

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT PLANT (ELECTRICAL)

TENDER NO. BDM 2007-027 C2

TENDER DOCUMENT (BOOK 2 OF 2)

CLOSING DATE: 14 MAY 2025 @ 12H00

PREPARED FOR:



THE EMPLOYER

Dr Ruth S. Mompoti District Municipality

34 Church Street, Vryburg, 8600

Tel: 053 – 928 6400

Fax: 053 – 927 2401

PREPARED BY:



THE ENGINEER

Lidwala Consulting Engineers SA (Pty) Ltd

Postnet Suite 328, Private Bag X21, Bryanston, 2021

Tel: 011 543 9252

Fax: 0867 662 829

NAME OF TENDERER	:	
TENDER AMOUNT (INCL VAT)	:	R
TEL & FAX NUMBERS	:	
CENTRAL SUPPLIER DATABASE (CSD) SUPPLIER NO.	:	



DR RUTH S MOMPATI DISTRICT MUNICIPALITY

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS

CONTRACT No. BDM 2007-027C2

CIDB GRADING CLASS 6 EP PE / 6 EB PE or 7 EP / 7 EB or HIGHER

Dr Ruth S Mompoti District Municipality P.O. Box 21 Vryburg 8600 34 Church Street Vryburg 8600 Contact: Procurement: Mr. Setlogeleng Malekanyo Telephone (053) 928 6400 Technical: Mr. Evans Matope Telephone 053 928 6400,	Lidwala Consulting Engineers Postnet Suite #328 Private Bag X21 Bryanston 2021 Unit 18 Corner Main Office Park 2 Payne Road Bryanston 2191 Contact: Name: Mr. Busiso Nyoni Telephone (0861) 543 9252 Email bnyoni@lidwala.com
APRIL 2025	
Tenderer	
Total of the prices inclusive of value added tax: R	
Preferences claimed for: (tick relevant boxes) ☐ B-BBEE Status Level Contributor	

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS

BDM 2007-027C2

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The Contract

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C4	Site Information



**DR RUTH S MOMPATI DISTRICT MUNICIPALITY
CONTRACT NO: BDM 2007-027C2**

**UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL
WORKS
FOR DR RUTH S MOMPATI DISTRICT MUNICIPALITY**

Dr Ruth S Mompoti District Municipality invites tenders for the Upgrading and extension of the Bloemhof Water Treatment Works.

The Contract comprises the construction of Bloemhof Water Treatment Works - Electrical Works. The prospective bidders with CIDB grading of 6 EP PE / 6 EB PE or 7 EP / 7 EB or higher are hereby invited to bid for the electrical works.

Bid document must be placed in a sealed envelope marked "**BDM 2007-027C2 UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS**" and deposited in the council tender box, at Dr Ruth S Mompoti District Municipality offices, 34 Church Street on or before closing date and time. A compulsory site inspection will take place on the 14 April 2025 @ 11:00. at the Bloemhof Water Treatment Works (Magalies Water) at R34 Coordinates: -27.650807, 25.596009

Technical enquiries must be directed to the following representative;

Procurement Enquiries	:	Mr Setlogeleng Malekanyo (083) 582 7583
Technical Enquiries	:	Mr Evans Matope (079) 700 3222
		Mr Andrew Maherry (072) 117 9601

Visit our website: www.drmsmdm.gov.za
Closing Date and Time: 14 May 2025..at 12h00

Bid documents, containing details of requirements and conditions, are obtainable from Dr Ruth S Mompoti District Municipality offices at 34 Church Street, Tel: 053 928 6400, Finance department (office hours: Monday to Friday 07h30 to 13h45 to 16h15) from 08h00 on Monday, 07 April 2025 also downloadable on Etender Portal, after payment of R1500.00...non-refundable tender document fee, The bid document will also be available at the compulsory site inspection.

All bids shall be valid for a period of 120 days from the closing from the closing of the bid.

Council reserves the right to accept any tender or part(s) therefore or not to accept any tender at the Council's discretion, the lowest or any tender shall not necessarily be accepted.

It is anticipated that tender adjudication will be based on a 80/20 preferential points system.

The tender must be in accordance with the tender specifications.

Municipal Manager:
DR RUTH S MOMPATI DISTRICT MUNICIPALITY
P.O Box 21; VRYBURG;
8600

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

**UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS;
ELECTRICAL WORKS**

CONTRACT NO: BDM 2007-027C2

CONTRACT SUMMARY PAGE

NAME OF CONTRACTOR : _____

DETAILS OF CONTACT PERSON :

NAME : _____

TELEPHONE NUMBER : _____

FAX NUMBER : _____

ADDRESS OF CONTRACTOR : _____

VAT REGISTRATION NUMBER : _____

CONTRACT PRICE : **R**
(VAT and Contingencies Included)

CONSTRUCTION PERIOD : **7 Months**
(Measured from Date of Site Hand Over*)

**DATE OF SIGNING
OF CONTRACT :** _____

CONTRACTORS SIGNATURE : _____

- **Note : The Contract Period in terms of Clause 1.1.1.14 of GCC 2010 is calculated by adding 35 calendar days to the Construction period offered**

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

**UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS;
ELECTRICAL WORKS**

BDM 2007-027C2

C1.1 Form of Offer and Acceptance

A. Offer

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

CONTRACT NO. BDM2007-027C2: UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS

The Contractor, identified in the Offer signature block, has examined the documents contained in this contract accepts the Conditions of this Contract.

By the representative of the Contractor, deemed to be duly authorized, signing this part of this form of offer and acceptance, the Contractor offers to perform all the obligations and liabilities of the Contractor under the Contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the Conditions of Contract identified in the Contract data.

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

R _____ **(VAT Incl) (IN WORDS);):**

.....

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

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

Date

Name : *(of signatory in capitals):*

Capacity:*(of Signatory)*

for the Tenderer

(organization)

Address:*(organization)*

Telephone number: Fax number:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

1. **Witness:** _____

Signature: _____

Name:
(*in capitals*): _____

Date: _____

2. **Witness:** _____

Signature: _____

Name:
(*in capitals*): _____

Date: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

B. Acceptance

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

The terms of the Contract, are contained in:

Tender T1 incorporating;

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

and drawings and documents or parts thereof, which may be incorporated by reference into Parts 1 to 4 and returnables T2 schedule above.

Deviations from and amendments to the documents listed in the Contract data and any addenda thereto as listed in the Contract Schedules as well as any changes to the terms of the Offer agreed by the Contractor and the Employer during this process of Offer and Acceptance, are contained in the Schedule of Deviations attached to and forming part of this Agreement. No amendments to or deviations from said documents are valid unless contained in this Schedule, which must be duly signed by the authorized representatives of both parties.

The Contractor shall deliver the Guarantee in terms of Clause 6.2 of the General Conditions of Contract 2010 within the period stated in the Contract Data, and he shall immediately after receiving a completed copy of this Agreement, including the Schedule of deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the Conditions of Contract identified in the Contract Data. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this Agreement.

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

Signature: Name:

Capacity : Date:

Name of the Employer Dr Ruth S Mompati District Municipality
34 Church Street, Vryburg, 8600

Witness : Date

Signature: Name:.....

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

Schedule of Deviations

Notes:

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

1 Subject

Details

2 Subject

Details

3 Subject

Details

4 Subject

Details

5 Subject

Details

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

By the duly authorized representatives signing this Agreement, the Employer and the Contractor agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to the documents listed in the Contract data and addenda thereto as listed in the Contract Schedules, as well as any confirmation, clarification or changes to the terms of the offer agreed by the tenderer and the employer during this process of Offer and Acceptance.

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

For the Contractor:		For the Employer:
.....	Signature	.....
.....	Name	.....
.....	Capacity	.....
Name and address of organisation:		Name and address of organisation:
.....		
.....		
.....		
.....		
.....	Witness Signature	.....
.....	Witness Name	.....
.....	Date	.....

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Confirmation of Receipt

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

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

For the Contractor:

.....
Signature

.....
Name

.....
Capacity

Signature and name of witness:

.....
Signature

.....
Name

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS

BDM 2007-027C2

C1.2 Contract Data

The General Conditions of Contract for Construction Works (2010) published by the South African Institution of Civil Engineering, is applicable to this contract. Copies of these conditions of contract may be obtained from the South African Institution of Civil Engineering (tel. no 011-805 5947).

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

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

The additional clauses to the General Conditions of Contract are:

5.12 Extensions of time in respect of clause 5.12 in respect of abnormal rainfall shall be calculated using the following formula for each calendar month or part thereof:

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

Where:

V = Extension of time in calendar days in respect of the calendar month under consideration.

Nw = Actual number of days during the calendar month on which a rainfall of 10 mm or more has been recorded.

Nn = Average number of days in the relevant calendar month, as derived from existing rainfall records, as stated in the Site Information, on which a rainfall of 10mm or more has been recorded for the calendar month.

Rw = Actual average rainfall in mm recorded for the calendar month under consideration.

Rn = Average rainfall in mm for the calendar month as derived from existing rainfall records as stated in the Site Information.

For purposes of the Contract Nn, Rn, X and Y shall have those values assigned to them in the Appendix and/or the Specification.

If V is negative and its absolute value exceeds Nn, then V shall be taken as equal to minus Nn.

The total extension of time shall be the algebraic sum of all monthly totals for the period under consideration, but if the total is negative the time for completion shall not be reduced due to subnormal rainfall.

Extensions of time for part of a month shall be calculated using pro rata values of Nn and Rn.

This formula does not take account flood damage which could cause further or concurrent delays and will be treated separately as far as extension of time is concerned.

The factor (Nw – Nn) shall be considered to represent a fair allowance for variations from the average in the number of days during which rainfall exceeds 10 mm. The factor (Rw-Rn) shall be considered to represent a fair allowance for variations from the average in the number of days during which the rainfall did not exceed 10 mm but wet conditions prevented or disrupted work.

For the purpose of applying the formula, accurate rain gauging shall be taken at a suitable point on the Site and the Contractor shall at his own expense, take all necessary precautions to ensure that rain gauges cannot be interfered with by unauthorized persons.

Table 5.12/1: Rainfall records for Bloemhof

MONTH	AVERAGE RAINFALL (mm)	AVERAGE RAIN DAYS (per month)	(n) DELAY DAYS RAIN (per month)	(n) DELAY DAYS OTHER (per month)
JANUARY	86.8	10.4	8	
FEBRUARY	79.4	9.7	5	
MARCH	71.6	9.5	5	
APRIL	46.5	5.8	1	
MAY	18.6	2.2	-	1
JUNE	7.3	1.5	-	2
JULY	4.7	0.9	-	2
AUGUST	5.7	1.5	-	2
SEPTEMBER	11.7	3.2	-	1
OCTOBER	37.5	7.2	2	
NOVEMBER	54.7	8.1	4	
DECEMBER	63.7	9.1	5	
TOTAL	488.2			

C.1.2.1 Local Economic Participation

Additional The Contractor shall procure local goods, services and labour in order to stimulate local economic development in terms of the requirement of the Local Economic Participation Specifications included under section T2.2.18 (Form R). The total of 30% of the Contract Sum (excluding Preliminary and General Items) to a local goods, services and labour.

