1 + MCC2)

Supply and install wall mounted/free standing indoor type switchboards, in the plant room for feeding Pump 1 and Pump 2.

The switchboards must be constructed in vertical modules, subdivided in separate enclosed compartments.

The switchboard and switchgear must be rated at 60 kA minimum and a S.T.A or T.T.A in terms of SANS 19731-1:

Note: That each group of related equipment must have their own control panel.

The switchboard must comprise the following:

E3.1.1 Section Equipped With:

- a) Main circuit breaker rated at 800A (adjustable 600 - 800 A).
- b) Class 1 Surge Protection similar and equal to the DehnVentill TT type complete with backup fuses.
- c) Star Delta Starter for 500kW motor.
- d) Single electronic meter to measure the following:
 - i. 3-phase voltage,
 - ii. current,
 - iii. power,
 - iv. demand,
 - v. energy,
 - vi. frequency,
 - vii. power factor
 - viii. Ethernet port with Modbus TCP protocol
- e) Phase fail protection. This may be incorporated into the main Circuit Breaker.

E4 EQUIPMENT CONTROL

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E4.1 PUMPS (500kW)

Three pumps can be operational at any time depending on the volume of water required to be pumped. It will be possible to select any two of the three pumps for duty and any one for standby. The panels are installed at each pump and does not form a continuous panel. All the interconnecting wires must be taken to terminal blocks in the control section and from there will be connected to the other panels and external signals. Provision for a future SCADA system must also be wired to terminals and labelled for future use.

E4.1.1 Mode Selection

The pumps must be operated both automatically and manually, by means of a three position selector switch for each pump labelled AUTO/OFF/MANUAL. In the OFF position it shall not be possible to start a pump and a running pump shall stop when switched OFF.

a) MANUAL mode

The pumps must be started and stopped by means of START and STOP pushbuttons for each pump on the switchboard.

b) AUTOMATIC mode

When the level in the sump drops to a low level, all pumps shall STOP and an indication lamp on each panel "SUMP LEVEL LOW" will light up. The indication light will extinguish as soon as the water level rises above the low level and the "SUMP START LEVEL" will light up.

If the level rises to a level 1, the pumps shall operate until the level reaches the low level again, are stopped manually or by the SCADA interface.

c) Duty select

A three position selector switch labelled PUMP DUTY SELECT must be provided for each pump, with the switch positions marked ON/OFF/MANUAL.

Should any pump be switched off or fail, the next available pump must START with a 5 second delay. Should the failed unit be reset, the pump must not restart until the next pumping cycle, (i.e. the running pump must complete the pumping cycle), but be available as standby.

E4.1.2 Protection

Each pump must be protected in all control modes against damage due to the conditions described below. The motor must STOP and a corresponding fault indication light must switch ON.

All protection devices must have manual resets, unless specified to the contrary elsewhere. The motor may only restart once the protection device has been reset.

A flow switch shall be provided in the suction piping of each pump. In the event of the pump command being for the pump to run and the corresponding flow switch is not activated, the pump shall be shut down, a fault alarm generated, and the next pump shall be switched ON.

A pressure switch shall be provided in the discharge piping of each pump. In the event of the pump command being for the pump to run and the corresponding pressure switch is activated, the pump shall be shut down, a fault alarm generated, and the next pump shall be switched ON.

a) Pump set

- Motor overload

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- Phase fail
- Pump Failure by means of Flow Switch.
- Pump Failure by means of Pressure Switch.

E4.1.3 Alarm And Status Indication Facilities

Alarm and status indication facilities must be provided for the following:

a) Pump group

- POWER HEALTHY (Yellow)
- GENERATOR SUPPLY (Flashing Yellow)
- RUN (Green)
- EMERGENCY STOP (Red)
- REMOTE TRIP (Red)
- OVERLOAD TRIP (Red) - Alarm
- OVER TEMPERATURE (Red) - Alarm
- PHASE FAILURE (Red) – Alarm

b) Control group

- SUMP START LEVEL (Green)
- SUMP LOW LEVEL (Yellow)
- NO FLOW (Yellow) - Alarm
- OVER PRESSURE (Yellow) - Alarm

Note: That it must be possible to reset the level alarms as soon as the level are normal. The indication lights must stay ON until manually reset.

E4.1.4 Remote Monitoring And Control

Signals must be provided for future monitoring and control, wired to terminals and labelled. Remote STOP/START pedestals will be installed and must be wired to the control system through terminals.

E5 CONTROL EQUIPMENT

E5.1 LEVEL SENSING

E5.1.1 Ultrasonic Level Sensor (Will be added to the installation at a later stage)

The level sensing equipment will be added at a later stage. All the interconnections wired to the terminals will be bridged out for this phase of the project.

E.5.1.1.1 Pumps

Three levels must be monitored in each of the sumps for:

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- HIGH LEVEL ALARM
- LEVEL 1 - PUMP START
- LOW LEVEL PROTECTION & PUMP STOP

E6 GENERAL ELECTRICAL INSTALLATION

E6.1 CABLES

Tenderers must allow for the re-termination of all the electrical cables to the motor panels. Some terminations will be redone as heat damage did occur on a number of cables.

Cables on walls or across structures must be installed on cable rack/ladder and cables installed across floors to any equipment will not be allowed.

E6.2 EARTHING

All equipment shall be bonded to earth.

The contractor shall provide an earthing certificate on completion of the contract to verify the earthing integrity of the installation.

E6.3 PLANT INSTALLATION

The work comprises the installation of all electrical equipment supplied under the electrical section and other, as well as the connection, testing and commissioning of all electrical equipment related to the relevant sections below, including all associated material and labour such as cable ladder, cable boxes, glands etc.

Note that all glands for external use must be of the Pratley Enviro (double seal) type.

a) Local control stations

Local control stations shall comprise a weatherproof IP65 purpose made stainless steel box brushed finish, with hinged door and fitted with:

- START pushbutton.
- STOP pushbutton.
- Separate red mushroom-head push lock, twist unlock emergency stop. **Note that the emergency stops must be wired fail safe.**

Control stations must be pedestal mounted on a stainless stand bolted to a concrete plinth in close proximity of the motor served, the position to be confirmed with the engineer before construction.

In the case where motors are located together as a functional unit a common box may be used for both, but separate control equipment.

E7 TESTING AND ACCEPTANCE

Switchboard factory tests and testing on site will be carried out in accordance with PMA.5.

On completion of the switchboards, the Contractor must inspect and functionally test the switchboards in the factory.

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Once the Contractor is satisfied that the switchboards complies with the specification and any agreed amendments, he must arrange a factory inspection with the engineer. The switchboard functionality must be demonstrated to the engineer and all equipment required for simulation of the works operation must be provided on a test bench.

All switchboards will be inspected at the same time. If the factory test is unsuccessful, all costs incurred by the engineer, i.r.o the inspection shall be borne by the Contractor and subtracted from the Contractor payment certificates as damages.

Travelling cost and time for re-inspection will be recovered from the Pretoria office of the Engineer.

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STEVE TSHWETE LOCAL MUNICIPALITY

UPGRADING OF THE VAALBANK WATER TREATMENT PLANT

ELECTRICAL MOTOR CONTROL PANELS

ANNEXURE B

PARTICULAR SPECIFICATION : PMA : MECHANICAL INSTALLATIONS

SECTION 1 : GENERAL

PMA.1.1 DATA TO BE SUPPLIED BY TENDERERS

Full particulars of the material and equipment offered shall be submitted at the time of tendering, and all information requested shall be supplied on the information sheets in this contract document. Any additional information shall be given in accordance with the specific tender conditions ruling the tender and all drawings, sketches, pamphlets, etc., shall be submitted with the tenders.

PMA.1.2 PLANT DRAWINGS

Within as short a time as possible, but not exceeding the time as stipulated in the relevant conditions of Contract, the Contractor shall supply the Engineer, with fully dimensioned drawings of the plant and equipment ordered from him and of the position and sizes of all foundations, bolt holes, openings in walls or floors and other special features, affecting construction of the works, so that the Engineer can arrange for the necessary concrete work, foundations, bolt holes, openings for pipes, cable ducts, etc., for the proper erection and installation of the plant.

Any cutting or alteration of structural work arising from inadequate or incorrect dimensions and particulars afforded by the Contractor, or through late receipt of such particulars, will be arranged by the Engineer to be carried out as he thinks fit at the expense of the Contractor concerned under this contract.

PMA.1.3 PACKING

All plant, equipment, apparatus and pipe-work likely to be damaged in loading or unloading, or through chafing or through being subjected to pressure, or likely to deteriorate through exposure to the atmosphere, is to be suitably packed so as to prevent such damage.

PMA.1.4 QUALITY OF MATERIAL AND ACCEPTANCE

Any material and/or workmanship which is found to be unsound, damaged or contrary to the specification, or which is found during the defects liability period or during tests in situ to be defective, or in any way contrary to the specification due to causes within the Contractor's control and responsibility shall be rejected.

All material rejected by the Engineer shall be replaced or repaired by the Contractor at his own expense to the instructions and satisfaction of the Engineer.

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PMA.1.5 TIME OF DELIVERY AND COMPLETION

Tenderers are to state in the schedule of prices, the periods in which they undertake to effect complete delivery of all material under the contract from the date of placing the order. Tenderers are also to state the period in which they undertake to complete all erection, adjustment, putting into proper working order and testing of all plant and material after receipt of the order from the Engineer to commence erection or after the date of final delivery of material, whichever is later.

PMA.1.6 IMPORT PERMITS

No special import permits will be available for the importation of materials under this contract. Tenderers shall tender therefore on the understanding that if they are awarded the contract, the materials will be supplied ex local stocks or that importation will be effected from their own permit quota.

Tenderers are to bear in mind that preference will be given, other things being generally equal, to tenders offering material of local manufacture.

PMA.1.7 OPERATING AND MAINTENANCE MANUAL

The Contractor shall prepare and supply manuals for the successful operation and maintenance of the installation. A draft of the manual shall be submitted after commissioning, for approval. The draft shall then be corrected, if required, and three sets of the manual shall be submitted before acceptance of the plant will be taken.

These manuals shall contain the following information:

Section 1: System description

A comprehensive description of the system including schematic diagrams, where required for clarification.

Section 2: Commissioning data

The results of all checks and measurements as recorded during the commissioning period shall be included and shall be compiled in such a manner that every check and measurement is clearly defined.

Section 3: Operating instructions

- 3.1 Pre-start checklist for each individual plant.
- 3.2 Starting and stopping instructions.
- 3.3 Plant running checklist.
- 3.4 Safety precautions to be taken.
- 3.5 Manual operation.
- 3.6 Operator's duties.

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Section 4: Mechanical equipment

- 4.1 Description of all major items of equipment with the make, model number, names, addresses and telephone numbers of the supplier, manufacturer or their agents.
- 4.2 Design capacities of all equipment including selection parameters, selection curves, capacity tables etc.
- 4.3 Manufacturer's brochures and pamphlets.
- 4.4 Schedule of spares with part numbers recommended to be held in stock by the owner.
- 4.5 Pressure vessel (e.g. receiver) test certificates.

Section 5: Maintenance instructions

- 5.1 Schedule of maintenance particulars.
- 5.2 Part numbers of all replacement items.
- 5.3 Capacity curves of driven equipment.
- 5.4 Sizes, types and lengths of drive couplings.
- 5.5 Serial numbers of principal pieces of equipment.

Section 6: Electrical equipment

The following information shall be provided for all electrical equipment whether switchboard or field mounted.

- 6.1 Electrical equipment schedule with make, model number, rating, commissioning setting and name, address and telephone number of supplier.
- 6.2 Maintenance instructions.
- 6.3 Manufacturer's brochures and pamphlets.

Section 7: Instrumentation and control

- 7.1 Description of each individual control system.
- 7.2 Control equipment schedule with make, model number, rating, commissioning setting and name, address and telephone number of supplier.
- 7.3 Manufacturer's brochures and pamphlets.
- 7.4 Maintenance instructions.

Section 8: Drawings

Paper prints of all Contractor's drawings (mechanical and electrical) updated to "as built" drawings.

The contract will be considered incomplete until all tests have been conducted to the satisfaction of the Engineer and all drawings and manuals have been handed over to the Engineer.

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PMA.1.8 PROGRAMME OF WORK

In carrying out erection, a definite scheme of operation shall be observed by the Contractor, and such scheme shall at all times be subject to the approval of the Engineer, and be in accordance with his requirements.

The Engineer may, from time to time, by order in writing, without in any way invalidating the contract or giving to the Contractor any claim for additional payment, require the Contractor to proceed with the execution of the works in such order as in his opinion may be necessary, and may alter the order and suspend any part of the work at such time and times as he may deem desirable in terms of the applicable Conditions of Contract.

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

PMA.1.9 STRUCTURAL WORK

The building work to accommodate the plant and equipment of the Contractor will generally be provided by a third party under a separate contract or as part of the same comprehensive contract in advance of the delivery of the mechanical and electrical plant equipment. It will be the responsibility of the Contractor to provide the third party in writing with all requirements for structural openings, fixing holes or any construction related matter affecting the mechanical installation, well in advance of any construction of such related building sections. Any cost forthcoming due to failure of the Contractor to comply, including any remedial action, will be for the account of the Contractor.

The Contractor may not make any structural openings or modifications to the building work without prior written approval by the Engineer.

PMA.1.10 ERECTION, ADJUSTMENT AND OPERATION

The Contractor shall make his own arrangements for handling and transporting all material to the site of works in a proper and careful manner to avoid damage, and shall be responsible for properly storing and protecting all plant and equipment against damage by water, weather, fire and any other interference before and during erection.

This contract is to include for the erection, adjustment, putting into proper working order and upholding of all plant, equipment and materials supplied by the Contractor. The work of erection of the plant is to be carried out under a skilled and experienced erector and the plant, when erected is to be of neat and workmanlike appearance, solidly and evenly supported true to line and level, plumb and in proper working order. The erection is to include for the proper grouting in of all bolts, pipes, fittings and holes left by the building contractor for the reception of the equipment and pipes, unless specified otherwise in the project specifications as well as properly making good any damage to completed work, caused by the Contractor under this contract.