C.1.2.2 Sub-contractors

The Contractor shall appoint such authorities and/or specialist sub-contractors and suppliers as may be designated or nominated by the Employer or the Engineer for those portions of the Works specified in the Scope of Works.

As required by the Conditions of Contract, the Contractor shall be responsible for all work carried out by sub-contractors (whether nominated by the Employer or selected by the Contractor) on his behalf. The Engineer will not liaise directly with any such sub-contractor, nor will he become involved in any problems and/or disputes related to payments, programming, workmanship, etc., unless provided for in the Conditions of Contract. Such problems and/or disputes shall remain the sole concern of the Contractor and his sub-contractors.

No additional management fee will be payable to the Contractor for works executed by the sub-contractor(s).

Notwithstanding other requirements of the Contract, the Contractor shall not sub-contract any part of the Contract without prior consent of the Engineer, which consent shall not be unreasonable withheld.

Any consent granted by the Engineer for the appointment of any sub-contractor shall not imply a contract between the Employer and the sub-contractor, or a responsibility or liability on the part of the Employer to the sub-contractor and shall not imply a contract between the Engineer and the sub-contractor, or a responsibility or liability on the part of the Engineer to the sub-contractor and shall not relieve the Contractor from any liability under the Contract and the Contractor shall be liable for the acts, defaults and neglects of any sub-contractor, his agents or employees as fully as if they were the acts, defaults or neglects of the Contractor, his agents or employees.

C1.2.3 Contractor's Personnel

The Contractor shall limit the utilisation of his permanently employed personnel to that of key personnel only on the Works, as defined below, and shall execute and complete the Works utilising a temporary workforce employed directly by the Contractor and/or by his sub-contractors, using the assistance of the Labour Desk(s), from the various communities that are established in proximity to the Works or which will be consumers from the Scheme.

Without derogating from the Contractor's obligations to complete the Works within the specified time for completion in terms of the General Conditions of Contract, the numbers in each category of the Contractor's key personnel, as stated by the Contractor in the Returnable Schedules, will be strictly controlled during the contract period and any increase in numbers will be subject to the prior approval of the Employer.

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

The Engineer may at his discretion, upon receipt of a written and fully motivated application from the Contractor, and where he deems the circumstances so warrant, authorise in writing that the Contractor may utilise in the execution of the Works, workers not being his key personnel but who are in his permanent employment. Without limiting the generality of application of this sub-clause, circumstances which may be considered by the Engineer to

warrant authorization of the use of the Contractor's permanent employees other than key personnel, include:

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

C1.2.4 Temporary Workforce

The Contractor shall employ labour from the local communities through the Labour Desk(s). Accordingly, the workforce that is employed on Site shall consist of local residents, except for approved key staff in the permanent employ of the Contractor, to the maximum extent that is compatible with the requirements of Clause C1.2.1.

With the assistance of the Infrastructure Portfolio Committee of the Lekwa-Teemane Local Municipality and local ward committees, and a Project Steering Committee (PSC) will be established. The PSC will appointment a Community Liaison Officer (CLO) that will be employed by the Contractor for the duration of the Contract.

The CLO will assist the Contractor with local labour issues, including employment conditions, remuneration, performance monitoring, etc.

The PSC shall assist in identifying available local labour and, where available, semi-skilled labour as well as local sub-contractors. The PSC shall also assist and advise regarding conditions of employment, minimum wages, disputes and disciplinary procedures. The function of the PSC shall however in no way diminish the responsibilities of the Contractor in terms of the Conditions of Contract.

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

A contract of employment or subcontract shall be signed between the Contractor and each of his employees and sub-contractors. Likewise, contracts of employment must be entered into between each such sub-contractor and each of the specific sub-contractor's employees.

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

Contracts of employment or sub-contracts should provide for the following basic conditions:

- a) The minimum wage payable will be determined in terms of latest applicable (at the time of tendering) legislation and shall, as a minimum, adhere to section 56(1) of the Basic Conditions of Employment Act (Act 75 of 1997), Sectorial Determination 2: Civil Engineering Sector as published by the Department of Labour.
- b) The Contractor shall adhere to the provisions for payment method and intervals, overtime and pay for work on Sundays and public holidays (if required) in the Basic Conditions of Employment Act (Act 75 of 1997).
- c) The Contractor shall register all labourers employed on the Contract with the Workmen's Compensation Commissioner and the Unemployment Insurance Fund, as applicable. The Contractor shall obtain the Unemployment Insurance Fund and Workmen's Compensation registration cards.
- d) Workers shall be entitled to one (1) day sick leave with full pay per month worked. This will accumulate if the leave is not used.
- e) Annual leave shall be calculated as published in terms of (the latest edition of) section 56(1) of the Basic Conditions of Employment Act (Act 75 of 1997), Sectorial Determination 2: Civil Engineering Sector as published by the Department of Labour.
- f) Upon termination of the Contract, each locally employed labourer shall be entitled to receive his/her Unemployment Insurance Fund and the Workmen's Compensation registration cards as well as a Certificate of Employment from the Contractor clearly stating the following:
 - i) The type of work done.
 - ii) The duration of employment.
 - iii) The number of days absent from work.
 - iv) The Contractor's general impression of the quality of work done.
- g) The Occupational Health and Safety Act must be adhered to with reference to the safety of all employees employed by the Contractor. Suitable safety equipment and clothing shall be issued and maintained by the Contractor for the duration of construction.
- h) Contractor's company policy regarding:
 - i) Inclement weather
 - ii) Sickness and absence
 - iii) Disciplinary matters
 - iv) Grievances

Should any of the above conditions be less favourable than any bargaining council agreement or Act applicable to the Contractor, the more favourable condition shall apply.

C1.2.5 Labour Intensive Construction

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

Appropriate portions of the Works included in the Contract shall be executed using labour intensive construction methods. These portions of the Works shall be constructed utilising only locally employed labour and/or the labour of local sub-contractors, supplemented to the extent necessary and unavoidable by the Contractors key personnel as provided for in clause C1.2.1, unless otherwise instructed by the Engineer. The portions of the Works to be executed using labour intensive construction methods are:

- bedding, selected fill and compaction of all cable trenches irrespective of depth, but assisted by mechanical compaction equipment in order to achieve the specified densities;
- construction of all manholes, but excluding the mixing of concrete and transporting of same to the point of pouring;
- dismantling and re-erection of fences; and
- cleaning and tidying of the Site.

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

Part 1: Contract Data completed by the Employer

Clause

- 1.1.1.13 The Defects Liability Period is 12 months.
- 1.1.1.14 The time for achieving Practical Completion is **7 months**.
- 1.1.1.15 The name of the Employer is the **Dr Ruth S Mompoti District Municipality**
- 1.1.1.26 The pricing strategy is by re-measurement Contract.
- 1.2.1.2 **The address of the Employer is:**
Telephone: 053 928 6400
Facsimile: 053 927 2401
Address (physical): Dr Ruth S Mompoti District Municipality, 34 Church Street, Vryburg, 8601
Address (postal): PO Box 21, Vryburg, 8600
- 1.1.16 The name of the Engineer is **Lidwala Consulting Engineers (SA) (Pty) Ltd**
- 1.2.1.2 The address of the Engineer is:
Telephone: 0861 543 9252 / (0861) LIDWALA
Email: info@lidwala.com
Address (physical): Unit 18, 1st Floor
Corner Main Office Park
2 Payne Road
Bryanston
Address (postal): Postnet Suite 328
Private Bag X 21
2012
- 3.1.3 The Engineer is required to obtain the specific approval of the Employer before executing any of the following: The Engineer requires the Clients approval in order to authorize any expenditure in excess of the tender sum excluding contingencies as per Clause 6.4.
- 5.3.1 The following documentation is to be provided by the Contractor before commencement of the works:
- Health and Safety Plan as per Clause 4.3
 - Initial Programme as per Clause 5.6
 - Security as per Clause 6.2.1
 - Insurance as per Clause 8.6
 - Quality Assurance Plan as per Clause B1205 (Standard Specifications)
- 5.3.2 The time to submit the documentation required before commencement with Works execution is 28 days.
- 5.8.1 Non-working days are Sundays.
- Special Non-working days are the following statutory public holidays as declared by National or Regional Government:
- New Year's Day, Human Rights Day, Good Friday, Family Day, Freedom Day, Workers day, Election Day, Youth Day, National Women's Day, Heritage Day, Day of Reconciliation, Christmas Day and the Day of Goodwill including the construction industry year-end break.

The year-end break commences on the first working day after 18 December and ends on the first working day after 3 January of the next year.

- 5.13.1 The penalty for failing to complete the Works within the stipulated Time for Practical Completion shall be 0.5% of Contract Value per work week (6 days).
- 5.14.1 Practical completion will be considered when all pipe works have been completed, tested and backfilled. All road/rail crossings and accesses are back to original conditions before construction. The pipeline is operational.
- 5.16.3 The latent defect period is 10 years.
- 6.5.1.2.3 The percentage allowance to cover overhead charges is max. 15%.
- 6.8.2 Contract Price Adjustment will be applicable for this contract.
- 6.8.3 No price adjustment for variations in the cost of special materials will be applicable for this contract.
- 6.10.3 The percentage retention on amounts due to the Contractor is 10 %. The limit on retention is 10 % of the Contract Price.

A Retention Money Guarantee is NOT permitted.
- 6.10.1.5 The percentage advance on materials not yet built into the Permanent Works is 80% on material paid by the contractor at the purchase cost, but not more than 80% of the tender amount as per clause 6.10.2.
- 8.2.2 The safekeeping of all material paid as material on site not yet built into the works remains the responsibility of the contractor, although ownership rest with the client as per clause 6.10.1.5.
- 8.6.1.1.2 The value of the materials supplied by the Employer to be included in the insurance sum is R0-00
- 8.6.1.1.3 The amount to cover professional fees for repair or reinstatement of damage to the works to be included in the insurance sum is R 300 000-00
- 8.6.1.3 The limit of liability insurance is R 5 000 000 per claim.
- 8.6.1.5 No additional insurance is required.
- 10.5.2 Dispute resolution is to be by means of ad-hoc adjudication.
- 10.5.3 The number of ad-hoc adjudication board members is one.
- 10.7.1 Disputes are to be referred for final settlement to arbitration.

Part 2: Data provided by the Contractor

Clause

1.1.1.9 The name of the Contractor is.

1.2.1.2 The address of the contractor is:

Contact Person:

Telephone:

Facsimile:

Email:

Address (physical):

.....

.....

Address (postal):

.....

.....

6.2.1 The Security to be provided by the Contractor shall be

- Performance Guarantee of 10% of the Contract Sum. And;
- Retention of 10% of the Value of the Works.

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

**UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS;
ELECTRICAL WORKS**

BDM 2007-027C2

C1.3 Performance Guarantee

For use with the General Conditions of Contract for Construction Works, Second Edition, 2010.

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means:

Physical Address:

"Employer" means:

"Contractor" means:

"Engineer" means:

"Works" means:

"Site" means:

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

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

Amount in words: R

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

Amount in words:

"Expiry Date" means: The date on which the Certificate of Completion has been issued.