In the event of the Contractor not commencing erection when required by the Engineer, or his speed or quality of erection not being to the satisfaction of the Engineer, the Employer shall in addition to any remedial action provided for under the applicable Conditions of Contract, have the right to commence erection or to assist in or to complete erection with his own staff, or to engage another Contractor to do the work, in which case all expenditure so directly incurred by the Employer, plus the addition of twenty (20) percent thereon for administration and supervision will be debited to the Contractor and shall be recoverable from him in such manner as the Employer may elect.

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On completion of erection, unless otherwise specified, the Contractor is to clean all exposed metalwork, polish parts to be left bright and paint all other parts, as instructed.

The Contractor is to finish off neatly all grouting and painting carried out by him and is generally to leave all his work under this contract clean, tidy and in an efficient working order.

After completion of erection, the Contractor is to operate his plant for a period as stipulated in the project specification or tender data or in absence of such a stipulation, at least seventy two (72) hours or such longer time as may be necessary in order to put all equipment into proper adjustment and working order, using for this purpose the water and electricity provided free of charge by the Employer.

Before calling the Engineer for acceptance testing for handing over the plant, the Contractor is to ensure that every part of the equipment is operating satisfactorily. The plant will only be taken over after the procedures as provided for in the relevant Conditions of Contract have been met, or in absence of such Conditions, once the Engineer is satisfied that the installation is completed and the plant performs to specification or as otherwise agreed in writing.

In the event of the Contractor being unable to test and adjust the plant and equipment at the time of installation through circumstances beyond his control, it may be necessary for him to return to site at a later date to undertake this work. An item has been provided in the schedule of prices to cover the cost of returning to site, if ordered by the Engineer to do so, in order to carry out this work.

The completion date will be taken as the date provided for in the relevant Conditions of Contract.

PMA.1.11 TRAINING

The contractor must provide training for the Employer’s operators in the operation and maintenance of the plant installed by the Contractor, prior to and as a condition for taking over. This training must be in a structured format providing hands on training and not only on a demonstration basis. The following documentation must be submitted to the Engineer as proof of training:

- a) Proof of request to the Employer to identify the relevant employees who must receive training.
- b) Schedule from the Employer of employees who must receive training, an agreed date for training and confirmation by the Employer that all such employees have been notified.
- c) A brief summary of training provided, signed by the relevant employee, must be submitted to the Employer with copies to the Engineer.

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SECTION 2 : MATERIALS

PMA.2.1 STANDARD SPECIFICATIONS

Reference made hereinafter to specifications of the South African Bureau of Standards (SABS) or the British Standards Institution (BS) shall be deemed to include all the latest revisions of and/or additions to such specifications, where applicable.

PMA.2.2 MATERIALS GENERALLY

All materials used shall be of the best of their respective kinds and shall be suitable for working at the pressures and temperatures involved under all working conditions without deteriorating or distorting or the setting up of undue stresses in any part. No welding, burning, filling or plugging of defective castings shall be permitted without the written approval of the Engineer.

PMA.2.3 CORROSION

Where corrosion of metal may be expected from contact with water or sewage or from any other cause, the Contractor shall supply materials which are resistant to corrosion. Any material showing signs of corrosion, tuberculation or pitting before expiry of the defects liability period shall be replaced by the Contractor at this own expense with materials to the Engineer's approval.

PMA.2.4 STRUCTURAL STEELWORK

All joists, angles, channels, plates and structural steel are to conform to BS 4369, Part 2.

PMA.2.5 PIPES AND FITTINGS

1. Galvanised screwed and socketed tubes

All screwed and socketed pipes shall conform to SABS 62 so far as it may apply and if not amended by any other conditions in this contract. Pipes shall be medium class and galvanised.

2. Steel and malleable iron pipe fittings

Pipe fittings to be used in conjunction with screwed and socketed pipes shall, as far as applicable, comply with the appropriate requirements of BS 1387 and BS 143, and shall be galvanised.

3. Copper tubes

All copper tubes shall conform to SABS 460 class 2, unless specified otherwise in the project specifications.

4. Cast iron pipes and fittings

All cast iron pipe, fittings and specials shall conform to SABS 509.

Tenderers are at liberty to put forward any type of flexible coupling suitable for cast iron pipes, but must submit full particulars at the time of tendering.

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5. **Non-corrosive pipes and fittings**

Non-corrosive pipes and fittings shall be made of completely non-corrosive materials such as uPVC manufactured to SABS 966.

6. **Steel pipes and fittings**

All steel pipes and fittings shall comply with the requirements of SABS 719, where applicable, and shall be made of steel plate of not less than 6 mm thickness, unless specified otherwise in the project specifications.

PMA.2.6 **VALVES AND FITTINGS**

1. **Gate Valves**

Gate valves shall be flanged cast-iron waterworks pattern valves with non-rising spindles and shall comply with the requirements of SABS 664 - Figure 1 - Class 16. All gate valves shall be fitted with hand wheels with the direction of closing, which shall be left-hand, indicated thereon. Resilient seal valves shall not be accepted.

2. **Non-return valves**

Non-return valves shall be of the flanged single door type complying with the requirements of SABS 1551 - Part 1.

3. **Flanges**

Flanges shall comply with SABS specification 1123 and shall be drilled to the table indicated in the project specification.

Flanges shall be machined flat, i.e. without a raised joint face. Before the machined surfaces have become affected by rust, they shall be coated with a mixture of white lead and tallow or other approved protective composition.

PMA.2.7 **JOINTING MATERIAL**

The scheduled prices shall include for all jointing material to complete the installation of the pipe-work. In the case of flanged joints, this shall include bolts, nuts and rubber insertion rings, the latter complying with BS 2494, class E. The length of the bolts shall be such that when the joint is fully tightened up, two threads of the bolt shall be exposed. The diameter of the bolts shall comply with BS 4622.

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SECTION 3 : PAINTING AND FINISHING

PMA.3.1 GENERAL

The following clauses shall apply to all items to be painted under this specification:

1. No paint will be applied unless the surface to be painted has been thoroughly cleaned to remove all traces of dust, grease, oil, millscale, rust or corrosion of any nature.
2. All metal surfaces shall be moisture dry before paint is applied. All paint surfaces shall be "hard" dry before a further coat may be applied, unless otherwise specified.
3. All surfaces which will be inaccessible after installation, shall receive the specified application before installation.
4. If the shop coat was left for a few months, the surface shall be rubbed down with emery paper or steel wool before final coats are applied. Washing down and scrubbing with clean water and hard brush is recommended.
5. The painter shall satisfy himself that the final coat completely covers the previous coat.
6. The dry film thickness shall be measured using a non-destructive thickness gauge similar to MIKROTEST.
7. In all cases the manufacturer's instructions must be strictly adhered to.

PMA.3.2 METAL PREPARATION

1. All steel surfaces shall be sandblasted to a minimum of Sa. 2½ (off-white) finish, to the Swedish specification S.I.S. 05/59/00.
2. The abrasive shall comply in all respects to SABS code 064 and shall be free of any traces of oil, grease, foreign objects or corrosive contaminants such as chlorides, etc.
3. The abrasive and blast cleaning shall be adjusted to ensure that the minimum amount of abrasive remains embedded in the steel.
4. Blast cleaning shall not be done when there is dew on the metal or in the case of nozzle blasting, when the atmospheric humidity is such that moisture condenses at the nozzle during work.
5. Blasted surfaces shall be brushed or cleaned by vacuum before painting. It is essential to apply the primary coat within the shortest possible time after blasting and certainly within four (4) hours.

PMA.3.3 PAINTING

PMA.3.3.1 General

The ideal temperature for painting lies within the range 13 to 32 °C (55 to 90 °F). The steel surface should be clean and dry and the ambient relative humidity below 90 %. Painting should be suspended under the following conditions:

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- (a) When the temperature of the ambient atmosphere falls below 4 °C (40 °F), or its relative humidity rises above 90 %. (It may be possible to paint satisfactorily outside under these conditions by erecting some form of temporary shelter).
- (b) For outdoor work, during periods of inclement weather, i.e. rain, snow, fog or mist.
- (c) Generally when the conditions are such that condensation has occurred or is likely to occur on the steel.

Because of the possibility of condensation when cold material that is brought into a warm shop for painting after having stood in the open, ample time should be given to reach the ambient temperature, e.g. stand in the shop overnight before work is begun.

PMA.3.3.2 Preparing Paint For Use

Correct preparation of paint immediately before use is highly important.

All paints should be supplied from the stores and the painters, ready for application (with the exception of mixing). Any instructions given on the containers by the manufacturers should be strictly followed for example, any paint not used within its specified "pot life", should be discarded. No paint should be used after the expiry of the safe "shelf life" indicated on the container. The quantity of paint mixed at one time should be restricted according to its "pot life".

All paints should be thoroughly mixed under the supervision of the foreman in a manner approved by the project engineer. During the progress of the work, only the minimum number of containers needed should be open at any one time and partly full containers should be temporary sealed.

PMA.3.3.3 Paint Application

A zinc rich (epoxy) primer conforming to SABS 926, must be applied within four (4) hours after blast cleaning, to a dry film thickness of at least 15 micron. It is preferable that the primer be applied by brush.

After fabrication a coat of zinc-chromate or similar undercoat, shall be applied, as described in the detailed specification. Prior to applying this coat the painter shall ensure that the entire surface is free of contamination.

Final coats shall conform to the detailed specification set-out hereunder.

When painting over blast cleaned surfaces which are unavoidably rough, it is essential that sufficient thickness of priming paint be applied to ensure that the high spots of steel surface are adequately covered. Should inspection reveal that this is not the case, the number of priming coats should be increased accordingly.

Each coat should be allowed to become sufficiently cured before the next is applied. Unduly long curing periods may impair adhesion between successive coats and the interval between successive coats should not exceed two (2) days.

If the curing interval has been so long as to endanger the adhesion of the following coat, the paint already applied should be lightly rubbed down with fine abrasive paper before applying the next coat.

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PMA.3.4 **DETAIL PAINT SPECIFICATION**

A. Ordinary Steelwork

- Primers : One coat zinc-chromate plus one coat universal undercoat
- Finishing coats : Two coats gloss enamel of approved manufacture
- Total film thickness 0,1 mm

B. Steelwork in sea environment

- Primer* : *One coat zinc rich epoxy primer with dry film thickness of 15 microns*
- Undercoat : One zinc-chromate
- Finishing coats : Two coats micaeous iron oxide structural paint of different colours to a total film thickness of 38 microns per coat

C. Steel work in contact with water

- Primers* : *One coat zinc-chromate plus one coat red-lead undercoat*
- Undercoat : Two coats "Chemgard" undercoat or similar of different colours (Plascon ref no A.R.1)
- Finishing coats : Two coats "Chemgard" enamel or similar (Plascon ref no. A.R.6) with top coat light grey, unless otherwise specified

Film thickness of all "Chemgard" coats to be at least 25 microns.

D. Galvanised steel

All traces of protective coatings must be removed with an approved cleaning agent.

- Primer : One coat of approved galvanising etching agent
- Undercoat : One coat universal undercoat
- Finishing coat : Two coats approved gloss enamel

E. Cast iron

Remove as much as possible of the bitumen covering layer.

- Primer : One coat aluminium based paint
- Undercoat : One coat universal undercoat
- Finishing coat : Two coats approved gloss enamel

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F. Aluminium

- Primer : One coat of approved etching agent
- Further coats : As D. and E. above

G. PVC

- Primer : One coat of approved etching agent
- Further coats : As D. and E. above

PMA.3.5 GALVANISING

1. Surface treatment

The surface must be completely free from rust, dirt, grease, millscale and any other contaminants and must in general be cleaned to the same standards laid down in clause PMA.3.2 of the specification.

Further cleaning must be carried out by acid pickling. As soon as the product to be galvanised has been sufficiently cleaned and rinsed, a coating of flux must be applied.

2. Zinc coating

When hot-dip galvanising, the composition of the steel, the zinc temperature and the immersion items, shall comply to the standards generally accepted for that type of item. All aspects of hot-dip galvanising shall comply with the requirements of SABS 763. A coating of at least 765 g/m² must be achieved.

PMA.3.6 EPOXY COATING

1. Surface treatment

The surface must be completely free from rust, dirt, grease, millscale and any other contaminants and must in general be cleaned to the same standards laid down in clause PMA.3.2 of the specification.

2. Epoxy coating

Epoxy coating of piping shall be done to the manufacturer’s specification and shall be similar or equal to COPON KS 16 W. The epoxy coats shall be applied in layers of 40 to 60 µm to form a total thickness of 120 µm.

PMA.3.7 REPAIRS TO DAMAGED SURFACES

Damage to any previous paint coats should be made good by re-coating the affected areas in the same or in an equivalent manner to that originally specified. They should first be cleaned to bare metal if necessary and the edges of the undamaged paint should then be bevelled and sand papered. The patches of new paint shall overlap the old paint by at least 20 mm.

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SECTION 4 : ELECTRICAL EQUIPMENT, INSTRUMENTATION AND INSTALLATION (R)

PMA.4.1 GENERAL

This specification covers the general items of equipment for electrical installations related to mechanical installations. All materials and installation of such materials shall comply with the following:

1. The Occupational Health and Safety Act (Act 85 of 1993) incorporating SANS 10142 -1 the "Wiring Code".
2. SANS 10142-2 (MV installations) the latter in conjunction with any specific stipulations in the Project Specification.
3. The Local Supply Authority's Regulations and Fire Insurance Regulations.
4. Any special conditions implied in this specification.

Note: That where reference is made to any Standard, Act or statutory requirements, the latest amendment / replacement shall apply.

PMA.4.2 MOTOR CONTROL CENTRES (MCCs) GENERAL REQUIREMENTS

This specification covers indoor MCCs, as well as outdoor kiosk type MCCs.