CONTRACT DETAILS

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

PERFORMANCE GUARANTEE

1. The Guarantor's liability shall be limited to the amount of the Guaranteed Sum.
2. The Guarantor's period of liability shall be from and including the date of issue of this Performance Guarantee and up to and including the Expiry Date or the date of issue by the Engineer of the Certificate of Completion of the Works or the date of payment in full of the guaranteed sum, whichever occurs first. The Engineer and/or the Employer shall advise the Guarantor in writing of the date on which the Certificate of Completion of the Works has been issued.
3. The Guarantor hereby acknowledges that:
 - 3.1. any reference in this Performance Guarantee to the Contract is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory or any intention whatsoever to create a suretyship;
 - 3.2. its obligation under this Performance Guarantee is restricted to the payment of money.
4. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 4.1 to 4.3:
 - 4.1 A copy of a first written demand issued by the Employer to the Contractor stating that the payment of a sum certified by Engineer in an Interim Payment Certificate has not been made of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon Guarantor to make payment in terms 4.2;
 - 4.2 A first written demand issued by the employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 4.1 and the sum certified has not still been paid.
 - 4.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 4.
5. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor undertakes to pay to the employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:
 - 5.1. the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or
 - 5.2. a provisional or final sequestration or liquidation court order has been granted against the Contractor and that the Performance Guarantee is called upon in terms of 5; and
 - 5.3. the aforesaid written demand is accompanied by a copy of the notice of termination and/or the provision/final sequestration and/or the provisional liquidation court order.
6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.
7. Where the Guarantor has made payment in terms of 5, the Employer shall upon date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus.

All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.

8. Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand tot the Guarantor.
9. Payment by the Guarantor in terms of 4 or 5 will only be made against the return of the original Performance Guarantee by the Employer.
10. The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may deem fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.
11. The Guarantor chooses the physical address as stated above for the service of all notice for all purposes in connection herewith.
12. This Performance Guarantee in neither negotiable nor transferable and shall expire in terms of 2, where after no claims will be considered by the Guarantor. The original of this Guarantee shall be returned to the Guarantor after it has expired.
13. This Performance Guarantee, with the required demand notices in terms of 4 or 5, shall be regarded as a liquid document for the purposes of obtaining a court order.
14. Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's Courts Acts No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

Signed at

Date.....

Guarantor's signatory (1)

Capacity

Guarantor's signatory (2).....

Capacity.....

Witness signatory (1)

Witness signatory (2).....

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

**UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS;
ELECTRICAL WORKS**

BDM 2007-027C2

C1.4 SAFETY AGREEMENT

MEMORANDUM OF AGREEMENT CONCLUDED BY AND BETWEEN:

**DR RUTH S MOMPATI DISTRICT MUNICIPALITY
(HEREINAFTER REFERRED TO AS THE MUNICIPALITY)**

herein represented by _____

in his capacity as _____

of the Municipality, he being duly authorised thereto

and

(hereinafter referred to as the Mandatory)

herein represented by _____

in his capacity as _____

of the Mandatory, he is being duly authorised thereto

WHEREAS:

1. The Municipality and the mandatory entered into a written, alternatively oral agreement on the.....Day of 20..... in terms of which the Mandatory undertook to carry out the following work for the Municipality , viz. (give a short description of the type of contract work to be done as well as the address where work will be done)

(The said contract work is hereinafter referred to as the **Work**)

2. The Occupational Health and Safety Act, Act 85 of 1993 as amended (hereinafter referred to as **the Act**) contains amongst others certain provisions with regard to the health and safety of people at work and in connection with the usage of plant and machinery, as well as the protection of other persons than persons at work against hazards to health and safety that originates from or in connection with the activities of persons at work.
3. Section 37(2) of the Act makes provision for the exclusion by the parties, by way of a written agreement, of supposition and accompanying liability of the Municipality as stipulated in section 37(1) of the Act.
4. The parties have reached consensus with regard to the terms and conditions to which they agree in terms of the provisions of section 37(2) of the Act.

NOW THEREFORE THE PARTIES AGREE AS FOLLOWS

1. WRITTEN AGREEMENT

The parties herewith agree in terms of section 37(2) of the Act on the arrangements and procedures that must be followed to ensure compliance with the provisions of the Act by the Mandatory.

2. ACKNOWLEDGEMENT BY THE MANDATORY

The mandatory acknowledge herewith that he is fully acquainted with the contents of the Act, as well as with all regulations and SABS codes of practice that have been made in terms of section 43 of the Act.

3. UNDERTAKING BY MANDATORY

- (a) The Mandatory hereby undertakes and binds himself to the Municipality to ensure prompt and strict compliance with the provisions of the Act and the said regulations as well as with the provisions included in this Safety Agreement at all times during the execution of the Works
- (b) It is hereby recorded that the provisions of this Safety Agreement as set out hereinafter are in no way intended to restrict the duties of the Mandatory, nor to exempt the Mandatory from his obligation in accordance with the Act and the said regulations

4. PERSONAL PROTECTIVE EQUIPMENT

- (a) It is compulsory to wear equipment for eye protection when working in an eye protection zone or where the Work requires eye protection.
- (b) It is compulsory to wear safety helmets when working in a safety helmet zone or where the Work requires safety helmets.
- (c) It is compulsory to wear hearing protection when working in a noise zone or where the Work requires hearing protection.
- (d) The wearing of other protective clothing and equipment as prescribed by the Occupational Health and Safety Officer of Nelspruit Municipality is compulsory.
- (e) The Mandatory shall ensure that the statutory requirements are complied with at all times.

5. FENCING AND GENERAL MACHINERY PROTECTION

No shield or fencing may be removed from or be moved at any machinery or installation without written permission.

6. SCAFFOLDING, LADDERS, TOOLS, ET CETERA

The Mandatory without the written permission of the Municipality may use no equipment or tools that belong to the Municipality.

Except where agreed beforehand the Mandatory shall provide enough tools and equipment to enable him to complete the Works and the Mandatory shall provide all storerooms, offices and eating halls that he may need. The Mandatory will be responsible for all his material on site.

In special case where the Municipality may lend equipment, tools, or materials to the Mandatory, the Mandatory will use such equipment, tools and/or materials at his own risk and the Mandatory herewith indemnifies the Municipality against any liability of whichever nature or from any cause whatsoever, whether direct or indirect, that may arise from such usage.

7. SERVICES AND WORKING METHODS

The written permission of the Chief Executive/Town Clerk of the Municipality shall be obtained where any work which must be undertaken by the Mandatory is connected with a working process or machinery or any other service in connection therewith, or may possibly affect it, before he commences with such work.

Approval shall be obtained from the City Electrical Engineer of the Municipality before any equipment is connected to the electrical supply of the Municipality. All equipment shall be isolated before any equipment is connected to the electrical supply of the Municipality. It shall be isolated and be provided with earth leakage protection. Electrical machinery, portable electrical tools, and portable lights must comply with the requirements of the applicable regulations.

Work permits must be issued in terms of the Occupational Health and Safety Act and Regulations when the nature of the work requires it. Permits must be issued by the relevant departmental head where necessary.

8. EXCAVATIONS

Written permission for excavations shall be obtained from the City Engineer of the Municipality and the Mandatory shall make sure of the existence and position of electrical cables, discharge pipes, gas lines, water conduits, et cetera before he commences with any excavation work.

All excavations and obstructions and/or any openings in platforms or floors shall be enclosed in a safe way and warning notices shall be erected to ensure absolute safety. An adequate number of red or orange caution lights shall be provided when it is dark or should bad light prevail.

The area surrounding excavations shall be kept in a safe, orderly, and tidy condition. No loose material of whatever nature may be left in walkways or workplaces or be allowed to block walkways or workplaces.

Nobody may enter into any restricted area in which hazardous fumes or a shortage of oxygen exists without a permit giving permission to do so, issued by the head of the relevant department of the Municipality and until it has been certified safe for entrance by the Occupational Health and Safety Officer and the Health Inspector of the Municipality.

9. RESTRICTION TO WORKPLACE

Employees of the Mandatory shall be restricted to their workplaces except when they have to leave their area for work purposes or when they visit toilets.

10. SUBCONTRACTORS

The Mandatory shall ensure that all subcontractors receive a copy of this safety agreement and must ensure they comply with it.

11. OCCUPATIONAL HEALTH AND SAFETY OFFICER AND THE REPORTING OF ALL ACCIDENTS

The Occupational Health and Safety Officer of the Municipality is available for consultation and he will make periodical visits to the workplace of the Mandatory. Any hazardous occurrence or incident to the employees of the Mandatory that results in absence from work for a period longer than three days shall be reported in writing to the Occupational Health and Safety Officer of the Municipality within forty-eight hours as well as to the Department of Labour as specified by the Act. Every user, employer, occupier, builder, or excavator must, under this Act, keep record of all accidents that occur.

In the case of an accident that results in loss of life, nobody may disturb the scene of the accident or any articles involved in the accident prior to the arrival of the Occupational Health and Safety Officer and the Inspector, unless it is to prevent another accident from happening or the prevention of loss of life or to remove corpses.

The Occupational Health and Safety Officer will issue contravention notices to the Mandatory or a sub-contractor when there is a non-compliance and will specify the time in which it must be rectified.

The Occupational Health and Safety Officer will issue work stop notices to the Mandatory or sub-contractor whenever he is of the opinion that the health and safety of any person at work is threatened or that the contravention notices are not adhered to.

12. FIRST AID

Where five or more persons are employed at a workplace, the Mandatory shall provide and maintain an adequately equipped first-aid box that meets the following requirements.

- (a) Every first-aid box shall contain the minimum contents as prescribed by the Occupational Health and Safety Act.
- (b) Nothing except articles and equipment required for first-aid purposes may be kept in the first-aid box.
- (c) Each first-aid box shall be kept in a place readily accessible in case of an accident.

All first-aid boxes shall be placed under control of a responsible person except where five or less persons are at work. The responsible person must be in the possession of a valid first-aid certificate issued by one of the following organisations:

- A South-African Red Cross Society
- B St. John's Ambulance Foundation
- C South-African First-Aid League

A notice indicating where the first-aid box is kept as well as the name of the person in charge, shall be affixed in a conspicuous place. The first-aid facilities of the Municipality may be used during emergencies.

13. FIRE PREVENTION MEASURES AND STORAGE OF FLAMMABLE MATERIAL

The Fire department of the Municipality shall be notified before any welding, oxyacetylene welding, cutting, burning of paint or tar from floors or roofs is undertaken so that the necessary fire prevention measures can be arranged. All "NO SMOKING AND OPEN SURFACE FIRES/LIGHTS PROHIBITED" notices shall be adhered to. The Mandatory and his senior employee shall acquaint themselves and their fellow workers with the fire prevention measures of the Municipality, which will also include fire alarm notices and exits in case of fire, and they shall ensure that these rules are strictly complied with.

14. COMPLETION OF WORK

Before the mandatory or his sub-contractors leaves the site, they shall inform the Head of the relevant Department of the Municipality and obtain his/her written approval that the work has been completed satisfactory and that the site of the work is left in a good condition.

15. SALVAGED MATERIAL AND EQUIPMENT

Any building demolished or equipment or materials that are salvaged whilst carrying out the work shall remain the property of the Municipality, unless the contract specifically provides otherwise.