PMA.4.2.1 Statutory Requirements

MCCs (low voltage assemblies) must be provided as detailed below and conform to the requirements of the OHS Act in terms of SANS 10142-1 in general and specifically in terms of SANS 1973 (latest editions), as briefly summarized below. Note that this interpretation serves as a guideline only, and tenderers/contractors must acquaint themselves fully with the relevant SANS requirements, since they will be responsible in terms of the Act and in case of conflict in interpretation or clarity, the SANS requirements shall apply.

- MCCs rated at 10 kA and less must comply with SANS 1973-3.
- MCCs rated at more than 10 kA, must comply with SANS 1973-1 and the MCC must be certified to comply with the relevant type provided for within SANS 1973-1.
- Tenderers must state in the data sheets whether and how they comply with the relevant requirements and the type of assembly offered based on which compliance is claimed.
- On completion the MCC manufacturer must certify that the MCC complies with the OHS Act in terms of the relevant SANS certification, before delivery will be taken. SABS permit holders must apply the mark to the MCCs. This certification, as well as a routine test report, must be provided to the installation electrician for purposes of the COC.
- In the case where the MCC populator is not the steelwork and busbar manufacturer, the steelwork and busbar manufacturer must inspect the populated MCC and certify that the populated MCC has not compromised his certification and that the populated MCC complies with the relevant code. This certification must form part of the MCC manufacturer's supporting documentation for the C.O.C.

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PMA.4.2.2 Switchgear General

Switchgear for the main offer must be Rockwell/Allan Bradley, Siemens, Telemecanique/Schneider, Eaton, ABB, Rockwell or Mitsubishi. Any other switchgear offered for the main offer is subject to the approval by the Engineer, which if not approved will have to be changed to one of the above on the Engineer's decision, at no extra cost. Equivalent alternatives may be offered, but only as a separate alternative offer, for evaluation and consideration. Circuit breakers must provide short-circuit and overcurrent protection, suitable for motor starting.

The main and motor starter circuit breakers must have panel door mounted, door interlock padlockable handles. Circuit breaker handle extended shafts coupling to the circuit breaker must be an integral part of the circuit breaker body, or screw fixed into a threaded receptacle in the body. A clip or clamp-on adaptor will not be acceptable. Rear access MCCs, rear panel doors, must be fitted with square key locks and padlockable handle.

PMA.4.2.3 Starter General Requirements

Starters must conform strictly to clauses PMA.4.3, unless specified otherwise in the project specification and must be equipped with auxiliaries, as stated. Comprehensive motor protection shall include, overload, underload, phase fail/under voltage and phase rotation.

Note: That all drives, including ancillary equipment e.g. motor driven grease pumps etc. associated with the relevant equipment, must have a separate starter included in the MCC, even if not mentioned in the project specification.

PMA.4.2.4 Ratings

The MCC and all switchgear must be rated for the specified fault level as specified in the project specification under the relevant MCC. Single pole circuit breakers on MCCs with a fault level in excess of 10 kA, may be rated at 10 kA with suitable HRC backup fuses.

Fault levels given at the relevant MCCs, are based on the position of MCCs as shown on the tender drawings and cable sizes in the schedule of cables. Should there be any deviation, the fault levels must be re-evaluated.

MCCs shall be rated to a protection degree of IP54 for external use and IP44 for use inside buildings

Ratings given for equipment are based on the estimated power requirements of new driven equipment, but must be determined according to the specific motors as installed. Starters may not be rated at less than the motor rating.

PMA.4.2.5 General Construction

The MCC must be floor or wall-mounted and be manufactured from 3CR-12 sheet steel not less than 1,6 mm thick. The MCC shall be arranged for front access to live parts if placed against the wall and front and rear access for MCCs not placed against a wall. Rear access doors must be padlockable. Floor standing MCCs must be provided with a 50 mm x 100 mm hot dipped galvanised U-channel base.

The MCC must be constructed in tiers, subdivided in separate panels, one each per individual drive and control section, each with own door. For MCCs with a fault level of 10 kA and more, the panels must be fully compartmentalized and for less than 10 kA, open construction may be used, subject to the requirements of SANS 1973-3.

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A push lock twist unlock emergency stop which will stop all running equipment (via auxiliary relays in each panel) must be provided on the incoming section door, with corresponding indication light if the E-stop is operated. In the case where individual motors and / or panels are fitted with E-stops, each E-stop must have an indication light. The active status of all E-stops must be wired to the Terminal/Marshalling enclosure for remote monitoring.

All interactive equipment must be installed on doors. Doors must be hinged and fitted with rubber door seals. MCCs for external use must have outside weather-proof doors and both the internal and external doors must be fitted with rubber gaskets, to prevent ingress of dust and sand. **The door construction must provide a continuous sealing edge against the gasket.** Cut outs for overlapping doors, hinges or locks will not be permitted. Coin slot or square key type locking mechanisms shall be used for securing the front panels and doors must be removable.

The grouping of equipment on panels must be logical and neat and shall be done on the following basis:

- a) Incoming section with main incoming breaker, metering and incoming cable access.
- b) Outgoing sections for each motor circuit with sub-main breaker, starter, dedicated control, ancillary equipment and status indication.
- c) Separate control panel, for each group of related equipment operating together such as a duty and standby pump and all common controls and indication lights.
- d) Outgoing section for plant room auxiliaries and general control circuits, power and lighting.
- e) The lowest operator interface (operating facility, status indication etc.) may not be less than 500mm from MCC base level.

All connections, including motor connections must be extended to terminals above the gland plate, within dedicated terminal compartments with own doors. Connections to starter panels situated at the bottom of a tier may be accommodated within that starter panel, but no others.

Tiers with enclosed starter compartments must be provided with separate full length vertical wiring compartments of minimum width 250 mm between tiers, for wiring to terminals in the terminal compartments. Terminals to signal and control cabling may be installed within such tiers.

Hot air from electronic starters, unless fitted with a bypass contactor, must be ducted to the top or back of the MCC with aid of extraction fans at the point of exit. Starters with a combined rating of 100 kW or more must be vented to the outside of the building. Air entry openings must be fitted with filters in a removable frame for easy removal for cleaning. Screens must be fitted to air exits to prevent ingress of foreign bodies.

Sufficient space must be provided between the base of the panel, the gland plate and the main circuit breaker to allow easy connection of the supply cable. In the case of free-standing MCCs, there must be at least 300 mm clearance between the base and gland plate with additional space below in a trench, to allow for the cable bending radii. In absence of a trench, the additional height must be provided by means of a raised angle iron platform.

Painting must be in accordance with section 3 on painting and the final coat must be electric orange or light grey baked enamel baked or powder epoxy. Outdoor MCCs for pump stations must be olive green.

The electrical equipment to be provided in the MCC must comply with the requirements of the project specification and other relevant sections hereafter.

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The MCC must have a totally enclosed air insulated busbar chamber running the length of the MCC. If the MCC is fitted with a distribution section feeding other MCCs or distribution boards (such as a local DB for power and lighting), the MCC section bus bars must be separated from the main supply bus bars. The MCC section must be fed from the distribution section by means of a distribution circuit breaker fitted with external locking facilities, to provide the facility to isolate the MCC section from the distribution section, without affecting the other distribution feeds.

Internal bus bars shall be of solid copper for each phase and neutral. Wiring and terminals shall be of suitable size and rating and terminals shall be of brass and comply with SANS 60947-3. Bus bars must be solidly mounted on insulated supports with bolted lug connections to conductors. Screw type connections with clamps shall be acceptable for conductors up to and including 10 mm². Neutral and earth bus bars of solid copper with one way for each connection must be provided. Flexible conductor may not be used in parallel to increase current carrying capacity. The maximum size for flexible conductor is 95mm² after which solid copper bar must be used.

Wiring to equipment must be installed in PVC trunking (maximum utilization 80%), or within dedicated wire-ways by means of neatly arranged vertical and horizontal runs and laced together in circular looms by means of PVC cable ties. Wire looms not in trunking must be strapped to rails, secured to the steelwork. Self-adhesive type securing material shall not be accepted. Wire ends must be fitted with suitable crimped lugs to suit the connection type. All control wiring and terminals shall be numbered with approved wire and terminal markers.

Openings in steelwork for wiring passing through must be provided with suitable edge protection (bushing/ rubber grommet or similar) to prevent wiring insulation damage. Wiring at panel breaks for transport must be fitted with a suitable fixed plug and socket arrangement with positive connection locking facility (terminal strips with jumpers are not acceptable). The MCC sections must be fitted with lifting lugs and the surrounding steelwork must be suitably reinforced to prevent metal distortion.

All equipment must be clearly labelled by means of plastic engraved labels in a clearly readable position.

External door mounted labels must be fixed to the boards immediately below the equipment by means of screws. A label must be provided at the incomer and outgoing circuit breakers depicting the point of supply / equipment served and cable size.

Note: That all supporting structures for freestanding MCCs, such as over cable trenches, must be provided under this contract and included in the switchboard price.

PMA.4.2.5.1 Outdoor type MCCs

The following additional requirements are applicable to outdoor (kiosk) type MCCs.

Outdoor MCCs must be of the weather-proof type rated at IP 54 and manufactured from 3CR12 sheet steel. MCCs within residential areas must be green and outside residential areas, off-white, to be confirmed with the Engineer, before manufacture.

MCCs must have a double slope roof with a minimum of 50 mm overhang and be of the hinged double door construction. The inner doors must be hinged with square key locks utilised for the mounting of indication and control equipment and the outer door as total weather protection, hinged, with padlockable rotary handles operating a stainless steel sliding locking rod. The outer doors must be fitted with hold-open stays.

Refer to *General Construction* i.r.o. door seals.

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MCCs must be installed on a hot-dipped galvanised angle iron framework bolted to a concrete plinth, provided as part of the contract. The bottom end of the kiosk may not be less than 600 mm from ground level (including the plinth height above ground). The operating side must face south. The intention is to prevent submersion in positions prone to flooding (i.e. outside residential areas with no storm water drainage) such as for boreholes and must be verified with the Engineer if the total height exceeds 1,8m or is considered inappropriately high.

Shade canopies manufactured from 1,6 mm 3CR12 sheet steel (unfolded) must be provided for MCCs, if so specified in the project specifications. The canopy must have a double slope and overhang the MCC by 200 mm on all sides. Full length side panels must be provided. The canopy must be fixed to the MCC stand.

Where specified in the project specification, the MCC must be provided with a back to back section with own padlockable hinged door, as for the front door. This section is for use by other parties specified in the project specification and the dimensions must be liaised with such parties.

The Contractor must establish the incoming cable size from the supply authority before construction of the board starts if not supplied as part of this contract. Suitable terminals must be provided for the incoming cable if the main circuit breaker terminals are inadequate.

Pump stations

Kiosk type outdoor MCCs for pump stations may not be installed over the access opening to the sump so that the panel encloses the opening. The panel must be installed on a hot-dipped galvanised steel framework bolted to the concrete plinth so that any sewage gas from the cable opening is vented to the atmosphere. This framework must raise the panel ± 200 mm above the concrete plinth. This stipulation is based on the assumption that the installation position is within a residential area with storm water drainage. Should this not be the case, refer to the abovementioned section on outdoor type MCCs. The sides of the framework must be covered with removable galvanised diamond mesh grilles to allow free circulation of air under the panel.

The panel bottom plate shall serve as gland plate and must be totally sealed against ingress of sewage gas.

The MCC operating side shall not be closer than 1,0 m from the pump sump access opening.

PMA.4.2.6 Ancillary And Control Equipment

Control relays must be of the type indicating switched status and have an external manual switching facility. Connection pins must be sturdy in construction and of ample dimension. Thin pin type, prone to bending and misalignment, will not be acceptable.

Rotary switches must be of the wafer type with through fixing bolts and not of the multiple in line switch block type.

The framework and canopy detail drawing must be submitted to the Engineer for approval before manufacture, as well as a drawing of the concrete plinth detail.

PMA.4.2.7 Protection/Alarm Devices

Unless stated to the contrary, motor protection devices must be of the following type:

- a) Overload : Thermal overload relay
- b) Overheat : Motor winding embedded thermal protection device

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- c) Phase fail : Phase fail relay with AUTO reset (300 s time delayed, adjustable) for protection against phase loss, phase rotation and undervoltage. (This protection must include control equipment such as contactor coils).

Where comprehensive motor protection is specified as a separate electronic protection relay, it must have at least the above facilities. Soft starter and variable frequency controllers must have integral comprehensive protection. The specific fault must be identified on the unit by means of a LED or LCD display and a single trip contact must also be provided for a common TRIP indication light on the external panel door. Comprehensive motor protection relays may be offered, even if not specifically specified.

All protection/alarm devices must have manual resets, unless specified to the contrary elsewhere in the project specification. Electrically latched alarms must be reset by a manually operated pushbutton on the relevant MCC, or remotely via a telemetry system, if so specified in the project specification. It must be possible to reset an alarm as soon as the alarm detection unit is in the normal state again. An equipment drive motor may only restart once the protection device has been reset.

Protection devices for other plant equipment are specified in the project specification.

PMA.4.2.8 Alarm And Status Indication

The plant status and fault/alarm conditions must be identified on the panel as described for each MCC, by means of indication lights of the cluster LED type.

Fault/alarm lights must stay on until the alarm/fault condition has been rectified **and the protection/alarm device reset operated.**

Indication light colors reflect the plant status and must be provided in accordance with the following general guideline:

- GREEN : Healthy/active (such as RUN, START DEMAND)
- RED : Fault / alarm (such as TRIP, HIGH LEVEL)
- AMBER : Neutral (such as OPEN/CLOSED)
- BLUE : Special status

All equipment fitted with an emergency stop must have an associated indication light on the relevant control panel, which will switch on if the E- stop is activated and off when the E-stop is deactivated.

An alarm generated at a specific MCC and relayed to another MCC by means of a telemetry/cable system, must be reset at the MCC of origin, resulting in an automatic reset at the secondary MCC, due to absence of the alarm.

A lamp test pushbutton must be provided to switch on all indicating lights simultaneously. MCCs comprising more than three tiers must have a test pushbutton for each panel.