16. BREAKING OF THESE RULES AND POOR CONDUCT

The Mandatory is warned that no behaviour that causes danger to their own employees, to the employees of the Municipality or general public will be tolerated. The Occupational Health and Safety Officer of the Municipality reserves the right of the withdrawal of any employees of the Mandatory or Municipality from the premises in the case of any default or breach of the agreement and to order that the completion of the work be stayed, pending compliance with this agreement; alternatively to cancel the agreement referred to in par.2 in which event the Municipality will be entitled to appoint an alternative contractor to complete the work and recover the costs thereof from the mandatory, without prejudice to any alternative or additional right or action or remedy to the Municipality, to recover from the mandatory damages for the default or breach and the cancellation.

The senior employees of the Mandatory shall sign a note of acknowledgement of this safety agreement to certify that they have received the regulations as included herein and that they understand the regulations

17. INTOXICATION

Nobody that is in a state of intoxication or that is in any other condition that causes or may cause his/her incapability to control him/herself or persons under his control may and shall not be permitted on the premises of the Municipality. The Occupational Health and Safety Officer of the Municipality reserves the right to the withdrawal of any employees of the Mandatory or Municipality from the premises in the case of any transgression of this nature.

18. CONFIDENTIALLY

The Mandatory shall at all times treat data and information that have been made known to him or that he requires in connection with his work from the Municipality as confidential and he may not make unauthorized use thereof. He must also ensure that such data and information are not communicated to anybody else that is not an employee of the Mandatory without obtaining prior written approval from the Municipality and he must further ensure that such persons do in fact know that the said information is confidential and that they are obliged to treat it as such.

The Mandatory shall provide for adequate physical protection for any confidential documents, sketches, et cetera that he receives from the Municipality in connection with the work as well as for any copies thereof that he makes. He shall hand back all documents sketches and copies thereof to the Municipality upon completion of the work, or earlier, if so requested by the Municipality. The Mandatory shall inform the Municipality immediately should any such documents or sketches become lost.

19. INDEMNIFICATION BY THE MANDATORY

The following conditions will be applicable to the Mandatory:

- (a) The Mandatory is liable and herewith indemnifies the Municipality irrevocably and in full against any claim for loss or damage to property or arising from death or injury of any person and any associated loss or damage suffered, and against all lawsuits, claims, demands, costs, expenses, and charges that may arise when the said occurrences are caused on purpose or through the negligence, violation of legal obligations or failure by the Mandatory or its employees.
- (b) Whenever any of the employees of the Municipality is busy with work to, or with the supply of material that will be used during the execution of the work by the Mandatory, or otherwise busy with work under the instruction and supervision of the Mandatory, in as far as they may be negligent or fail to do their duty, they will be regarded as employees of the mandatory
- (c) All installations, equipment, hoisting-apparatus and other implements, scaffolding, ladders, material, et cetera that are borrowed from the Municipality by the Mandatory for usage during the execution of the work, will be used entirely at the risk of the Mandatory or employees of the Mandatory and the Mandatory herewith indemnifies the Municipality irrevocably and in full against any liability that may arise from such usage.

20. AMENDMENTS MUST BE IN WRITING

The parties agree herewith that this safety agreement is the only safety agreement between them and that no amendment thereof will be valid unless it is in writing and signed by both parties.

21. JURISDICTION AND LEGAL COSTS

In the event of any legal action being instituted pertaining to this agreement the party in default or breach will be liable for the other party's legal costs on the scale as between attorney and own client and the parties consent to the jurisdiction of the magistrate's court for purpose of any legal action being instituted.

PARTICULARS OF THE MANDATORY

Name (Mandatory) _____

C.E.O. (Section 16(1)) _____

ID NO _____

Designation _____

Name of Business _____

Address of Business _____

Tel number (h) _____ (w) _____ e-mail _____

Number of employees employed _____

Registration number as allocated to the Mandatory by the Workman's Compensation Commissioner

Date allocated _____

Thus done and signed on this _____ day of _____ 20 _____

As witnesses:

_____ (Signature) _____ (Name in print)

_____ (Signature) _____ (Name in print)

_____ (Signature) _____ (Name in print)

THE MANDATORY

Thus done and signed on this _____ day of _____ 20____

As witnesses

_____ (Signature) _____ (Name in print)

_____ (Signature) _____ (Name in print)

_____ (Signature) _____ (Name in print)
THE MUNICIPALITY

Acknowledgement of receipt of the agreement:

THE MANDATORY

C1.5 TENDER DATA

The conditions of tender are the Standard Conditions of Tender as contained in Annexure F of SANS 294:2000.

The Standard Conditions of Tender makes several references to the Tender Data. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the Standard Conditions of Tender to which it mainly applies.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.1.1 Actions	The Employer is Dr Ruth S. Mompati District Municipality, collectively referred to as "The Parties" The term "bid" in the context of this standard is synonymous with term "tender".

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.1.2 Tender documents	The tender documents issued by the Employer comprise the documents as listed in the Table of Contents.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.1.3 Interpretation	Add the following new clause:

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
"F.1.3.4	The Tender documents have been drafted in English. The contract arising from the invitation of tender shall be interpreted and construed in English."

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.1.4 Communication and Employer's Agent	Each communication between the Employer and a Tenderer shall be to or from the Employer's Agent only and in a form, that can be read, copied and recorded. The Employer shall not take any responsibility for non-receipt of communications from or by a Tenderer. Lidwala Consulting Engineers, Postnet Suite #328, Private Bag X21, Bryanston, 2021, Tel: 011 793 5486, Fax: 0867 662 829, E-mail: bnyoni@lidwala.com <u>and the Specialist Sub-consultant:</u> The Engineers per GCC 2010: Mr. B Nyoni Pr Tech Eng, Mr. A Maherry Pr Eng
F.1.6 Procurement Procedures	<u>Preferential Procurement Regulations – B-BBEE Compliance Level (from 07 December 2011)</u> "B-BBEE" means broad-based economic empowerment as defined in Section 1 of the Broad-Based Black Economic Empowerment Act. "B-BBEE status level of contributor" means the B-BBEE status received by a measured entity based on its overall performance using the relevant scorecard contained in the Codes of Good Practice on Black Economic Empowerment, issued in terms of Section 9(1) of the Broad-Based Black Economic Empowerment Act. The new Preferential Procurement Regulations have arrived as a result of the recently promulgated Preferential Procurement Policy Framework Act (PPPFA). These new regulations are the final part of implementing BBBEE as contemplated in the Broad Based Black Economic Empowerment Act. Clients/Implementing Agencies calling for tenders are now compelled to consider compliance to the Codes of Good Practice when evaluating tenders and that all tenders be accompanied by a valid B-BBEE certificate, issued by an accredited verification agency. The PPPFA and new rules are effective as of 7 December 2011. B-BBEE points are awarded on the basis of the B-BBEE Status Level of the tenderer. In the event that two or more tenders have scored equal points, the successful tender must be the one scoring the highest number of preference points for B-BBEE.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender																														
	Evidence of B-BBEE status A Tenderer must submit their original (or certified copy) valid B-BBEE status level verification certificate substantiating their B-BBEE rating. Exempt Micro Enterprises (EME's) must submit a certificate issued by a registered auditor, accounting officer, or an accredited verification agency. The validity of B-BBEE certificates will be determined by its compliance with the requirements of instructions and guidelines issued by the National Treasury and any notices published by the Department of Trade and Industry in the Government Gazette. JV's and sub-contracting: Incorporated JV's must submit the B-BBEE status of the entity. Unincorporated JV's must submit a consolidated B-BBEE scorecard as if they were a group structure for every separate tender. Limitations are placed on subcontracting of services, where the value of subcontracted services exceeds 25%. In such instances, the organ of state may not award points for B-BBEE status if the subcontractor does not qualify for at least the same points as the principal tenderer. <u>Data Pertaining to CIDB Registration</u> Basis for CIDB Rating Requirement – CIDB Table 8. A contractor registered in a specific contractor's grading designation indicated in column 1 of Table 8, is considered to be capable of undertaking a contract in the range of values indicated in columns 3 and 4 in the class of construction works to which the category of registration relates to: <i>The tender value range adjustments set out in Table 8 amended by Government Notice No. 357 of July 2019 published Government Gazette no. 42561 of 5 July 2019</i> <table><tr><th>Contractor Grading Designation</th><th>Tender Value Range Designation</th><th>Less than or Equal to (R)</th></tr><tr><td>1 (Class of Construction Works)</td><td>1</td><td>500 000</td></tr><tr><td>2 (Class of Construction Works)</td><td>2</td><td>1000 000</td></tr><tr><td>3 (Class of Construction Works)</td><td>3</td><td>3 000 000</td></tr><tr><td>4 (Class of Construction Works)</td><td>4</td><td>6 000 000</td></tr><tr><td>5 (Class of Construction Works)</td><td>5</td><td>10 000 000</td></tr><tr><td>6 (Class of Construction Works)</td><td>6</td><td>20 000 000</td></tr><tr><td>7 (Class of Construction Works)</td><td>7</td><td>60 000 000</td></tr><tr><td>8 (Class of Construction Works)</td><td>8</td><td>200 000 000</td></tr><tr><td>9 (Class of Construction Works)</td><td>9</td><td>"No limit"</td></tr></table> <i>Information regarding the CIDB can be obtained from their website: www.cidb.org.za</i>	Contractor Grading Designation	Tender Value Range Designation	Less than or Equal to (R)	1 (Class of Construction Works)	1	500 000	2 (Class of Construction Works)	2	1000 000	3 (Class of Construction Works)	3	3 000 000	4 (Class of Construction Works)	4	6 000 000	5 (Class of Construction Works)	5	10 000 000	6 (Class of Construction Works)	6	20 000 000	7 (Class of Construction Works)	7	60 000 000	8 (Class of Construction Works)	8	200 000 000	9 (Class of Construction Works)	9	"No limit"
Contractor Grading Designation	Tender Value Range Designation	Less than or Equal to (R)																													
1 (Class of Construction Works)	1	500 000																													
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9 (Class of Construction Works)	9	"No limit"																													