A continuous duty audible and flashing strobe type alarm must be provided at each MCC. The flasher must be in a clearly visible position. All alarm and fault (protection) conditions derived from equipment served by the MCC, must activate this alarm. An ALARM ACCEPT pushbutton must be provided on the control panel of the MCC, to cancel this alarm. Note this is separate from any alarm/fault reset pushbutton.

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In the case of indoor MCCs, the alarm light must be installed on the building outside wall and in the case of outdoor MCCs; the alarm must be fitted to a bracket attached to the side of the roof canopy, that ingress of water into the MCC at this point is not possible. Alarm lights must be protected against vandalism with a stainless steel wire grid enclosure.

PMA.4.2.9 Remote Monitoring

Provision must be made for the necessary signals for the plant status to be remotely monitored and controlled by a SCADA system. The points to be monitored and controlled are as stated below and under each MCC, description, wired to terminals as described below.

PMA.4.2.9.1 Terminal / Marshalling enclosure

A separate, totally enclosed compartment with its own door, must be provided for each MCC, fitted with terminals wired to the relevant equipment to be monitored and controlled by the remote monitoring and control system, as described below and under the relevant equipment.

All terminals for digital signals (output) to the monitoring system, must be wired to voltage free contacts of interposing relays (fitted within this panel). Similarly, all digital signals (input) from the remote control system, shall be from corresponding voltage free contacts of interposing relays within the remote system. I.e. no direct voltage transfer may be done between the motor control circuitry and monitoring and control I/O.

Voltage for the interposing relay coils within the MCC must be taken from the control voltage. Relay contacts must be suitable for 230 V AC.

The following points must be monitored:

- a) Motor status (each):
 - Motor circuit breaker ON/OFF status: Auxiliary switch on motor circuit breaker wired to interposing relay (open in OFF); this switch must be separate from any CB trip auxiliary switches. I.e. a CB switched off must not display TRIP status.
 - Mode selector switch MANUAL and AUTO positions wired to interposing relays (closed in monitored position; open in OFF);
 - Motor RUN status: Auxiliary switch on starter wired to interposing relay (closed in RUN);
 - Equipment TRIP status: All driven equipment protection devices, including emergency stop, wired to a common interposing relay (closed in TRIP).
 - All other **alarm and status indication** as per the control description of the driven equipment in the relevant project specification.

PMA.4.2.10 Power Factor Correction

Power factor correction equipment must comprise a suitable circuit breaker or fused on-load isolator, switching contactor and capacitors to provide correction to 0,98 lagging. Discharge resistors must be provided to discharge the capacitors to less than 10 % of the system voltage within 30s of disconnection. Compartments fitted with capacitors must be provided with a label stating CAPACITORS BEHIND DOOR. ENSURE FULLY DISCHARGED PRIOR TO MAINTENANCE.

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In the case of free-standing rear access MCCs, the PFC capacitors must be installed at the back of the associated starter panel. In the case of front access only MCCs, the capacitors must be installed in the motor starter compartment, but separated from the starter and control equipment by means of a solid barrier plate.

PFC capacitors used in conjunction with soft starters, must be arranged that the capacitors are not switched to the starter outgoing terminals, by means of a suitable contactor arrangement, isolating the soft starter during running (including start up and stopping).

PMA.4.2.11 Spatial Requirements

MCC sizes must be verified against spatial provision on the tender drawings. Any constraints must be qualified in the offer.

After appointment, prior to submission of drawings for comment, the MCC sizes must be verified against the spatial provision for construction. Failure to do so resulting in additional cost for special measures required to overcome such constraints, will be for the contractor's account.

PMA.4.2.12 MCC Drawings

All MCC drawings must be done in CAD format as per PMA 4.1.2. Paper copies submitted for comment must be at least in A3 size. Once the Engineer has commented on a drawing, construction can proceed, unless there are unresolved issues. A copy of the updated drawings must be issued to the Engineer for record. All revisions must be listed on drawings. Note that no additional payment will be made for amendments to drawings.

PMA.4.2.13 Payment For MCCs

MCCs are considered as complete functional units and no progress payments will be made on uncompleted MCCs. Payment will only be certified once the MCC has passed the factory test and installed on site, unless provision has been made in the Contract Data for payment against a guarantee.

PMA.4.3 MOTOR STARTERS

Starter types will be specified in the project specification.

Unless specified to the contrary in the project specification, starters must conform to the requirements as set out below. The following starter panel configuration and functional requirements will also be applicable to electronic controllers/drives.

PMA.4.3.1 Starter Assembly Configuration

Should the starter type, duty or torque characteristics specified in the project specification not be suitable for the application of the tendered equipment, a suitable starter must be offered as an alternative in the annexure together with price implication and full particulars similar to that required in the information sheets.

Starters shall be rated for not less than 15 starts per hour and consist of the following:

- a) Circuit breaker with padlockable handle;
- b) CT operated ampere meter;
- c) 6-digit running hour meter;

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- d) Controllers/contactors and current limiting devices in accordance with the motor starting and control requirements;
- e) Protection devices which shall be provided as follows:
 - Motor overload relay with adjustable thermal trips and single phasing protection;
 - Winding overheat protection in accordance with the type of temperature sensing devices in the motor. In the case of thermistor relays, it must be ensured that the thermistor resistance curve and the thermistor relay tripping characteristics are compatible;
 - Earth leakage protection for motors liable to flooding, i.e. subterranean installations. Earth leakage protection shall be provided for submersible motors, irrespective.
 - Protection equipment for moisture sensing probes (submersible motors only).

All protection devices must trip the associated motor and individual fault indication must be given by means of a red pilot lights. Push buttons must be provided for resetting electrically latched protection equipment.

- f) Control devices which shall be provided as follows:
 - Manual starting and stopping must be provided by means of a green and red push button respectively. Automatic starting must be provided in accordance with the project specification requirements.

A green pilot light operated by the motor "RUN" contactor must be provided to indicate when the motor is running;
 - Starters used in conjunction with automatic starting and stopping equipment, shall be fitted with a red mushroom-head stop-lock type emergency stop (E-stop) , which must also be operative in manual mode. These E stops must be mounted on the control panel of motors grouped under a common control panel and on the starter panel of motors operated individually. This requirement is additional to any safety requirements in accordance with SANS 10142-1.
 - A lamp test pushbutton must be provided which will switch on all pilot lights simultaneously, when operated;

The starters shall be fitted with approved terminals of ample dimensions to suit the cables to be supplied from this equipment. The terminals must be installed directly above the gland plate for the outgoing cables.

An approved earth terminal shall be provided on the frame of each starter housing gear and provision shall be made for earthing each starter.
- g) Comprehensive simulation facilities must be provided in the factory to test starters and all protection equipment.

PMA.4.3.2 SOFT STARTERS

PMA.4.3.2.1 General

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The general requirements as per PMA.4.3.1 will be applicable, as starter in this section refers to the electronic controller.

Soft starters must provide smooth acceleration during run up, reducing voltage drop, current and torque peaks, by means of reduced voltage at start-up, which is increased to full value on an adjustable time ramp, with an adjustable maximum motor current limit. At the time the motor has reached full speed, a bypass contactor must close to take the full running current over and deactivate the thyristor modules.

The motor and starter combination must be carefully selected to ensure compatibility of the torque requirements and motor insulation class for the operating cycle and starter to prevent thermal tripping of the starter due to overheating of the motor (prolonged starting times).

They must be in accordance with the type(s) specified in the project specification and must conform to the following minimum requirements.

PMA.4.3.2.2 Application

Soft starters will in general be specified for purposes of torque control rather than current limit. The reduced voltage at start-up and degree of current limit (if specified) may reduce starting torque considerably. Tenderers must ensure that the starter and conditions specified, comply with the requirements of the driven machinery offered and should qualify their tender including financial implications, accordingly.

Any financial implication arising due to non-compliance with this stipulation will be borne by the Tenderer.

PMA.4.3.2.3 Technology

The unit must consist of a microprocessor controlled control unit and a power unit with 3 banks of 2 thyristor modules back to back with protection devices and gamma firing angle control.

PMA.4.3.2.4 Climatic operating conditions

- a) Ambient temperature : 0 °C -40 °C
- b) Humidity : 93 % at 40 °C without condensation

PMA.4.3.2.5 Standards

- a) Vibration resistance : to IEC 68-2-6
- b) Shock resistance : to IEC 68-2-27
- c) Radio electrical interference : to IEC 801-3

PMA.4.3.2.6 Supply

400 V3 phase - 15%,+10 % at 50 Hz.

PMA.4.3.2.7 Rating

The starter must be suitable for the continuous rated motor connected load plus 10% and 12 starts per hour. This is a minimum requirement and the application as per 4.3.2.2 must be taken into account with the selection.

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PMA.4.3.2.8 Control functions

- a) Starting
 - Voltage ramp (starting acceleration): Adjustable 1-90 seconds from a fixed threshold of 0,33 rated voltage.
 - Current limit: Adjustable 2-5 times motor rated current.
 - Start voltage boost facility: Switch selectable full voltage starting for 100 ms.
- b) Stopping (switch selectable)
 - Uncontrolled free-wheel stop by switching of the supply to the motor.
 - Controlled stop with voltage ramp (deceleration) : Adjustable 2-90 seconds.
- c) Switch selectable automatic and manual fault reset.
- d) Motor thermal protection by adjustment of the motor current setting.

PMA.4.3.2.9 Protective features

- a) Starter short circuit protection by means of fast acting fuses or other approved (by manufacturer) method.
- b) Self diagnostic internal fault check before starting.
- c) Thermal:
 - Protection of the starter against over-load and over-temperature shutting the unit down. Units fitted with a cooling fan must have a fan fail alarm.
 - Protection of the motor against overload (slow, medium and fast overheating exceeding the motor thermal capacity) by setting the motor operating current. It must incorporate a thermal memory, taking into account previous starts, which will prevent a restart once the thermal capacity has been exceeded until the motor has cooled down sufficiently. This facility must remain operational even if the starter is bypassed once the motor is up to speed.
- d) Voltage Phase failure and phase imbalance must stop the motor.

PMA.4.3.2.10 Status display (LED)

- a) Starting/stopping
- b) Normal operation
- c) Cooling down
- d) Internal fault (starter)
- e) Thermal fault (starter)
- f) Overload (motor)

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- g) Phase failure

NOTE:

The status indication must be visible without opening the panel door (in case of panels with an inner and outer door such as weatherproof panels, this applies to the inner door only).

PMA.4.3.2.11 Output relays

- a) Fault : (1 x N/O; 1 x N/C)
- b) Overload : (1 x N/O)
- c) End of starting : (1 x N/O)

NOTE:

These conditions must be displayed external to the enclosure in which the starter is mounted, by means of pilot lights.

PMA.4.3.2.12 Cabinet installation

When installed in a general purpose enclosure protection degree IP44, sufficient space must be provided around the starters to ensure adequate air flow in accordance with the manufacturers requirements. If sufficient cooling cannot be obtained by natural ventilation fan(s) must be fitted. In case of IP54 enclosures an internal cooling fan must be fitted and adequate heat exchanging surfaces must be provided (calculation to be provided on request).

PMA.4.3.2.13 Power factor equipment

If power factor equipment has been specified in the project specification steps must be taken that the power factor correction equipment is never connected to the starter output terminals. I.e. in the case of individual motor correction, the motor must be directly connected to the main supply after run up and the starter output disconnected, by means of interlocked contactors, before the power factor equipment is switched into the motor circuit. In these cases motors must be provided with separate overload relays since the starter overload protection is then out of circuit. Note the starter thermal memory must be retained when the motor is disconnected, to be functional if the motor is restarted.

PMA.4.3.3 VARIABLE FREQUENCY CONTROLLERS (VFCs)

PMA.4.3.3.1 General

The general requirements as per PMA.4.3.1 will be applicable, referenced as electronic controllers.

VFCs must provide smooth linear acceleration during starting and stopping, by means of increasing the motor supply frequency from zero to the desired operational speed (maximum 55 Hz), on an adjustable time ramp during run-up and the reverse on deceleration to standstill.

The motor and starter combination must be carefully selected to ensure compatibility of the torque requirements and motor insulation class for the operating cycle and starter.

They must be in accordance with the type(s) specified in the project specification and must conform to the following minimum requirements.

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PMA.4.3.3.2 Application

VFCs will in general be specified for three phase induction motor torque and dynamic speed control. In some instances it may be for enhanced acceleration and deceleration characteristics, reduced current at starting and stopping in standby power applications, or (reduced) fixed speed pumping applications providing for future pumping capacity upgrade by increasing the operational speed.

PMA.4.3.3.3 Basic Technology

The unit must consist of a microprocessor controlled six or twelve pulse rectifier section, DC link and final inverter section with associated protection devices. The default option will be six pulse and twelve pulse units may only be offered in conjunction with a phase shift transformer supply. If a six pulse unit, does not meet the harmonic distortion requirements (refer to PMA.4.3.3.8), a twelve pulse unit (including phase shift supply), may be considered if it will result in a more economical solution than a six pulse unit with additional harmonic (active/passive) mitigation measures. Such measures may be provided by various means. Refer to PMA 4.3.3.8 for the related technology.

Unless stated to the contrary in the project specification, the supply transformer must be presumed to be a standard transformer, whether existing, or new provided by a third party. If a new transformer is provided as part of the tendered project, it must still be a standard transformer, unless the project specification specifically provides for a special (phase shift) transformer.

Vector torque control must be provided and deceleration braking of rotary loads must be via vector control. The use of resistors for absorbed braking energy dissipating is not acceptable.

VFCs must communicate on a Modbus /Ethernet communication bus to a controlling PLC, MMI, VFCs on a multiple drive system and other network connected field devices.

PMA.4.3.3.4 Operator/controller interface

An operator interface must be provided via a keypad for navigation and programming/parameter setup with LCD message display window. This interface must be removable for remote (door) mounting. The interface for different models within a specific manufacturer series must be the same (interchangeable).

The message window must provide status display of all preset operational parameters, all dynamic functional parameters such as frequency/speed, supply voltage, phase/line currents, power, kVA etc. and protection/alarm facilities.

A USB port must be provided for laptop access for control programming facilities.

PMA.4.3.3.5 Drive (controller) assembly configuration

VFC drives will generally be configured on a discrete component basis. The standard VFC drive configuration must comply with the starter assembly configuration as per PMA 4.3.1, i.e. comprising an upstream circuit breaker in accordance with the specified fault level, the controller itself with fast acting HRC fuses between the circuit breaker and controller and relevant control and protection equipment. This assembly (or assemblies in case of multiple drives), must be mounted within a purpose built MCC to the requirements as set out in the project specification, in compliance with the statutory requirements as per PMA 4.2.1. In high power applications, modular configuration of the controller power sections will be acceptable, whereby multiple stacks can be used to achieve a specific power rating.

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Where a single drive is housed in more than one panel, the doors must be interlocked that it shall not be possible to open any panel door without switching the main circuit breaker for that drive off.

In the case of an imported pre-manufactured standalone cabinet assembly, for a high power application, this assembly must still comply with the stated statutory requirements. These units may be combined as a composite MCC in a multi-drive application, only if the system has been designed that way, where adjoining assemblies and the main incoming section are linked by means of solid busbar. All sections such as the main incoming section, drive sections, additional filters, PLC/control/marshalling sections, must be part of an integrated system, designed on a modular extendable basis, i.e. not standard pre-manufactured cabinet assemblies linked with flexible cable, since the composite MCC must still comply with the abovementioned statutory requirements for a composite MCC.

PMA.4.3.3.6 Ambient conditions, cooling and ventilation

The VFC must be able to function under the following unconditioned ambient conditions:

- a) Temperature : 0 °C to 50 °C
- b) Humidity : 93 % at 40 °C without condensation.

VFC power modules must be force ventilated by means of fans. Hot air must be expelled to the outside of the MCC room, by means of ductwork and extraction fans at the point of exit. Refer to the general MCC requirements PMA.2.5 in this regard.

The onus is on the Tenderer to determine the operating conditions relating to the above and the cooling requirements of the VFCs, especially in multiple VFCs and/ or high power applications, where, **in addition** to the abovementioned measures, the heat load of the equipment or specific site ambient conditions will necessitate air conditioning. The air conditioning installation must by default be provided as part of the Contract, unless stated to the contrary in the project specification and the Tenderer must qualify his tender, should air conditioning be required and not provided for under the Tender. AC does not replace the abovementioned ventilation system, but serve as enhancement only when required.

The Tenderer must provide the heat load of the installed equipment, whether for own determination of the air-conditioning requirements, or where the AC installation is provided by a third party.

PMA.4.3.3.7 Standards

The VFCs must comply with the following standards:

- a) Vibration resistance : to IEC/EN 60068-2-6
- b) Shock resistance : to IEC/EN 60068-2-27
- c) EMC : to SANS 61800/61000 (latest editions), as well as NRS 048-2 (latest edition)
- d) Harmonics : SABS 61000: Quality of Supply.

IEEE 519 1992 (as revised): Harmonic suppression.

PMA.4.3.3.8 Harmonics

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VFCs generate voltage and current harmonics which must be suppressed to ensure the integrity and reliable operation of the power supply system upstream and downstream of the VFC installation. The distortion effect of the harmonics on the fundamental voltage and current waveforms is referred to as Total Harmonic Distortion (THD) expressed as a percentage value at a reference point. THD must be referenced to voltage (THD_v / V_{THD} and current THD_i / I_{THD}).

Harmonic suppression must be provided to comply with the above-mentioned standard SABS 61000-3-4. The provision of mitigation measures must be done in accordance with the guidelines in IEEE 519, table 10.2 (voltage harmonic distortion) and 10.3 (current harmonic distortion).

The VFCs must be fitted as standard with a built in DC link reactor for controllers rated at 16 A to 75 A. If the standard unit does not comply with the harmonic suppression requirements, additional mitigation measures must be taken, such as passive line filters, active suppression or using a higher order rectifier section (refer PMA.4.3.3.3), depending on the THD requirements to be met. Line (passive) compensation components may be separate from the controller module, but must still be incorporated in the controller panel assembly and must be provided per individual controller.

The offered technology must be the most cost effective solution relevant to the rating of the drive and any other constraints. Especially for large drives, the accommodation requirements (footprint) associated cost must be considered (refer to PMA.3.3.9, MCC Construction).

For purposes of this document the reference point will be the point of common coupling (PCC), unless stated to the contrary. In the case of a LV connection from a distribution network shared with other users, it will be the point of connection. In the case of a dedicated MV supply, it will be the supply transformer MV primary incoming supply terminals. In the case of a utility supply point, the metering point (MV or LV) will be the PCC. The inherent suppression of the supply system between the PCC and the VFC installation must be taken into account when the THD is calculated.

In the case of the PCC being upstream of the supply transformer, it will be referenced as the primary PCC (PCC1), relevant to other (external) users on the supply side. The secondary PCC (PCC2) will be the connection point of the VFCs, typically the related MCC bus bars relating to the internal users upstream and downstream of this PCC2. The harmonic distortion at this point PCC2 must also conform to the relevant requirements of IEEE 519. Generally speaking, if the design meets the IEEE limits at PCC2, it will also comply at PCC1 due to the impedance of the PCC1 transformer. Irrespective, the Contractor is responsible and liable for the proper performance of all equipment provided for a specific project and potentially affected by the harmonics generated by related VFCs provided as part of the same project.

The voltage and current distortion limits at the PCC must be determined in accordance with IEEE 519 tables 12.2 and 10.3 respectively. Note that the current distortion per table 10.3 is defined in terms of Total Demand Distortion (TDDi) and must be based on the full rated load of the equipment provided. (Should the difference between the full rated load and duty point load have a significant impact on the design and related cost of mitigation measures, an option may be offered based on duty point for consideration as an alternative only.) The supply system parameters for purposes of design will be provided in the Project Specification. If undetermined at the time of tender.

Tenderers must use the guideline figures below for basis of design. After appointment of the Contractor, when all parameters are available, the design must be revisited and amended to suit if necessary. Tenderers must allow for this required harmonic analysis and design amendment in the tendered supply rates. Any resultant equipment cost adjustment (additional/reduction) will be entertained by means of a variation order as part of the review. The Engineer reserves the right to request the design harmonics analysis at any time.

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In absence of specific design parameters in the project specification, as a general default guideline *General* classification in table 10.2 must be used for THDu (5%) and with reference to table 10.3, 10% for TDDi.

PMA.4.3.3.9 Accommodation requirements

Further to PMA 4.2.11 (Spatial requirements) the accommodation requirements (footprint) of large multiple drives and their related filters can be substantial and affect both the building spatial requirements as well as the configuration. This aspect need be addressed with particular care since the different available technologies available will determine the footprint. It is thus of paramount importance that the MCC with VFCs and harmonic suppression **equipment dimensions be provided at tender stage**, that the effect on the building accommodation can be evaluated, with related the cost implications. This information must be provided in the data sheets or as separate attachment per covering letter. The proposed building accommodation as per the tender drawings must specifically be qualified if considered inadequate for the tendered equipment and the successful tenderer will be held liable for costs related to inadequate spatial provision if not qualified at tender stage relative to the available design information.

PMA.4.3.3.10 Supply

The system supply will be 3 phase at 400 V nominal, - 15%,+10 % at 50 Hz, unless stated otherwise in the Project Specification.

VFCs operated at other voltages will be addressed in the Project Specification.

PMA.4.3.3.11 Rating

The controller must be suitable for the continuous rated motor connected load, plus 10% and 12 starts per hour. This is a minimum requirement and the application as per PMA 4.3.3.2 above, must be taken into account with the selection.

PMA.4.3.3.12 Control functions

The VFCs must have the following minimum control facilities:

- a) Manual starting and stopping:
 - Acceleration and deceleration times to be separately adjustable, on a linear ramp scale.
- b) Facility for automatic starting and stopping.
- c) 16 programmable speeds.
- d) PID control function for dynamic speed control.
- e) Master/slave functionality to allow multiple drives to be locked onto a specific frequency.
- f) Frequency skips function to prevent the drive to operate at resonant/critical speeds.
- g) PLC programming capability.
- h) Addressable (configurable) Inputs and Outputs:
 - Analog inputs : 2

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- Digital inputs : 10
 - PTC probe input : As per Project Specification.
 - Analog outputs : 3
 - Digital outputs : 8
 - Relay outputs : 4
- i) Start on the fly facility (selectable) whereby a rotating motor in deceleration (stopping phase) can be re-started before first coming to a standstill, accelerating from the restart speed to the required speed.
 - j) Short time ride through capability whereby the drive system kinetic energy is utilized to energize the drive controls during brief supply interruptions.
 - k) Ethernet ports x 2.

The above-mentioned requirements are nominal/default, and may be adjusted for project specific applications, but must be qualified accordingly in the tender offer. For drives up to 15 kW (nominal), the above requirements may be relaxed to the project specific requirements, but for larger drives, where the project specific requirements exceed the above, additional I/O capacity and PLC programmability must be provided.

PMA.4.3.3.13 Protection

The controller must have the following minimum protection facilities, for protection of itself and downstream motors.

- a) Self diagnostic internal fault check before starting.
- b) Short circuit protection by means of fast acting fuses or other approved (by manufacturer) method, in addition to any upstream circuit breakers.
- c) Thermal protection:
 - Protection of the starter against over-load and over-temperature shutting the unit down.

Units must be fitted with a cooling fan and a high temperature alarm. The fan must be provided with its own motor protection and fan failure must shut the VFC down with related fault indication. Internal dedicated electronic component cooling fans must be provided for larger drives, which will operate automatically according to the temperature.

 - Protection (to IEC 60497-4-2) of the motor against overload, exceeding the motor thermal capacity. It must incorporate a thermal memory, taking into account previous starts, which will prevent a restart once the thermal capacity has been exceeded until the motor has cooled down sufficiently. This facility must remain operational even if the controller is bypassed once the motor is up to speed.
- d) Voltage Phase failure, imbalance and rotation.

Note that the controller must be designed to withstand and continue operation during short time voltage loss and reduced voltage, without interruption or damage to the controller. Short time at

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total loss of one or all three phases and reinstatement is 300 ms and 3 seconds for reduced voltage of up to 30%.

PMA.4.4 PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

PMA.4.4.1 General

PLCs must conform to the general requirements set out below. User specific preferences will be given in the project specification, as applicable.

PLCs shall be provided to perform logic sequence switching, arithmetical calculations to do switching based on field instruments inputs and process control requiring PID control.

The PLC shall be configured on a modular basis, with power supply, CPU, input, output, communication and process sections as separate modules slotted into a mounting rack.

Field wiring shall terminate on separate terminal sections, that modules can be removed without disconnection of wiring.

PMA.4.4.2 Inputs And Outputs

Provision shall be made for digital and analogue inputs and outputs.

Digital inputs shall be from potential free contacts and digital outputs shall be by means of solid state relays and electro-mechanical relays. Analogue inputs shall be suitable for 0-5V, 0-10V, and 4-20 mA and analogue outputs shall be of minimum 12 Bit resolution.

All I/O must be:

- galvanically isolated (by means of Opto isolator), surge and lightning protected;
- provided with status LEDs, to indicate the active (ON) status.

Failure of the CPU shall cause all outputs to revert to inactive (OFF) status. I/O modules must have suitable labelling facilities that I/O can be clearly labelled. The contractor must use a logic labelling system, to be submitted and approved by the Engineer before implementation.

PMA.4.4.3 Software And Programming

The PLC must be provided with propriety software or as specified in the project specification, inclusive of licensing cost. Proprietary software shall comply with IEC 116-1-3 standard.

Programming shall be executed via laptop and it shall be possible to execute program changes without interrupting the PLC operation. The program display on screen must shown I/O active statuses and it shall be possible to force I/O to an active / non-active status for system functional testing.

The program must be saved on non-volatile memory, independent of any battery supply, to be off-loaded on CD ROM for backup storage.

Hard copy printouts of the program, as well as electronic copies on CD must be provided for the Operation and Maintenance Manual. Completion / taking over shall not be given without this documentation.

PMA.4.4.4 Communication

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The PLC shall be able to communicate with other PLCs, field instruments, HMI and SCADA systems on all the major protocols such as Modbus and Profibus (or other as specified in the project specification) on a Ethernet communication bus.

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PMA.4.4.5 Interlocks

Safety and critical control elements such as emergency stops and other identified in the project specification, must be monitored and controlled via the PLC, but also directly wired to such elements for direct operation independent of the PLC.

The operational mode of the PLC in terms of manual overriding systems, process interlocks, functional blocks etc, will be addressed in the the project specification.

PMA.4.4.6 Functional testing

The PLC functional testing will be executed as part of the related MCC testing, as stipulated in other sections of this document.

PMA.4.5 CONTACTORS

All contactors shall have easily removable coils and contacts, the contacts rated at AC 3 for normal motor starting.

All contactors shall have adequately rated coils and continuously rated coils with a drop-off value of not more than 80 % of rated voltage.

PMA.4.6 SWITCHGEAR

All switchgear shall be rated for the maximum rupturing capacity of the particular system, as specified in the projection specification, but not less than 10 kA, unless otherwise specified in the projection specification.

PMA.4.6.1 Circuit Breakers

All circuit breakers shall be of the moulded case type, unless otherwise specified in the project specification, conforming to SANS 156 and carry the SABS mark. They shall be equipped with thermal or hydraulic devices for tripping on over currents and magnetic devices for instantaneous tripping on fault currents. The minimum voltage rating for single and double pole circuit breakers shall be 240 V and 400 V for three-pole. The ampere rating and fault rupturing capacity shall be as specified or shown on the drawings.

PMA.4.6.2 Miniature Isolators

Miniature isolators shall be micro-gap type manually operated air break switches, suitable for flush mounting and shall be to SANS 60947-3. Where individually mounted they shall be in galvanised steel boxes with brass dished cover plates finished to match switch cover plates.

PMA.4.6.3 Fused Switches

The fuse switch units shall be of the three phase and neutral arrangement having double break moving contacts supporting H.R.C. fuses, all housed in robust metal toggle mechanism. Interlocks shall be provided to ensure that the covers cannot be opened when the switch is in the closed position.