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.2.1 Eligibility	Only those Tenderers who satisfy the following eligibility criteria are eligible to submit tenders: (a) The Tenderer submits an original valid Tax Clearance Certificate issued by the South African Revenue Services or has made arrangements to meet outstanding tax obligations (b) The Tenderer submits a letter of intent from an approved insurer undertaking to provide the Performance Bond to the format included in Part C1.3 of this procurement document.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender								
	(c) The Tenderer or any of its Directors/Shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector. (d) The Tenderer has not abused the Employer's Supply Chain Management System or failed to perform on any previous contract and has been given a written notice to this effect. (e) The Tenderer has completed the Declaration of Interest and there are no conflicts of interest which may impact on the Tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process and persons in the employ of the state are permitted to submit tenders or participate in the contract. (f) The Tenderer is registered and in good standing with the compensation fund. (g) A contract will only be entered into with a Tenderer who has in his employment management and supervisory staff satisfying the requirements of the scope of work for labour intensive competencies for supervisory and management staff. (h) Only those Tenderers who have a valid and updated registration with the Construction Industry Development Board (CIDB) are eligible to submit tenders. Proof of Registration to be attached. Contractors who have a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the value in a class of construction work as per CIDB: <table border="1" data-bbox="508 1129 1263 1213"> <tr> <th>Description</th><th>Grading Required</th></tr> <tr> <td>Electrical Works</td><td>7 EP / 7 EB</td></tr> </table> Contractors registered as potentially emerging enterprises with the CIDB are required to have the following PE grading: <table border="1" data-bbox="508 1287 1263 1371"> <tr> <th>Description</th><th>Grading Required</th></tr> <tr> <td>Electrical Works</td><td>6 EB PE / 6 EB PE</td></tr> </table> and who satisfy the following criteria, that the employer: • is satisfied that such a contractor has the potential to develop and qualify to be registered in a higher grade; and • ensures that financial, management or other support is provided to the contractor by a main contractor/mentor to enable the contractor to successfully execute the contract (i) Joint ventures are eligible to submit tenders provided that: • <u>every</u> member of the joint venture is registered with the CIDB; • the lead partner has a contractor grading designation of at least 7 EB / 7EP in the Elec Engineering work classification; and • the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for 7 EB / 7 EP of Elec Engineering work (refer to the schedule below).	Description	Grading Required	Electrical Works	7 EP / 7 EB	Description	Grading Required	Electrical Works	6 EB PE / 6 EB PE
Description	Grading Required								
Electrical Works	7 EP / 7 EB								
Description	Grading Required								
Electrical Works	6 EB PE / 6 EB PE								

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender																
	Table of Joint Venture Combinations: <table border="1"> <thead> <tr> <th>Designation</th><th>Deemed to satisfy Joint Venture Arrangements</th></tr> </thead> <tbody> <tr> <td>3</td><td>Three Grade 2 Contractors</td></tr> <tr> <td>4</td><td>Three Grade 3 Contractors</td></tr> <tr> <td>5</td><td>Two Grade 4 Contractors or One Grade 4 and Two Grade 3 Contractors</td></tr> <tr> <td>6</td><td>Two Grade 5 Contractors or One Grade 5 and Two Grade 4 Contractors</td></tr> <tr> <td>7</td><td>Two Grade 6 Contractors or One Grade 6 and Two Grade 5 Contractors</td></tr> <tr> <td>8</td><td>Three Grade 7 Contractors</td></tr> <tr> <td>9</td><td>Three Grade 8 Contractors</td></tr> </tbody> </table> (j) Only tenders from <u>competent & experienced</u> Tenderers will be considered. The Tenderer must indicate his relevant experience (similar to the Scope of Works as tendered for) in the Forms (Forms L & M) provided. Proof of the Completion Certificate of at least <u>3 similar projects</u> (i.e. total value of each electrical project ≥ R15,0 million) completed within the last 5 years must be attached to (Forms L & M) of this tender. Combined electrical project value no less than R60,0 million. Appointment of a competent contractor for this Tender is subject to compliance with the Tender requirements and availability of funds for the implementation. If no information is provided, the Tenderer will be considered as inexperienced in the work tendered for and may therefore be disqualified. (k) Only Tenderers that are capable to provide a construction guarantee to 10% of the contract value (excl. VAT & Contingencies) for the full duration of the construction period from a Registered Financial Institution or Authorised Financial Provider registered at the Financial Services Board. Letter of Intent and previous Guarantee history should be provided. (l) Only those Tenderers with a bank rating of not less than a “C” can be considered for evaluation.	Designation	Deemed to satisfy Joint Venture Arrangements	3	Three Grade 2 Contractors	4	Three Grade 3 Contractors	5	Two Grade 4 Contractors or One Grade 4 and Two Grade 3 Contractors	6	Two Grade 5 Contractors or One Grade 5 and Two Grade 4 Contractors	7	Two Grade 6 Contractors or One Grade 6 and Two Grade 5 Contractors	8	Three Grade 7 Contractors	9	Three Grade 8 Contractors
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F.2.2 Cost of tendering	Add the following to the clause: “The Employer shall not compensate the Tenderer for any costs incurred in attending interviews in the office of the Employer or the Employer’s Agent.”																

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.2.4 Confidentiality and Copyright of Documents	Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the Employer only for the purpose of preparing and submitting a tender offer in response to the invitation. Any receiver of tender documents whether a Tender is submitted or not must consider the contents of the documents as private and confidential. Information supplied by Tenderers relating to the examination, clarification, evaluation and adjudication of tenders and recommendations for the award of the contract will not be disclosed to Tenderers or any other persons not officially concerned with such processes. If so instructed by the Procurement Department, return all retained tender documents within 28 days after the expiry of the validity period stated in the Tender Document.
F.2.5 Reference documents	The document "General Conditions of Contract for Construction Works", Second Edition, 2010, of the South African Institution of Civil Engineers. Tenderers, Contractors and Subcontractors shall obtain their own copies of this document for tendering purposes and for use for the duration of the Contract from the Secretary of the South African Institution of Civil Engineering, Private Bag X200, Halfway House, Midrand, 1685 and shall bear all expenses in this regard.
F.2.7 Site visit and clarification meeting	A <u>COMPULSORY SITE CLARIFICATION MEETING</u> with a representative of the Employer and Engineer will take place at Bloemhof WTW, Magalies Water, Coordinate : -27.650807, 25.596009 on Monday, 14 April 2025 starting at 11h00. Confirmation of attendance will be recorded on site in the attendance register to be signed by all Tenderers, in the name of the tendering entity. Addenda will only be issued to those tendering entities appearing on the attendance register. Tender documents will be made available at the clarification meeting upon receiving the Proof of Payment. No cash/cheque will be accepted at the Clarification Meeting. Detail relating to the collection of tender documents is indicated in the Tender Notice and Invitation to Tender.
F.2.8 Seek clarification	Replace the contents of the clause with the following: "Request clarification of the tender documents, if necessary, by notifying the Employer's Official or the Employer's Agent indicated in the Tender Notice and Invitation to Tender in writing at least seven working days before the closing time stated in the foregoing notice and clause F2.15."
F.2.9 Insurance	