The fuses shall be of the H.R.C. type and rated for the application duty category.

A set of spare fuses of each rating used in the MCCs, shall be supplied and handed to the representative at the site, who will issue a receipt.

PMA.4.7 METERING AND INDICATION EQUIPMENT

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PMA.4.7.1 kWh Meters

The meters shall be individually tested and comply with SANS 62053-11 and SANS IEC 521.

Test certificates shall be supplied with each meter. The scale shall be of the cyclometer type and definition down to 1/10th of a unit shall be provided for.

PMA.4.7.2 Ampere Meters

Moving iron ampere meters suitable for 5 amp secondary current transformers shall be used.

Maximum demand ampere meters shall be used for the main incomer and indicate the instantaneous current and have a separate indication for a 15 minute average value, preferably of a bi-metal element type.

The scale shall be clearly calibrated in black on white background and both instantaneous and maximum demand readings shall be on concentric scales by means of different coloured pointers.

Meters shall be over-scaled with a suppressed over range corresponding to the starting current and where current transformers are used, the ratio of such transformers shall be indicated on the ammeter fascia.

The scale must be selected that the ampere reading at rated load must be not less than 60 % of the scale of the linear section. Ancillary circuit short time loads such as socket outlets must not be accommodated within the linear section, but in the suppressed section.

PMA.4.7.3 Voltmeters

The instrument shall be a moving iron type, suitable for horizontal, as well as vertical flush mounting.

The scale shall be clearly calibrated in black on a white background.

Calibration shall be up to 120 % of rated voltage and a suppressed scale at the zero reading shall be preferable.

The instrument shall comply with IEC 60051-1 and shall have an industrial grade accuracy.

PMA.4.7.4 Voltmeter Switches

Voltmeter switches shall have one "OFF" and six measuring positions and shall be suitable for panel mounting in such a way that only the handle and labelling plate extends to the front of the panel.

The fascia inscriptions on the labelling plate shall be clearly marked.

The switch terminals shall be suitable for lug connection and shall be clearly marked.

The contact movement shall have a roller or wiping action.

The voltage rating shall be suited to the installation.

PMA.4.7.5 Voltmeter Fuses

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The fuse base shall have a voltage rating suited to the particular installation and shall be suitable for either flush or projection mounting.

Cartridge type fuses shall be used with nominal rating of 2 amp at 400 volts 50 Hz and a rupturing capacity of 20 000 amps.

PMA.4.7.6 Current Transformers

Current transformers shall be of the air-cooled type and shall have mounting facilities.

Split core current transformers shall not be acceptable.

The voltage rating shall be suited to the particular installation.

Current transformers shall have a class C accuracy and shall comply with SANS 60644-1 and shall be suitable for a 10 VA secondary load.

PMA.4.8 MOTORS

Motors shall be of an asynchronous squirrel cage high efficiency type and comply with IEC 60034-1 and dimensioned to SANS 60644-1 and be suitable for 400/230 Volt nominal, 3-phase, 50 cycle AC supply and shall be continuously rated for operation at the required altitude.

The motor rated power shall exceed the calculated duty point of the driven equipment by 15 % or more, with a tolerance of ±2 % or as specifically specified under the mechanical project specification. The anticipated number of starts per hour must be taken into consideration when determining the motor size.

The motor speed shall preferably not exceed 1 450 r.p.m. to suit the speed of the plant offered, as specified in the mechanical project specification. Whenever possible, motors must be directly coupled to the pumps either by horizontal or vertical spindles.

All motors shall have class B insulation and be of the totally enclosed fan cooled (TEFC) type, suitable to be used in wet environments, minimum protection rating IP 55. Submersible pump motors shall be protected against wet running due to seal failure by means of moisture sensing probes in the oil chambers, and provided with approved watertight cable glands to accommodate the cables to be supplied with the equipment.

Non-submersible motors rated at 11 kW and higher shall be protected against overheating by thermistors embedded in the motor windings. These devices shall trip the power supply to the motor as soon as the temperature in the windings exceeds safe levels. This will apply to submersible motors of 30 kW and higher. The thermistor temperature rating must be compatible with the temperature rating of the motor insulation class.

Motors shall be able to start satisfactorily at a voltage of 10 % below nominal voltage, as measured immediately after the starter is switched on. Motors shall be run-up to full speed in the time given in IEC 60470 with the voltage reduced to 10 % as above. Acceleration shall be smooth throughout the starting period with no signs of hesitation or “crawling”.

On completion of the manufacturer’s work all motors shall be subjected to routine and type tests in accordance with IEC 60034 and test certificates shall be submitted for approval before delivery to site is undertaken. After installation at site the Contractor shall carry out, in the presence of the Engineer, the high voltage tests laid down in IEC 60034.

Tenderers shall supply efficiency, power factor and starting current curves of the motors at the time of tendering.

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PMA.4.9 CABLES

Cables for general use shall be 600/1 000 V grade polyvinyl chloride (PVC) insulated steel wire armoured and PVC served overall in accordance with SANS 1574 general purpose grade.

All cables which might be submerged shall be of a similar standard to the VIRTRS 660 Volt grade submersible power cable.

NOTE:

All power and control cable necessary to provide a fully operational system as specified, must be provided. Cable sizes and lengths are given in the price schedule, but any cable not scheduled and required for full operation, must be qualified by the Tenderer in the cable schedule; if not it will be considered as included in the price and the contractor will have no additional claim.

Cables with long runs and or provisional routes, subject to change, are measured per meter. Such cable is re-measureable and remuneration will be for the installed length as measured from point to point, allowing 1.5°m for cable ends (each), against the tendered unit rates. Tenderers must allow for slack and wastage in the rates. Cable lengths in the price schedule must be verified on site before ordering. Cables, within the same building and/or fixed routes with short runs to the equipment served, are not measured individually and will not be re-measured. Only in a case where the layout has changed substantially affecting cable lengths, will adjustment be made.

Cable sizes where specified, are for purposes of tender only. Tenderers must verify these sizes against the requirements of their equipment offered and must qualify their tender accordingly. No claims in this regard will be accepted after appointment, for cables that are not suitable, which must then be rectified at the Contractor's cost.

Cable sizes given in the price schedule and not qualified must be confirmed with the Engineer before ordering.

Where so indicated in the price schedule, the Tenderer must fill in the type and quantity of instrumentation and network communication cable, in accordance with his specific communication network design.

PMA.4.9.1 Cables In Trenches

Trenching and backfilling must be provided under this contract.

MV and LV cable must be installed at a depth of 1000 mm and 750 mm below ground level respectively, with danger tape 300 mm above the cable on a 150 mm sand bedding with a 150 mm sand cover on top, for excavation other than soil. Cable may be installed in the same trench as a water line, but separated with at least 400 mm and not on top of the water line. The mechanical contractor must liaise with the civil contractor in this regard.

All excavation must be backfilled and compacted in accordance with particular Specification PI. In the absence of PI, the Contractor must verify the standard of backfilling and compaction with the Engineer prior to backfilling. Should the Contractor fail to comply, the Engineer will have the right to instruct the Contractor to re-open trenches and redo backfilling and compaction to the required standard. The cost of backfilling and compaction must be included in the tendered rates for excavation.

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The backfilled and compacted excavation top surface must be restored to the type prior to excavation. The standard must be for newly constructed surface irrespective of the condition of surrounding areas.

Cable markers must be installed every 50m and at every change in direction of the cable. The cable route must be shown on the "as built" drawings, dimensioned from permanent fixed points/structures.

PMA.4.9.2 Cables Within Buildings

Cables within buildings must be installed on cable rack (ladder or wired tray, but not perforated steel tray) fixed to the walls, or bottom (and sides if space is limited) of constructed cable ducts. Sleeves must be cast in floor slabs of new buildings for equipment away from the walls, if not serviced by a cable duct.

It shall be the responsibility of the mechanical contractor to timeously supply the sleeve requirements to the builder and verify the positions before any slabs are cast or walls built. In absence of the initial information, or incorrect placement by the builder, remedial action will be for the account of the Contractor under this contract.

In existing buildings without sleeves or ducts, the racking must be installed on the wall to a point where the racking can be installed on the floor to equipment; in case of pump stations, underneath the pipe work to the pump motor. Where cables have to cross a floor, or in an exposed area, a purpose made galvanised steel top hat section must be placed over the cable. All cable entries from outside into a building, must be covered with an appropriate top hat section.

Single core cable must be installed in Trefoil formation and special care must be taken that all parallel cables are exactly the same length. Unarmoured cable installed outdoors must be protected by concrete slabs (provided as part of the tender offer, but priced separately from the excavation or cable prices).

PMA.4.9.3 Instrumentation / Control / Communication Network Cable

Instrumentation, control and field devices must be connected to the relevant reporting point with the appropriate cable type. Cable for discrete control signals or control devices which is not cable type sensitive, e.g. local motor control stations, pressure-and flow switches etc., must be 1,5 mm² multi-core PVC SWA PVC cable. In general instrumentation cable must be twisted pair, individually and overall screened and armoured. Communication network cable must suit the network topology as per the Project Specification, as well as other supporting Particular specifications applicable for a specific project. Notwithstanding, it will be the responsibility of the Contractor to select the most suitable type of instrumentation and communication cable for the application if other than the general type, or otherwise specifically specified in the Project specification.

Instrumentation/field devices provided with fixed propriety cable must be extended with the same or appropriate compatible type cable to the reporting point. The cable junction must be done within a Pratley type cable box for all outdoor installations. Indoor cable junction boxes can be of the type appropriate to the protection required for the environmental conditions at the point of installation.

All external surface mounted cable must be installed within galvanised steel conduit, with flexible PVC conduit from the end of the steel conduit to the cable termination / entry point. In the case of communication networks, the cabling must be provided to the requirements of the system design, such as fibre optic cable, which will be covered by specific requirements in the Project Specification.

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PMA.4.9.4 Cable Termination

All cable ends are to be properly made off with cable glands to suit the cable type. Cable glands for external terminations or inside pump houses shall have a compression type outer sheath seal.

In the case of compression glands, only one cable per gland will be allowed, inclusive of small instrumental / control cables. Gland sizes must be carefully selected to ensure a tight grip on small diameter cables. Where the smallest gland size does not fit the cable, the cable outer diameter must be increased with successive layers of heat shrink tubing, or similar substance.

PRATLEY or CCG weatherproof cable connection boxes shall be used as cable junction boxes above ground level. If the number of cables does not permit this weatherproof polycarbonate or galvanised steel enclosures of approved design equipped with fixed terminal strips will be used.

PMA.4.9.5 Pump Connection

The cables from the MCC to the pump must be installed in a sleeve to a PRATLEY cable box installed against the pump base as a junction between the pump motor cable and the cable from the MCC from where the cables must be installed in a vertical loop, through an opening in the baseplate, with slack above to ensure that the cables are not under tension. The cable must be secured to an L-bracket by means of a compression gland. A compression gland must also be fitted to the cable at the opening through the baseplate, to protect the cable against the flange hole sharp edge. The cable loop above the bracket must be installed within flexible PVC tubing for protection.

The pump motor and control cables conduit must be tied to the borehole pipe at 1,5 m spacing, that the weight of the cable is not taken by the compression gland.

Two separate continuous polycop sleeves must be tied to the borehole pipe for water level monitoring and electrode level control. (The sleeve ID for the pressure sensor must be 28 mm). Suitable holes must be made in the baseplate for access to the sleeves directly below.

PMA.4.9.6 Submersible Pumps Connection

3 x 110 Ø Sleeves must be installed from the sump and terminate for the sewage pumps below the switchboard, flush with the concrete plinth. The sleeves must be sealed with expanding foam after installation of the cables.

Two sleeves are for the motor cables and one for the level sensors. The sleeves must be fixed to the sump soffit and extended to reaching distance of the access openings, that the sleeves can be easily accessed for installation/removal of the cable when installing/removing the pumpset.

Pump motor and control cables from the sump must be directly terminated on the switchboard bottom plate.

Excavation and backfilling for the required sleeves must be provided under this contract (excluding the supply cable).

PMA.4.9.7 Connection To Equipment In Subterranean Structures

In the case of pump stations installed in drywell structures below ground level, special attention must be given to cable entries into the pump chamber and adjoining sumps, to prevent ingress of water.

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No penetration for cable connections may be made through the wall between the sump and pump chamber, and interconnection cable must be routed via the outside of the structure. To this end, level detection equipment cables must be terminated in a watertight cable connection box directly adjacent to the level detection equipment mounting bracket. The extension cable to the MCC, must be installed in hot dipped galvanised tubing installed from this cable box, fixed to the underside of the soffit, to exit just below the soffit end extended to 500 mm below ground level. The entry into the adjacent pump chamber, must be done in a similar way. The extension cable must be installed on cable rack within the chamber and terminated on the MCC bottom.

The conduit wall penetrations must be sealed to prevent water ingress.

PMA.4.10 EARTHING OF EQUIPMENT

All starters, motors, pumps and associated equipment must be earthed by means of a separate bare copper stranded earth conductor, connected to the earth bar of the relevant MCC serving that equipment. The Contractor is required to lay and properly connect the earth conductors between the motors, starters, MCCs and the earth mat.

Earth conductors must be run alongside and strapped to its associated cable, not less than 50% of the cable conductors size, with a minimum of 6 mm² and generally a maximum of 70 mm², but notwithstanding to comply with SANS 10142-1. The ends must be fitted with soldered or crimped lugs, solidly bolted to the equipment to be earthed and the earth bar.

If there is a spare core in a cable, this may be used as an earth conductor instead of the separate bare copper earth conductor, as specified above.

Wire armouring of cables shall not be used as an earth conductor, but must nevertheless be earthed.

A suitable earth mat must be supplied at each MCC, connected (nominally) with a 70 mm² earth conductor, marked "earth mat" to the MCC earth bar, but must always be verified against the requirements of SANS 10142-1. If possible the earthing system must be bonded to the water reticulation system at least once, preferably at the main MCC.

PMA.4.11 DRAWINGS AND INSTRUCTION BOOKS

Within three (3) weeks, unless stated to the contrary in the Contract Data, after receiving written acceptance of the tender, the Contractor shall supply the following information in duplicate:

1. Plant room layout drawings showing the main items of equipment, as well as all cable and wiring diagrams.
2. MCC general assembly, equipment layout drawings and details of manufacturing.
3. Single line and wiring diagrams detailing all control metering and indication circuits inclusive of a description of circuit operation.

NOTE:

Drawings must be neat and clearly legible. Circuit diagrams must be done on a grid system with elements of control equipment referred to applicable (grid) line numbers in a schedule directly below the relevant control device.

The function of each control element must be clearly stated on the drawings.

PMA.4.12 CONTROL EQUIPMENT AND INSTRUMENTATION

TENDER NO.				
	BIDDER	WITNESS	EMPLOYER	WITNESS

PMA.4.12.1 Level Sensing

PMA.4.12.1.1 Ultrasonic level sensor

Ultrasonic level sensors must be equal and similar to the type specified in the project specification, with 4-20 mA analogue output proportional to level and four programmable level switching relays.

The sensor must be mounted on a sturdy stainless steel bracket of not less than 3 mm thickness, fitted higher than the structure overflow level. The bracket must be fixed to the holding structure soffit with stainless steel or brass fasteners (except sewage applications), to suit the structure, in an easily accessible position but not where it can be damaged by removal of equipment or interference (echo) from nearby equipment and/or structures.

The control unit must be installed within the controlled equipment MCC behind a Perspex see through window, or within a separately mounted polycarbonate enclosure with clear lid as otherwise specified in the project specification.

TENDER NO.					
	BIDDER	WITNESS	EMPLOYER	WITNESS	

PMA.4.12.1.2 Float level switches

Float level switches must be of the magnetic reed switch type, operated on 24V DC.

The level switches must be mounted on a sturdy stainless steel bracket of not less than 3 mm thickness, fixed to the holding structure soffit with stainless steel or brass fasteners, to suit the structure, in an easily accessible position but not where it can be damaged by removal of equipment or interfere with the operation of other equipment such as ultrasonic level sensors. The level switch cable must be secured to this bracket by means of compression glands and identified as to its function at the mounting point, by means of plastic cable markers e.g. labelled HIGH ALARM.

The float switches must be tied to an hot dipped galvanized chain or weighted down nylon rope.

Note: That float switches used for LOW LEVEL protection and alarm purposes must be wired failsafe, i.e. with the float switch in the hanging position, the contact must be open.

PMA.4.12.1.3 Level electrodes

Level electrodes must operate on the principle continuity of the medium, by means of electrodes submerged in the liquid and a liquid level relay.

The sensitivity of the relay must be adjustable and it must have suitably rated switching contacts. The electrodes must be suitable for the medium, e.g. rigid stainless steel probes or flexible PVC insulated conductors for use in boreholes.

Electrodes in boreholes must be installed in a suitable diameter continuous polycop sleeve.

PMA.4.12.2 Flow Sensing

PMA.4.12.2.1 Flow switches (non-intrusive type)

Flow switches must be of the weatherproof (IP67) type operating on the calorimetric principle, similar and equal to the Weber manufacture.

PMA.4.12.2.2 Flow switches (intrusive type)

Flow switches must be of the weatherproof type (IP67) with brass or stainless steel insertion paddle, operating a micro-switch.

Construction must be such that the mechanism operating the micro-switch cannot let water through to the switch chamber.

Sensing voltage must be 24 V DC.

PMA.4.12.2.3 Electromagnetic flow meters

Electromagnetic flow meters must be similar and equal to the types specified in the Project Specification, installed in the position as indicated on the drawings, for flow rate and volume recordal and any control function as specified in the project specification.

The meter must conform to the following requirements:

Type : Electromagnetic flow-meter

Sensor diameter : To suit pipe diameter as per project specification

TENDER NO.					
	BIDDER	WITNESS	EMPLOYER	WITNESS	

- Flanges : PN16 to SANS 1123 table 1600/3 or as per Project Specification
- Lining : Suitable for potable water or as per project specification
- Flow speed measuring range : 0,01 – 10 m/s
- Flow rate operational range : As per project specification
- Accuracy (maximum measured error):
 - Pulse output : $\pm 0,4$ % (max) of reading at 0,8 m/s; 0,2 % (max) of reading 2 m/s – 10 m/s
 - Current output : $\pm 5 \mu\text{a}$
- Repeatability : 0,1 % of reading max
- Alarm signal : Current output fail
Pulse / frequency fail
Relay output de-energised by fault or power supply failure
- Switching output : 60V / 0,1A DC configurable for:
 - Error messages
 - Empty pipe detection
 - Flow direction
 - Limit values
- Low flow cut-off : Selectable switch point
- Water temp (max) : 40°C
- Enclosure : IP 68
- Electrodes : Stainless steel
- Transmitter : Remote mounted
- Enclosure : IP 67
- Power supply : 9 - 32 VDC
- Display : 4 Line “Touch Control” display
- Output : Current:
 - 4 - 20 mA proportional to flow; full scale value selectable
 - Pulse/frequency:
 - Potential free contact 24V DC/25 mA (250 mA max for 20 ms)

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TENDER NO.					
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		WITNESS			

Frequency output:
Full scale 2 – 10 kHz; on/off ratio 1:1; pulse width max 10s

Pulse output :
Pulse value and polarity adjustable; pulse width (0,05 ms – 2000 ms)

All outputs must be separately adjustable for forward and reverse flow

Field bus interface : Profibus DP or other recognized current industrial standard.

The meter must be fitted with a remote display, installed in the local MCC control panel or in a separate wall mount polycarbonate enclosure with clear lid as otherwise specified in the project specification.

Specific attention must be paid to the offered meter grounding requirements across flanges to ensure current and potential equalisation in metallic pipes.

In the case of lined pipelines where grounding rings are used between flanges, the corrosion resistance of the grounding rings must be verified for the pumped fluid and material electrolytic compatibility.

Special care must be taken in areas with strong electrical interference (such as where variable frequency controllers are used) to ensure full electromagnetic compatibility. It may be advisable to link the flanges, bond to earth and connect to the meter earth potential terminal.

PMA.4.12.3 Pressure Sensing

PMA.4.12.3.1 Pressure Switches

Pressure switches must be provided as per the project specification and indicated on the layout drawings. The pressure switches must be of the mechanical dial display type with adjustable switch point, equivalent to the SAUTER or WIKA Manufacture. The pressure switch ranges must be selected to detect a low/high condition, as specified, with adjustable hysteresis at the switching point.

Sensing voltage must be 24 V DC.

PMA.4.12.3.2 Pressure Sensor

Pressure sensors must be equivalent to the types as specified in the project specification, conforming to the following:

- Measuring range : As per project specification
- Overpressure : As per project specification
- Type : Capacitive measuring cell with ceramic diaphragm, or as per project specification
- Output : 4-20 mA proportional to pressure, with adjustable scale value
- Field bus interface : Profibus DP or other recognized current industrial standard.
- Accuracy : ± 0,2 % of set span

TENDER NO.					
	BIDDER	WITNESS	EMPLOYER	WITNESS	

- Power supply : 12 to 45V DC
- Ambient temperature : -40 to 50°C

The sensor must be provided with analogue LCD display with the following functions (Profibus option):

- 4 digit pressure display
- Bar graph displaying current pressure value relative to the measuring range
- Error code

Pressure sensors used for control applications must be provided with an associated pressure controller with LCD display and four programmable switching relays and keypad for programming parameters, unless specified to the contrary in the project specification with PLC applications.

TENDER NO.					
	BIDDER	WITNESS	EMPLOYER	WITNESS	

SECTION 5 : GUARANTEE AND TESTING

PMA.5.1

GUARANTEE

The Contractor shall submit the following characteristic curves for the performance of the plant:

Pumps

1. Head quantity curve
2. Efficiency curve
3. Kilowatt curve

Motors

1. Efficiency curve
2. Power factor curve

The Tenderer is to state in his tender the percentage tolerances within which he is prepared to guarantee:

- (a) The rate of delivery at the specified duty head;
- (b) The pump efficiency at the specified duty;
- (c) The head quantity curve.

The Employer shall have the right to refuse acceptance of a pumping set which, under test in terms of clauses set out below, fails to deliver the specified duty discharge at the specified duty head. If the manufacturer specifies any tolerance in the delivery of the pump, the Tenderer must make due allowance for this in his design.

In the event of such refusal of acceptance the Contractor will be afforded an opportunity to effect refinements or adjustments in order to overcome the deficiencies of the pump, failing the success of which he shall replace the pump with a new one, which will be subject to the same conditions in regard to tests and guarantees as herein specified. Pending such replacement or agreement as to delivery and use of the pump, in which case the Contractor shall deliver the pump and the Employer shall have the right to use and continue using it until it is replaced by a satisfactory new pump.

Any costs involved in any refinements, adjustment or replacement shall be at the Contractor's expense.

PMA.5.2

FACTORY TEST

The electrical panels shall be demonstrated in the factory to the Engineer and all equipment necessary to test the performance and operation of the panels shall be provided.

Before the Engineer is called to witness any testing, the Contractor must test the equipment on his own and confirm in writing to the Engineer that the equipment conforms to specification.

PMA.5.3

TESTING ON SITE

PMA.5.3.1

Completion And Commissioning

On completion of the erection of the installation the Contractor must commission the plant to ensure the plant operation complies with the specification and performance figures tendered.

The testing of the pumps shall be carried out strictly in accordance with BS 599 except insofar as may be amended or amplified by any other condition of this contract. During the testing of the pumping unit, careful records are to be kept of the power consumed, the power factor, the quantity delivered and the head against which the pump operates. The pumping head is to be determined from calibrated pressure gauges on the delivery and suction pipes. The power consumed is to be determined by a calibrated kilowatt hour meter while the power factor is to be recorded by means of a suitable instrument. The quantity delivered is to be measured by displacement in the sump, or other suitable means.

From records kept, the capacity, efficiency and power input for the pumping unit shall be calculated to determine whether these are in compliance with the guaranteed figures submitted by the Contractor at the time of tendering.

An item has been included in the schedule to cover the cost of providing equipment, which must be adequately calibrated and standardised to carry out the test, as well as the cost of all labour necessary to complete the testing of the plant offered.

In the event of the Contractor being unable to test the pumps at the time of its installation through circumstances beyond his control, it may be necessary for him to return to the site at a later date to undertake this work. An item has been provided in the schedule to cover the cost of returning to site, if ordered to do so, in order to carry out the test.

The water and electric power required for the tests will be supplied free of charge by the Employer.

The following electrical tests must be carried out on the installation by the Contractor or a competent person appointed by him:

(a) **Before commissioning**

1. Insulation test;
2. Continuity test;
3. Test for correct direction applied to every motor;
4. Prove the correct connection and rotation of any energy meters;
5. Settings of all overload and other adjustable protective devices shall be set to the requirements of the equipment.

(b) **At commissioning**

1. Motor currents using instruments of which the errors, if any, have been established;
2. Speed of rotation;
3. Control of the equipment;

4. The commissioning results, both mechanical and electrical, must be submitted to the Engineer for scrutiny, before he is called out for the site acceptance testing. Commissioning test reports must be obtained from the Engineer for this purpose.

PMA.5.3.2 Acceptance Testing

On completion of commissioning of the plant, and submission of the test results for evaluation by the Engineer, the Contractor will be required to make suitable arrangements for demonstrating the plant and equipment supplied under this contract in the presence of the Engineer or his representative, to prove they comply with the specification. Any or all of the test results must be demonstrated to the Engineer at his request.

A competent person, fully conversant with all aspects of operation, must be present to carry out the demonstration.

PMA.5.4 RE-INSPECTION

Before the Engineer is called for an inspection to witness any final test or demonstration in the factory or on site, the Contractor must test the equipment himself to ensure that the equipment and performance comply with the specification.

Should the result of such an inspection be that a re-inspection is required at the Engineer's discretion, due to non-compliance by the Contractor, the full cost of this re-inspection will be for the account of the Contractor. Such amounts will be recovered from the Contractor by deduction from any payment certificates due, at ECSA rates.

PMA.5.5 TESTING INSTRUMENTS

The Contractor must provide all test instruments. They must be of a high quality and calibrated yearly by an approved calibration authority. The calibration certificates must be presented on request.

Note that should the plant not be accepted at this acceptance test due to inadequate commissioning, non-compliance with the specification or guaranteed performance figures, requiring a return visit, the full cost of the Engineer and the Contractor for this re-inspection, will be for the account of the Contractor.



STEVE TSHWETE LOCAL MUNICIPALITY

UPGRADING OF THE VAALBANK WATER TREATMENT PLANT

ELECTRICAL MOTOR CONTROL PANELS

ANNEXURE C

DATA SHEETS

DETAILS OF THE PLANT AND EQUIPMENT OFFERED ARE TO BE SUPPLIED ON THE DATA SHEETS AND MUST BE COMPLETED BY THE TENDERER.

IN ADDITION TO THE COMPLETED DATA SHEETS, ADDITIONAL RELEVANT INFORMATION CAN BE SUPPLIED IN A COVERING LETTER ACCOMPANYING THE TENDER DOCUMENTS

DATA SHEET NO. ??: SWITCHBOARD AND SWITCHGEAR

EQUIPMENT	NAME OF MANUFACTURER	PLACE OF MANUFACTURE
TTA Switchboards		
Non-TTA Switchboards		
Circuit breakers		
Non electronic starters		
Electronic starters		
Power Factor Correction		
Contactors & Relays		

SANS 10142 - 1 COMPLIANCE

Tenderers must take particular care in the completion of the section below, since it is a statement of compliance with the OHS Act.

Failure to provide concise and complete information, may seriously compromise the tender offer.