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.2.9.1	<u>Contract Work Insurance (also refer to GCC 2010: Clause 8.6)</u> A Fixed Construction Guarantee to the employer equal in value to 10% of the contract value excluding VAT & Contingencies and escalation if applicable by an institution approved by the employer. The amount so deposited, or the Suretyship so furnished, shall be held until the completion of the Contract, as security that the Contract shall be implemented and carried out to the fullest extent of its terms by the Tenderer. The fixed construction guarantee shall come into force on the date of issue and shall lapse on the date of Completion Certificate being issued. The Employer or his/her representatives shall return the original fixed construction guarantee policy contract to the Tenderer within fourteen (14) days from the date of Completion Certificate being issued. <u>The Tenderer is expected to provide a valid and original Construction Guarantee at time of site handover.</u> Should the Tenderer fail to furnish the required construction guarantee the employer, in his sole discretion may cancel the agreement with the appointed Tenderer. The Tenderer is to state clearly in the Tender form which of the forms of Surety specified, he proposes to submit in the event of his being called upon to take up the Contract, either: (a) Bank Guarantee; or (b) Surety Bond by an approved Insurance Company.
F.2.9.2	<u>Public Liability Insurance</u> This insurance provides indemnity against legal liability in the event of accidental death of or injury to a third-party person and/or loss of or damage to third party property directly arising from the performance of the contract and occurring during the period of insurance with an indemnity limit of R 15 million of all claims arising from any one event or series of events resulting from or attributable to any one source or original source.
F.2.9.3	<u>Insurance to be affected by the Tenderer</u> The Tenderer or Subcontractor must supply the following insurance, where applicable: Insurance for construction machinery and plant (including tools, offices and other temporary structures and content) and other items – other than those intended for incorporation into the works – brought onto site for an amount adequate to replace same.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.2.9.3	(a) Insurance under the provision of the Compensation for Occupational Injuries and Diseases Act, 1993 (Act No. 130 of 1993). (b) Motor vehicle liability insurance with (at least) indemnification for “balance of third party” risk, including passenger liability. (c) If the contract entails manufacture and/or assembly of the works or parts thereof on a site other than the contract site, the contractor must satisfy the employer that all materials and equipment intended for incorporation into the works are adequately insured during the manufacture or assembly, such interest should be recorded by way of endorsement on the policies concerned. A Coupon Policy for Special All Risk Insurance issued by the South African Special Risk Insurance Association to cover all materials (bought by the contractor or by cession) and works already constructed against damage; looting; fire due to civil unrest (SASRIA).
F.2.11 Alterations to documents	Add the following to the clause: “To correct errors made, draw a line through the incorrect entry and write the correct entry in black ink and place the full signatures of the authorised signatories next to the correct entry. No correction fluid may be used. Tampering with or taking the documents apart is strictly prohibited.” The bid will be rejected if corrections are not made in accordance with the above.
F.2.12 Alternative Tender Offers F.2.12.1	Unless anything to the contrary has been determined in the Contract Data, a Tenderer may, together with his Tender for the original design is contained in the contract document, submit alternative designs and tender offers for consideration. The Tenderer shall demonstrate that such alternative designs and tender offer shall comply with the Client’s standards and requirements. All designs, calculations, drawings and Operation and Maintenance manuals shall be fully endorsed by a third party registered engineer, accomplished in such specific field of practice and the cost thereof shall be borne solely by the Contractor. Such alternative designs and offers shall be subject to the following conditions and requirements: <u>Client’s Standards and Requirements</u> The Tenderer shall demonstrate that such alternative designs and tender offers comply with the Client’s standards and requirements. Failure to do so shall result in the alternative designs and tender offers not to be evaluated.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.2.12.2 F2.12.3	<u>Tenders</u> An alternative offer or design will be considered only if the tender for the original items has been fully priced and completed. The alternative tender offer is to be submitted in the same envelope as the main tender offer, together with a schedule that compares the requirements of the tender documents with the alternative requirements the Tenderer proposes. No alternative tender will be considered unless a tender free from qualifications is also submitted. Unless the alternative offer stipulates to the contrary, it shall be assumed that the period for completion of the Works shall be the same as for the original design. Designs, calculations, drawings and a modified schedule of quantities (as determined hereafter) in respect of each alternative offer or design shall accompany the alternative tender offer and shall be endorsed fully by a third party registered engineer, accomplished in such specific field of practice. <u>Preliminary Calculations</u> Preliminary calculations for an alternative design shall be submitted with the tender. Such calculations shall give adequate details so as to enable an assessment to be made of the general efficacy of the design and of its principal elements, also of the degree to which the design prescriptions and codes of the Employer are being complied with. The calculations shall be clear and in a logical sequence and shall clearly reflect all the design assumptions.
F.2.12.4 F.2.12.5 F.2.12.6	<u>Preliminary Drawings</u> Preliminary drawings of the alternative designs shall also be submitted with the tender. These drawings shall comprise adequate layout plans, elevations and sections and shall clearly illustrate the general efficacy of the design and its principal elements. <u>Quantities</u> Each alternative offer shall be accompanied by a modified priced schedule of quantities compiled in accordance with the specifications, in so far as it is applicable, which clearly shows the manner in which the price for the alternative offer has been determined and the items in the original schedule of quantities which fall away or are being changed. In addition to the schedule of quantities, a set of calculations shall be supplied to show how the quantities have been determined. All assumptions in regard to factors which will determine quantities shall be clearly and conspicuously marked by underlining or colouring, and shall indicate whether or not the assumptions have been based on information furnished in the Contract Data (with the necessary references). <u>Further Details</u> Should the Employer's Agent find that the calculations and drawings submitted for alternative designs are not complete enough for proper adjudication of the alternative designs, the Employer reserves to itself the right to call on the Tenderer to submit such further calculations and drawings as may be required. If such further details are not submitted within ten days of having been requested. The alternative designs will not be given further consideration.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.2.12.7	<u>Preliminary Adjudication of Alternative Designs</u> The Employer's Agent will undertake a preliminary scrutiny of any alternative designs for compliance with the specified requirements of the Employer. Should he find any mistakes or unsatisfactory aspects, he may afford the Tenderer the opportunity to rectify them within a period to be determined by the Employer's Agent. However, it is emphasized that the preliminary scrutiny of the design and tender by the Employer's Agent, by its very nature, cannot be comprehensive, and no guarantee can be given in this regard that all the mistakes made by the Tenderer will in fact be detected. Any correction of such mistakes shall be made with the tender price of the Tenderer being retained, and, wherever necessary, the priced schedule of quantities for the alternative design shall be adjusted accordingly.
F.2.12.8	<u>Acceptance of Alternative Design</u> The Tenderer shall note that the acceptance of a tender which includes alternative designs shall mean that the alternative designs have been approved in principle only. If the final calculations, drawings and details do not comply with the specified requirements, such alternative designs may be rejected, unless they are suitably amended by the Tenderer so as to be acceptable to the Employer.
F.2.12.9	<u>Final Drawings and Calculations and the Priced Schedule of Quantities</u> Where a tender with an alternative design has been accepted, the Contractor shall, not less than two months before he intends starting with the construction of such design, submit to the Employer's Agent a complete set of working drawings, detailed calculations and a complete schedule of quantities, for approval. The schedule of quantities shall be based on the preliminary schedule of quantities, but with the necessary adjustments in quantities and prices and with the tendered price for the alternative design being retained.
	Within three weeks of having received the above, the Employer's Agent will indicate which drawings, calculations, quantities, prices and other particulars are acceptable to him and which not, with reasons furnished. The Contractor shall then submit to the Employer's Agent in good time any modified drawings and other particulars for approval, for which he will require two weeks. Any delay arising from the fact that the amended particulars do not meet the requirements shall be the responsibility of the Contractor. No work which will be affected by an alternative design may be commenced, unless the drawings, schedule of quantities and prices for such alternative design have been approved. Should the Contractor fail to modify any drawings, calculations, quantities, prices or any other particulars to the satisfaction of the Employer's Agent, the alternative design will be rejected and the original design shall be constructed for the same amount as has been tendered for the alternative design.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender																	
F.2.13.5	The Employer's address for delivery of tender offers and identification details to be shown on such tender offer package are: <u>Location of Tender Box:</u> 34 Church Street, Vryburg, 8600 <u>Identification Details:</u> Tender No. BDM 2007-027 C1: Upgrade and Extension of the Bloemhof Water Treatment Plant (Electrical) Only tenders placed in the tender box will be considered. If forwarded by a third party or courier, the endorsed and sealed envelope enclosing the tender shall be annotated as above and delivered to Dr Ruth S. Mompoti District Municipality as stipulated in the Special Conditions of Tender. It is the Tenderer's sole responsibility to ensure that the tender is placed in Dr Ruth S. Mompoti District Municipality's Tender Box prior to the closing time. Late tenders and tenders not in the tender box at the time of opening will not be accepted by the Employer and will be returned to the applicant.																	
F.2.13.6	A two-envelope procedure will not be followed.																	
F.2.14	Add the following to the clause: "The Employer shall in the evaluation of tenders take due account of the Tenderer's past performance in executing for similar engineering works of comparable magnitude, and the degree to which he possesses the necessary technical, financial and other resources to enable him to complete the Works successfully within the contract period. Satisfy the Employer and Engineer as to his ability to perform and complete the Works timeously, safely and with satisfactory quality, by furnish details in Section T2.2. The Employer is restricted in accordance with clause 4.(4) of the Constructions Regulations, 2003, to only appoint a contractor whom he is satisfied has the necessary competencies and resources to carry out the work safely. Accept that submitting inferior and inadequate information relating to health and safety (as required in clause F.2.23) shall be regarded as justifiable and compelling reasons not to award a contract to a Tenderer." Accept that tender offers, which do not provide all the data or information as requested completely or in the form required, may be regarded by the Employer as non-responsive. The following criteria will be used to establish completeness for responsive tenders:																	
Information and Data to be completed in all respects	<table><tr><th>Criteria</th><th>Complete Yes</th><th>Incomplete No</th></tr><tr><td>(D)* Contractor has attended the compulsory site inspection and proof of payment of Tender document attached</td><td></td><td></td></tr><tr><td>(D)* Tender document returned in original form</td><td></td><td></td></tr><tr><td>(D)* Contractor has signed and completed the Form of Tender</td><td></td><td></td></tr><tr><td>(D)* Contractor has completed and signed all Returnable documents and included all required Certificates</td><td></td><td></td></tr></table>	Criteria	Complete Yes	Incomplete No	(D)* Contractor has attended the compulsory site inspection and proof of payment of Tender document attached			(D)* Tender document returned in original form			(D)* Contractor has signed and completed the Form of Tender			(D)* Contractor has completed and signed all Returnable documents and included all required Certificates				
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Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender		
	Schedule of Quantities has been completed in full in black ink, all items completed as instructed and Summary Page has been signed		
	(D)* Contractor has supplied an eFiling Tax Compliance Status letter with the PIN (Form F)		
	Contractor has supplied a valid B-BBEE certificate, issued by an accredited verification agency for <u>all</u> tendering entities (JV Partners) where applicable (Form G)		
	(D)* Contractor has supplied valid CIDB rating certificate (Form I)		
	(D)* Contractor has supplied Letter of Good Standing for Workmen Compensation (Form H)		
	Contractor has completed Bank details or provided a cancelled cheque. A bank letter has been submitted by Bank with the bank rating (Form J)		
	(D)* Tenderer has completed Form R and DTI forms (Annexures C, D & E)		
	Contractor has submitted a preliminary Health and Safety Plan		
	Contractor has completed, in full , Technical Data Sheets		
	(D)* Tenderer has supplied Central Supplier Database (CSD) registration certificate (T1.4)		
	* D: Non-compliance with this criterion results in disqualification		
F.2.15 F.2.15.1 Closing time	The closing time for submission of tender offers is 12h00 on Wednesday, 14 May 2025.		
F.2.16 F.2.16.1 Tender Offer validity	The Tender Offer validity period is <u>120 days</u>. Add the following to the clause: "If the tender validity expires on a Saturday, Sunday or public holiday, the Tender Offer shall remain valid and open for acceptance until the closure of business on the following working day."		
F.2.17 Clarification of Tender Offer after Submission	Replace the contents of the clause with the following clause: "Provide clarification of a Tender Offer in response to a request to do so from the Employer during the evaluation of Tender Offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors resulting from the product of the unit rate and the quantity by the adjustment of certain line item totals. No change in the unit rate or prices or substance of the Tender Offer is sought, offered, or permitted. The total of the prices shall be adjusted to reflect the arithmetically correct summation of corrected line item totals and shall be binding upon the Tenderer."		

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.2.19 Inspections, tests and analysis	The Tenderer must provide access during working hours to his premises for inspections on request.
F.2.23 Certificates	Include in the tender submission or provide the Employer with the required certificates as stated in the List of Returnable Documents. In cases where the Tenderer has failed to submit any of the documents above with the tender, the Employer reserves the right to, at any time after the closure of the tender, but before the award of the tender, request the Tenderer to provide the outstanding documents within 5 (five) working days from date of notification. Failure on the part of the Tenderer to submit details to any one of the returnable documents listed in the List of Returnable Documents could result in a tender offer being regarded as non-responsive.
Add the following new clause: "F.2.24 Canvassing and obtaining of additional information by Tenderers	Accept that no Tenderer shall make any attempt either directly or indirectly to canvass any of the Employers officials or the Employer's agent in respect of his tender, after the opening of the tenders but prior to the Employer arriving at a decision thereon. No Tenderer shall make any attempt to obtain particulars of any relevant information, other than that disclosed at the opening of tenders."
Add the following new clause: "F.2.25 Prohibitions on Awards	The Employer is prohibited to award a tender to a person/company: (a) who is listed in the Register of Defaulters into the "Prevention and Combating of Corrupt Activities Act of 2004" as a person prohibited from doing business with the Public Sector. (b) if that person / company has failed to satisfactory perform a contract for either of the parties acting as the Employer and has been issued with a written notice to the effect."
Add the following new clause: "F.2.26 Vendor Registration	Accept that the Tenderer is registered on the Central Supplier Database (CSD) for Government Accept that each Service Provider is required to register as a supplier/service provider on the CSD. Accept that if the Tenderer is already registered as a vendor, it is required to record the supplier number in the space provided on the cover page of the Tender document. Accept that a Joint Venture/Consortium submitting a Tender shall comply with the requirements on this clause."

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
Add the following new clause: F.2.27 Tax	Accept that a valid Tax Clearance Certificate must be submitted with this tender document. Should the Contractor submit the TCC via eFiling, please ensure the Tax Compliance Status letter with the PIN is included. Failure to provide the PIN will result in the tender being declared non-responsive. In cases where the Contractor has not submitted the Tax Clearance Certificate, the Employer reserves the right to, at any time after the closure of the tender, but before the award of the tender, request the Contractor to provide an original, valid Tax Clearance Certificate within 5 (five) calendar days from date of notification. Tenderers should note that in accordance with legislation, no contract may be awarded to a/an person/entity who has failed to submit an Tax Clearance Certificate from the South African Revenue Service (SARS), certifying that the taxes of that person/entity are in order, or that suitable arrangements have been made with SARS. Each party to a Consortium / Joint Venture must submit a separate Tax Clearance Certificate."
F.3.1 Respond to clarification	Replace the contents of the clause with the following: "Respond to a request for clarification received up to seven calendar days before the tender closing time stated in the tender data and notify all Tenderers who drew procurement documents"
F.3.4 F.3.4.1 Opening of Tender submissions	The time and location for the opening of tender offers are: 12h15 on Wednesday, 14 May 2025 Dr Ruth S Mompoti District Municipality Address: 34 Church Street, Vryburg, 8600
F.3.8 Test for Responsiveness	The employer or his representative will determine after opening and before detail evaluation whether each tender offer received: (a) Complies with the requirements of these Conditions of Tender in terms of Eligibility (b) Has been properly and fully completed and signed, (c) And is responsive to the other requirements of the tender document A responsive tender is one that conforms to all the terms, conditions and specifications of the tender documents without material deviations or qualifications. A material deviation or qualification is one which, in the opinion of the employer or his representative, would: • Detrimentially affect the scope, quality or performance of the works, services or supply identified in the Scope of Work; • Significantly change the Employers of the tenderer's risks and responsibilities under the contract; or Affect the competitive position of the other tenderers presenting responsive tenders, if it were to be rectified.