1. The low voltage assembly manufacturer must confirm whether he is in possession of a permit to apply the SABS certification mark in terms of the SANS Specification below and if so, a copy of the relevant permit must be attached to the tender offer (compulsory):

- a) SANS 1973-3 (assemblies \leq 10 kA) : YES : NO
- Is a copy of the permit attached : YES : NO
- b) SANS 60439-3 (assemblies > 10 kA) : YES : NO
- Is a copy of the permit attached : YES : NO

2. State method by which the low voltage assembly manufacturer will comply with:

a) SANS 1973-3:

.....

b) SANS60439-3

.....

.....

What type of assembly is offered in terms of SANS 60439-3?

TTA		PTTA(*)		MTA	
-----	--	---------	--	-----	--

(*): TTA with approved deviations

NOTE: If the manufacturer provides an assembly by a third party permit holder it must be stated under 2(b) and a copy of the permit must be submitted with the tender (compulsory).

The tenderer must further state who will certify the populated switchboard on completion.

.....
SIGNATURE OF TENDERER

.....
DATE

DATA SHEET NO. D1: AUTOMATIC CONTROL EQUIPMENT FOR PUMPS

a) Float level switches

Name of manufacturer

Place of manufacture

Make

Low tension supply to mechanism (Volts)

Further information:

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

b) Ultrasonic level sensor

Name of manufacturer

Place of manufacture

Make

Model number

Further information:

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

c) Flow Switches

Name of manufacturer

Place of manufacture

Make

Model number

Further information:

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

.....
DATE

.....
SIGNATURE OF TENDERER

STEVE TSHWETE LOCAL MUNICIPALITY

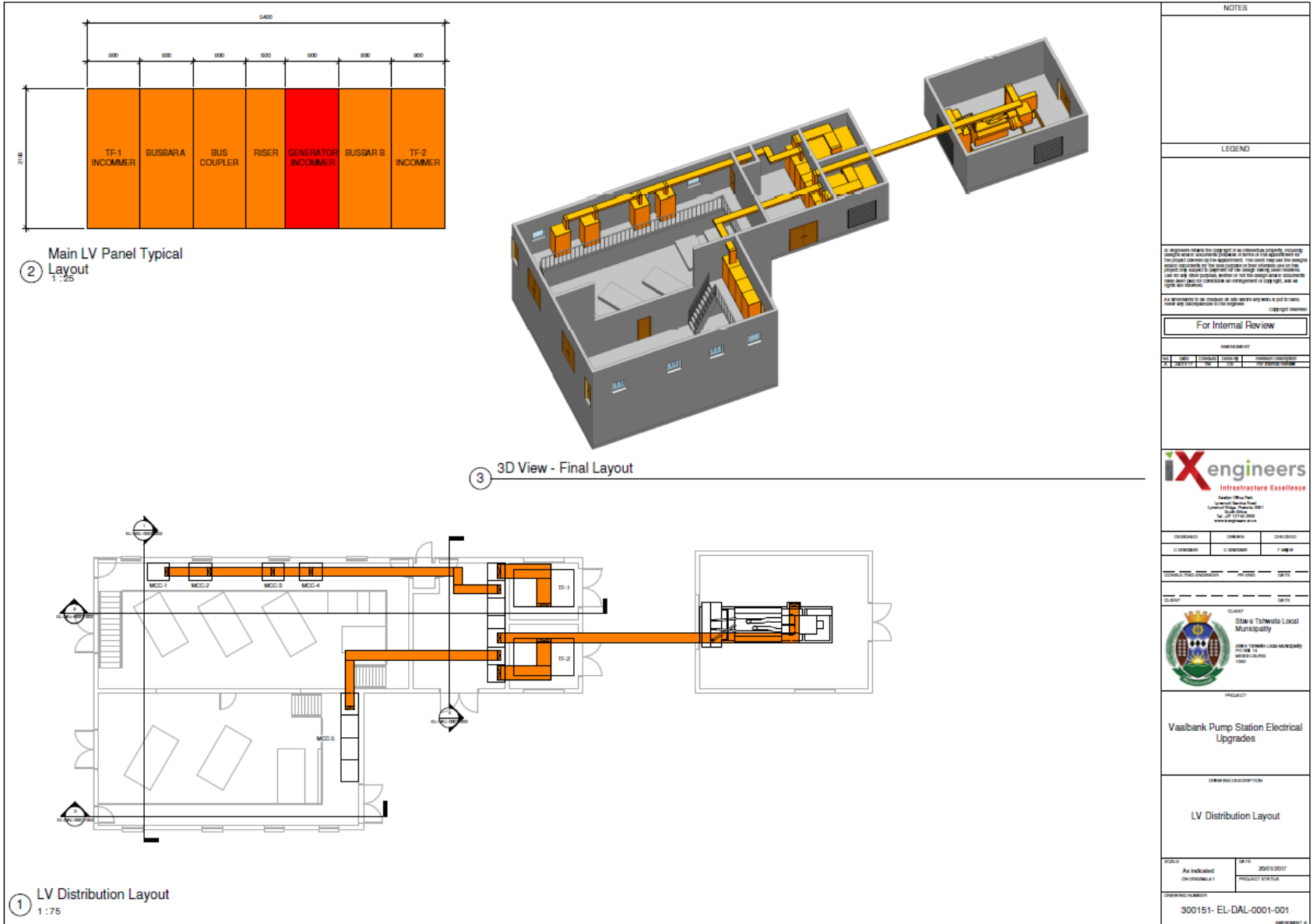
UPGRADING OF THE VAALBANK WATER TREATMENT PLANT



ELECTRICAL MOTOR CONTROL PANELS

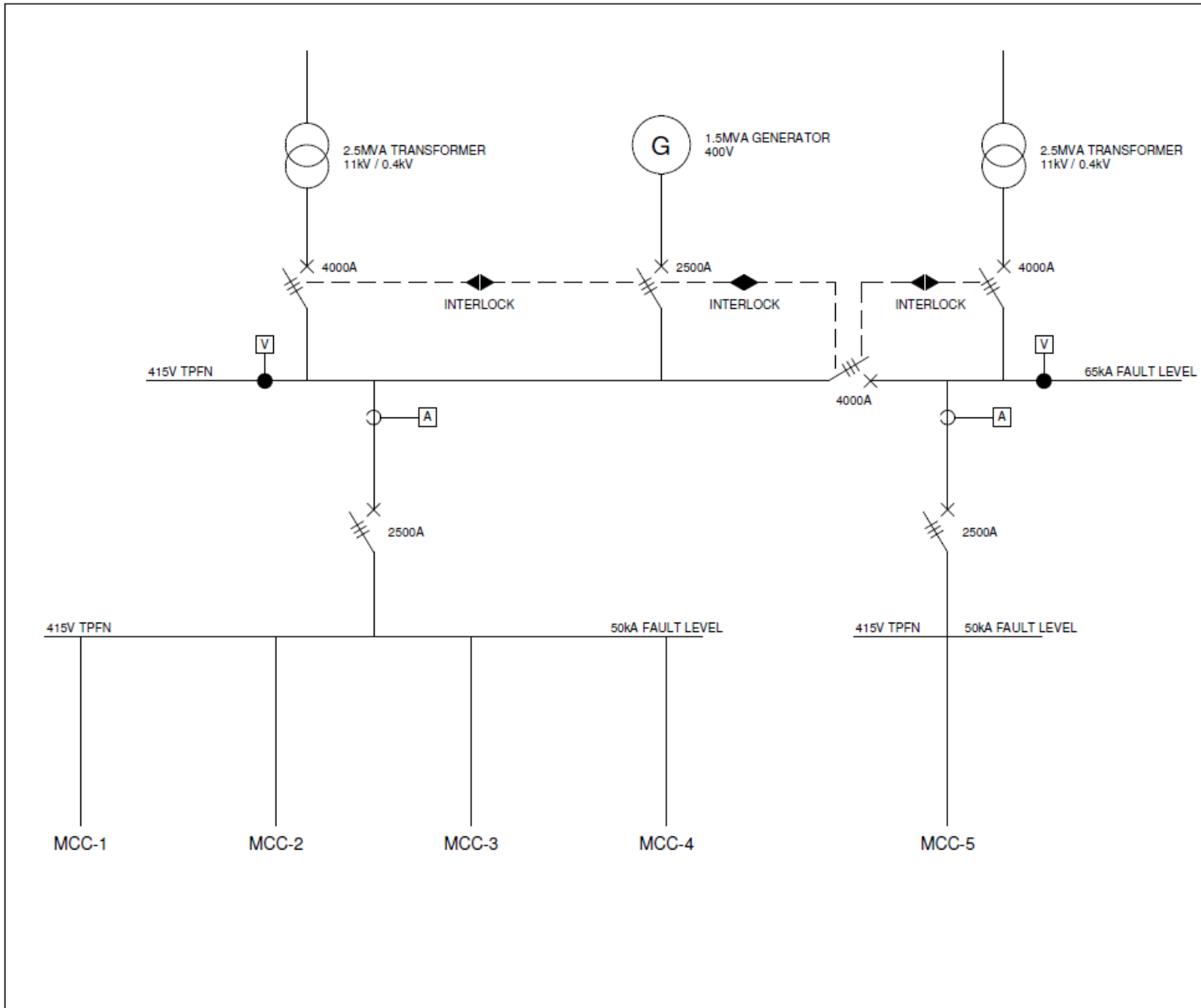
ANNEXURE D

TENDER DRAWINGS

Drawing Number	Description	Status
300151-EL-DAL-0001-001	LV Distribution Layout	Tender
300151-EL-SCH-0001	Main LV Panel Schematic	Tender
300151-EL-SCH-0002	MCC-1 Schematic	Tender
300151-EL-SCH-0003	MCC-2 Schematic	Tender



NOTES											
LEGEND											
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AMENDMENT

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DESIGNED	DRAWN	CHECKED
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CONSULTING ENGINEER _____ PR. ENG. _____ DATE _____

CLIENT _____ DATE _____

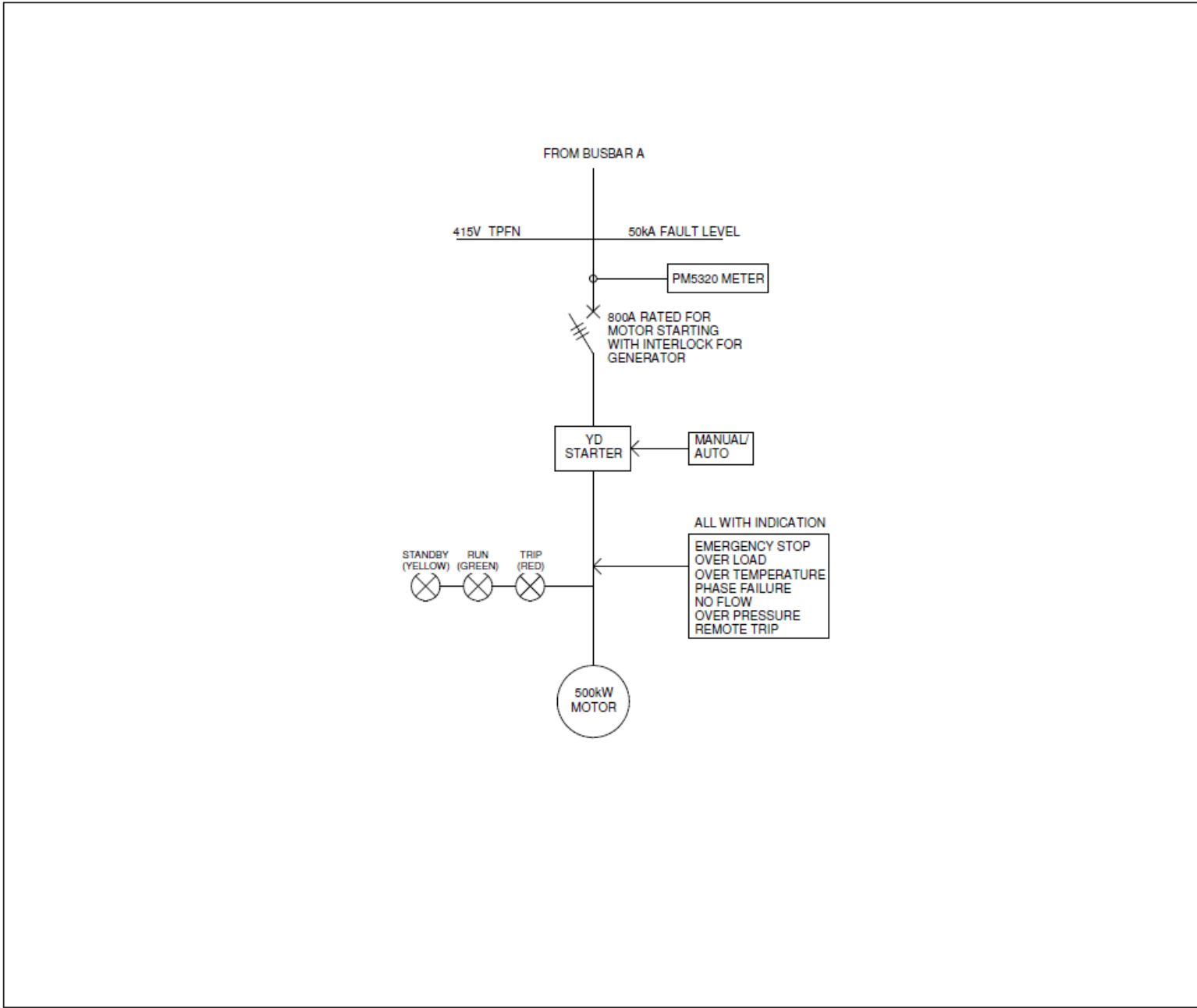


PROJECT
Vaalbank Pump Station Electrical Upgrades

DRAWING DESCRIPTION
Main LV Panel Schematic

SCALE	DATE
1 : 10 ON ORIGINAL A3	20/01/2017 PROJECT STATUS

DRAWING NUMBER
300151- EL-SCH-0001
AMENDMENT A



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AMENDMENT

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A	24/01/17	TM	CB	For Internal Review

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PROJECT

Vaalbank Pump Station
Electrical Upgrades

DRAWING DESCRIPTION

MCC-1 Schematic

SCALE	DATE
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300151- EL-SCH-0002
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