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.3.8.1	Add the following to the clause: “Failure on the part of the Tenderer to submit details to any one of the returnable documents listed in the List of Returnable Documents could result in a tender offer being regarded as non-responsive.”
F.3.9 F.3.9.1 Arithmetical errors	Replace the contents of the clause with the following: “Check responsive Tender Offers for arithmetical errors, correcting them in the following manner: (a) Where there is a discrepancy between the amounts in figures and in words, the amount in words shall govern. (b) If a bill of quantities (or schedule of quantities or schedule of rates) applies and there is an error in the line item total resulting from the product of the unit rate and the quantity, the <u>rate shall govern, and the line item total shall be corrected.</u> (c) Where there is an error in the total of the prices either as a result of corrections required by this checking process or in the Tenderer’s addition of prices, the total of the prices shall be adjusted to reflect the arithmetically correct summation of corrected line item totals.
F.3.9.2	Consider the rejection of a Tender Offer if the Tenderer does not accept the correction of the arithmetical errors in the manner described above.”
F.3.11 Evaluation of Tenders F.3.11.5 Method 4	The tender evaluation method to evaluate all responsive tender offers will be Method 4: Financial offer, quality and preferences (80/20)

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
	The value of W_2 is 40. The score for financial offer is calculated using Formula 2 (Option 1) where W_1 is the percentage score given to financial offer and equals 100 minus W_2. The score for quality and financial offer is to be combined, before the addition of the score for preference, as follows: $W_c = W_3 \times \left(\frac{1 + (S - S_m)}{S_m} \right)$ Where: W_3 is the number of tender evaluation points for quality and financial offer and equals: 1) the 90/10 system for requirements with a Rand value above R50,000,000 (all applicable taxes included); or 2) the 80/20 system for requirements with a Rand value of up to R50,000,000 (all applicable taxes included). S is the sum of score for quality and financial offer of the submission under consideration. S_m is the sum of score for quality and financial offer of the submission scoring the highest number of points. Up to 100 minus W_3 tender evaluation points will be awarded to Tenderers who complete the preference schedule and who are found to be eligible for the preference claimed.
3.11.7 Scoring Financial Offers F.3.11.9 Scoring Quality (Functionality) F.3.11.9.1	The number of points allocated to the financial offer will be calculated as follows: $N_{FO} = W_1 \times A$ Where: N_{FO} is the number of tender evaluation points awarded for the financial offer; W_1 is the weighting for price provided for in the tender data; A is the value based on Formula 2 (Option 1) as indicated in the Standard Conditions of Tender Where: P_m is the tendered parameter of the most favourable tender adjusted to a common financial base for comparative purposes, if applicable; P is the tendered parameter of the responsive tender under consideration, adjusted to a common financial base for comparative purposes, if applicable. The quality criteria and maximum score in respect of each of the criteria are as follows (Tenderer to provide sufficient supporting documentation to validate scores): Reputation in Industry .....(20) (To be attached to Forms L & M) (a) Tenderer's relevant experience with reference to the number and value of successfully completed relevant projects within the last 10 years, i.e. water treatment plant related electrical works inclusive of chemical dosing, filtration plant, ozone plant, of value of at least R5 million:

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
	<i>Less than 2 projects of minimum value of R5 million.....0 points</i> <i>Projects of value between R5 million and R10 million 1 point each</i> <i>Projects of value between R10 million and R20 million 2 points each</i> <i>Projects of value exceeding R20 million 3 points each</i> <i>Maximum score 12 points</i> (b) Tenderer's general experience in number and value of successfully completed electrical engineering projects, including for WTP's, Motor Control Centre for pumping stations, actuators and power cabling, of value of at least R10 million: <i>Less than 2 projects of minimum value of R10 million 0 points</i> <i>Projects of value between R10 million and R15 million 1 point each</i> <i>Projects of value between R15 million and R25 million 2 point each</i> <i>Projects of value exceeding R25 million 3 points each</i> <i>Maximum score 5 points</i> (c) Reference's assertion of performance on previous projects: <i>Poor.....0 points</i> <i>Satisfactory 1 point</i> <i>Good 2 points</i> <i>Very Good.....3 points</i> <i>Maximum average score.....3 points</i> The average number of points scored will be calculated based on the total number of points scored for all of the projects evaluated by the Tenderer's references divided by the number projects evaluated. Tenderers failing to meet a combined minimum average score of 12 points will be disqualified

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.3.11.9.2	Adequacy of Proposed Programme.....(10) (To be attached to Form R) (a) Completeness and adequacy of preliminary programme The Tenderer's programme will be rated by the Engineer for completeness and adequacy based on the level of detail provided in the programme with regard to listing and sequencing of key construction activities, highlighting critical path activities, and taking into account the processes necessary for a project of this nature: <i>Poor.....0 points</i> <i>Satisfactory 3 points</i> <i>Good 5 points</i> <i>Very Good.....7 points</i> <i>Maximum score.....7 points</i> (b) Time for completion offered by Tenderer The required time for completion as stated in the Contract Data is 52 weeks excluding the annual builders holiday. Points will be allocated on a pro-rata basis should the Tenderer offer an alternative Time for Completion as outlined below: <i>24 weeks.....3 points</i> <i>25 weeks (+ 5%) 2 points</i> <i>26 weeks (+ 10%) 1 points</i> <i>28 weeks (+ 15%) 0 points</i> <i>Maximum score.....3 points</i> Tenderer's failing to meet a combined minimum average score of 6 points will be disqualified

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.3.11.9.3	Qualification and Experience of Key Personnel involved in this Project .....(15) (To be attached to Form N) (a) Contracts Director..... (max 4 points) <i>Approved qualification (at least Pr Tech Eng or Pr Eng (civil, mech, elec, chem) 2 points</i> <i>Minimum points for 5 years of relevant water treatment unit process experience..... 1 point</i> <i>Maximum points for 10 years relevant water treatment unit process experience..... 2 points</i> Tenderer's failing to meet a minimum score of 2 points will be disqualified (b) Contracts Manager (to attend site meetings) (max 4 points) <i>Approved qualification (at least BTech or BEng in engineering discipline (civil, mech, elec, chem) 2 point</i> <i>Minimum points for 5 years relevant water treatment unit process experience..... 1 point</i> <i>Maximum points for 10 years relevant water treatment unit process experience..... 2 points</i> Tenderer's failing to meet a minimum score of 2 points will be disqualified NB. The Contracts Director can be the same person as the Contracts Manager (c) Contract Site Agent..... (max 3 points) <i>Approved qualification in engineering discipline (civil & mech work)..... 0.5 point</i> <i>Minimum points for 5 years relevant water treatment unit process experience..... 1 point</i> <i>Maximum points for 10 years relevant water treatment unit process experience 3 points</i> Tenderer's failing to meet a minimum score of 1 point will be disqualified (d) Number of skilled personnel (max 4 points) <i>Minimum points for at least 6 skilled personnel who are permanent employees of the Contractor's organisation 2 points</i> <i>Maximum points for at least 12 skilled personnel who are permanent employees of the Contractor's organisation 4 points</i> Points will be allocated on a pro-rata basis for Items (a) to (d) between the maximum and minimum stated limits. NB. Skilled personnel will include millwright, fitters, boiler makers, electricians and artisans and relevant engineering qualifications

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.3.11.9.4	Commitment to Occupational Health & Safety (8) (To be attached to Form X) (a) Submission of an acceptable Health and Safety Plan compiled in accordance with Part C3: Scope Work, Particular Specifications, PS 3000: Guidelines for the development of a Health & Safety Plan (max 4 points) Adequacy and completeness of Tenderer's health and safety plan including control procedures: <i>Poor.....0 points</i> <i>Satisfactory 2 points</i> <i>Good 3 points</i> <i>Very Good 4 points</i> <i>Maximum score.....4 points</i> <i>Minimum score.....2 points</i> Tenderer's failing to meet a minimum score of 2 points will be disqualified (b) Qualified Health & Safety Officer (max 4 points) <i>Registered as a Professional Construction Safety Agent with the South African Council for the Project and Construction Management Professions (SACPCMP)..... 1 point</i> <i>Minimum points for 2 years relevant project experience 2 point</i> <i>Maximum points for 5 years relevant project experience 4 points</i> Tenderer's failing to meet a minimum score of 1 point will be disqualified
F.3.11.9.5	Quality Assurance Plan.....(15) (To be attached to Form R) (a) Contractor has ISO 9001/2008 certification.....15 points If no ISO 9001/2008 certification, adequacy and completeness of Tenderer's own quality assurance plan and control procedures in accordance with part C3: Scope of Works, General Specification, Clause 4.4. Quality Control <i>Poor.....0 points</i> <i>Satisfactory 2 points</i> <i>Good 5 points</i> <i>Very Good 8 points</i> <i>Maximum score.....8 points</i> <i>Minimum score..... 5 points</i> Tenderer's failing to meet a minimum score of 5 points will be disqualified

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.3.11.9.6	Commitment to Environmental Management .....(5) (a) Contractor has an environmental management system which is certified in terms of ISO 14000 5 points (b) If no ISO 14000 accreditation, adequacy and completeness of Tenderer's own environmental management plan and control procedures: <i>Poor..... 0 points</i> <i>Satisfactory 1 point</i> <i>Good 3 points</i> <i>Very Good..... 5 points</i> <i>Maximum score..... 5 points</i> <i>Minimum score..... 3 points</i> Tenderer's failing to meet a minimum score of 3 points will be disqualified
F.3.11.9.7	Availability of Plant and Equipment Resources .....(12) (To be attached to Form P: also, to state the number of each type of plant or equipment available for this project taking into consideration the list of equipment considered necessary for the completion of the electrical works in accordance with Part C3: Scope of Works, General Specification, Clause 3.6. Construction Equipment) <i>Maximum score.....12 points</i> <i>Minimum score.....6 points</i> Tenderer's failing to meet a minimum score of 6 points will be disqualified
F.3.11.9.8	Financial Resources / Bank Rating .....(15) (To be attached to Form J) <i>Bank rating A – undoubted for the amount of enquiry 15 points</i> <i>Bank rating B – good for the amount of enquiry 12 points</i> <i>Bank rating C – good for the amount quoted if applied strictly in the way of business 9 points</i> <i>Bank rating D – fair trade for the amount of enquiry..... 0 points</i> <i>Bank rating E – figures considered too high 0 points</i> <i>Bank rating F – financial position unknown 0 points</i> <i>Bank rating G – dishonour on records 0 points</i> <i>Bank rating H – frequently 0 points</i> <i>Maximum score 15 points</i> <i>Minimum score..... 9 points</i> Tenderer's failing to meet a minimum score of 9 points will be disqualified

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
	NB. Refer to Form J where Tenderer's are required to submit a bank rating with the Tender. Should the Tenderer be unable to provide the bank rating, he/she shall state the reason as to why he/she is unable to do so, and in addition provide the necessary banking details. Total maximum evaluation points for Quality for Items F.3.11.9.1 - F3.11.9.8 above (Ms) (100) The minimum number of evaluation points for quality shall be 60, below which value the tender will be regarded as being non-responsive.
F.3.11.9.9	Scoring B-BBEE Preferences (Valid Certificate to be attached to Form G) (If the detail is not provided in the Returnable Schedules zero "0" points will be awarded)

Table taken from Government Gazette Notice 34350 (8 June 2011)
Unincorporated JV's will be evaluated on their consolidated B-BBEE level grading in terms of Clause 11(7).

Bids will be evaluated on 80/20 Preferential Procurement Points System.

- 80 points for price
- 20 points for Specific Goals (illustrated in the table below).

No	Specific Goals	Procurement Transactions Preference Points allocated out of 20
1.	Enterprises owned by black people. (must be included as a specific goal)	10 points • B-BBEE status level 1 = 10 points. • B-BBEE status level 2 = 05 points. B-BBEE status level = 0 points 3, 4, 5, 6, 7, 8, non-compliant contributor
2.	• District Municipality • North West Province for work to be done or services to be rendered in that area Tender (RFP) will specify which of the above will apply.	Maximum 4 points • District Municipality = 04 points • North West Province = 02 points • Outside the Northwest Province = 0 Points
3.	The following specific goals will be utilised: • Enterprises owned 100% by women. • Enterprises owned 100% by people with disability. • Enterprises owned 100% by youth.	Maximum 6 points 2 Points per specific goal

Reference to relevant clauses in Standard Conditions of Tender	Addition or Variation to Standard Condition of Tender
F.3.13 Acceptance of Tender Offer F.3.13.1	Tender offers will only be accepted as responsive if: (a) the tenderer has in his or her possession an original valid Tax Clearance Certificate / issued by the South African Revenue Services / eFiling Tax Compliance Status letter with the PIN; (b) the tenderer has in his or her possession an valid B-BBEE Compliance Certificate issued by an Accredited Service Provider; (c) the tenderer is registered with the Construction Industry Development Board (CIDB) in an appropriate contractor grading designation; (d) the tenderer or any of its directors is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector; and (e) the tenderer has not: • abused the Employer's Supply Chain Management System; or • failed to perform on any previous contract and has been given a written notice to this effect. The Employer reserves the right to accept any Tender or part thereof or to make no award at all. The lowest tender will thus not necessarily be accepted. The employer also reserves the right to award any part of the tender to any Tenderer. No reasons for the acceptance or rejection of a tender will be given.
F.3.18 Copies of Contract	One signed copy of contract shall be provided by the Employer to the successful Tenderer
F.3.19 Actions Taken	The Employer may withhold information with regard to action taken under certain conditions: e.g. (a) It is not in the public interest to divulged; (b) Is considered to prejudice the legitimate interest of tenders; or (c) Might prejudice fair competition between tenders.

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS

BDM 2007-027C2

C2.1 Pricing Instructions

1. The method of measurement published by the South African Bureau of Standards in Clause 8 of the Standardized Specifications for Civil Engineering Construction is applicable, subject to the variations and amendments contained in the section "Applicable SABS 1200 standardized specifications".
2. Descriptions in the Schedule of Quantities are abbreviated and comply generally with those in the Standardized Specifications. Clause 8 of each Standardized Specification, read together with the relevant clauses of the Scope of Work, set out what ancillary or associated activities are included in the rates for the operations specified. Should any requirements of the measurement and payment clause of the applicable Standardized Specification, or the Scope of Work, conflict with the terms of the Schedule, the requirements of the Standardized Specification or Scope of Work, as applicable, shall prevail.
3. The clauses in a specification in which further information regarding the schedule item appears under "Reference clause" in the Schedule. The reference clauses indicated are not necessarily the only sources of information in respect of scheduled items. Further information and specifications may be found elsewhere in the contract documents. Standardized Specifications are identified by the letter or letters which follow SANS in the SANS 1200 series of specifications, e.g. G for SANS 1200G.
4. Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.
5. The quantities set out in the Schedule of Quantities are the estimated quantities of the Contract Works, but the Contractor will be required to undertake whatever quantities may be directed by the Engineer from time to time. The Contract Price for the completed contract shall be computed from the actual quantities of work done, valued at the relevant unit rates and prices.
6. The prices and rates to be inserted in the Schedule of Quantities are to be the full inclusive prices for the work described under the several items. Such prices and rates shall cover all costs and expenses that may be required in and for the execution of the work described, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the documents on which the tender is based, as well as overhead charges and profit. Reasonable prices shall be inserted as these will be used as a basis for assessment of payment for additional work that may have to be carried out.
7. A price or rate is to be entered against each item in the Schedule of Quantities, whether the quantities are stated or not. Should the Contractor not enter a price or rate against each item, it could warrant that the tender be disqualified on the basis of incomplete information. It is in the interest of the Contractor to ensure at tender stage that the tendered rates and amounts are substantially comprehensive to execute the scope of the work.

8. Except where rates only are required, insert all amounts to be included in the total tendered price in the “Amount” column and show the corresponding total tendered price.
9. All prices and rates entered in the Bill of Quantities must be excluding VAT. VAT will be added last on the summary page of the Bill of Quantities.
10. For the purposes of this schedule of quantities, the following words shall have the meaning hereby assigned to them:
 - Unit: The unit of measurement for each item of work as defined in the specifications.
 - Quantity: The number of units of work for each item.
 - Rate: The payment per unit of work for which the tenderer tenders to do the work.
 - Amount: An amount tendered for an item, the extent of which is described in the schedule of quantities, the specification or elsewhere, but of which the quantity of work is not measured in units.
11. This schedule of quantities forms part of the contract documents and must be read in conjunction with all the other documents comprising the contract documents.
12. Rates and lump sums shall include full compensation for overheads, profits, incidentals, tax (except for VAT), etc. and for the completed items of work as specified, all in accordance with the standard specifications. Full compensation for completing and maintaining, during the maintenance period, all work shown on the drawings and specified in the specifications, and for all the risk, obligations and responsibilities specified in the general conditions of contract, special conditions of contract and the project specifications shall be considered as provided for collectively in the items of payment given in the schedule of quantities, except in so far as the quantities given in the schedule of quantities are only approximate.
13. The amount of work or the quantities of material stated in the schedule of quantities shall not be considered as restricting or extending the amount of work to be done or the quantity of material to be supplied by the contractor.
14. The statement of quantities of material or amount of work in the schedule of quantities shall not be regarded as authorisation for the contractor to order material or to execute the work. The contractor shall obtain the engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements in this regard.
15. The short description of the payment items in the schedule of quantities is only given to identify the items and to provide specific details. Reference shall inter alia be made to the drawings, project specifications, general conditions of contract and special conditions of contract for more detailed information regarding the extent of work entitled under each item.
16. The provisions of Clause 6.6 of the General Conditions of Contract shall apply to provisional sums and prime cost sums.
17. Subject to the conditions stated in paragraph 18 below, the rates and lump sums filled in by the tenderer in the schedule of quantities shall be binding. Should there be any discrepancies between the tender sum and the correctly extended and totalled schedule of quantities, the amounts will be regarded as being correct, and the Employer shall have the right to make adjustments to the tender rates to reconcile the tender sum with the total of the schedule of quantities. In such an event the contractor will be consulted but, failing agreement between the parties, the decision of the Employer shall be final and binding. Adjustment of the tender rates will take place only after acceptance of the tender, but prior to the signing of the contract. In their own interest tenderers must make double sure of the correctness of their tendered rates, the extensions and the tender sum.

18. A tender may be rejected if the unit rates or lump sums for some of the items in the schedule of quantities are, in the opinion of the Employer, unreasonable or out of proportion, and if the tenderer fails, within a period of seven (7) days of having been notified in writing by the Employer to adjust the unit rates or lump sums for such items, to make such adjustments.
19. The units of measurement indicated in the schedule of quantities are metric units. The following abbreviations are used in the schedule of quantities:

mm	=	millimeter
m	=	meter
m ²	=	square meter
m ³	=	cubic meter
km	=	kilometer
kg	=	kilogram
DN	=	Nominal Diameter
Hrs	=	hours
t	=	tons
No	=	number
PC Sum	=	prime cost sum
Prov Sum	=	provisional sum

20. All rates and sums of money quoted in the schedule of quantities shall be in **Rands** and whole cents. Fractions of a cent shall be discarded.

NOTE: The schedule of quantities shall be completed in **BLACK INK**.

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

**UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS;
ELECTRICAL WORKS**

BDM 2007-027C2

C2.2 Bills of Quantities

Bloemhof Water Treatment Works Extension Electrical Works Installation

CONTRACT NO.: BDM 2007-27C2

BILL OF QUANTITIES

Note: The installation and equipment supply shall be according to the attached specifications included in the tender document and shall in general and specific terms meet all the SANS specification and all equipment like luminaires shall have an SABS mark.
All supplied cable should be red stripe, PVC for sheath and insulation, steel wire amour and fire retardant
Single core power cable should be red stripe, PVC for sheath and insulation, aluminium wire amour and fire retardant in trefoil arrangement
The specific manufacture of switchgear for MCC shall be as stated in the schematics. For all other equipment, Magalies Water (Formerly known as Sedibeng water) preferences should be offered.

Legend: "RO" = Rate only - no initial quantities anticipated

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
1,00	<u>BILL NO 1</u> <u>Preliminary and General Provisions</u>				
1,01	- Mobilization	lot	1.00		
1,02	Demobilization	lot	1.00		
1,03	Insurance Workman's Compensation	lot	1.00		
1,04	Site Establishment	lot	1.00		
1,05	Safety (Induction) & Safety Requirements	lot	1.00		
1,06	Personnel Protection Equipment	lot	1.00		
1,07	Management	lot	1.00		
1,08	Site De-Establishment	lot	1.00		
1,09	Tools & Consumables	lot	1.00		
1,10	Travelling Management / Meetings & Time.	lot	1.00		
1,11	Mark up hard copies drawings and hand over to engineer to do as built drawings	lot	1.00		
1,12	Stationary for the Engineer	PC Sum	1.00		
1,13	Profit on item above	%	10,000.0		
1,14	Site Audit And Verification	lot	1.00		
1,15	Supervision	Weeks	28.00		
1,16	Safety Officer	Weeks	28.00		
1,17	Monthly Variable Charges (Inclusive of Travel / Accommodation / Communication)	Weeks	28.00		
1,18	Training and Community Liaison				
1,18,1	Training by accredited training institution	PC Sum	1.0	150,000.0	
1,18,2	Profit on item 1,18,1 above	%	150,000.0		
1,18,3	Renumeration of Community Liaison Officer	PC Sum	1.0	150,000.0	
1,18,4	Profit on item 1,18,3 above	%	150,000.0		
	TOTAL CARRIED TO COLLECTION		Total 1		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
2.01	<u>BILL NO 2</u> <u>Main plant Motor Control Centre (MCC-02) -</u> <u>MCC Supply and Installation (Compact</u> <u>Design - Front only access)</u>				
2,01.01	- Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (0.25kW to 5.5kW)	ea.	24		
2,01.02	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (Welding feeder)	ea.	1		
2,01.03	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (PLC Controller Panel)	ea.	1		
2,01.04	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (11.0kW)	ea.	2		
2,01.05	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (15.0kW)	ea.	2		
2,01.06	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (22.0kW)	ea.	2		
2,01.07	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (37.0kW)	ea.	2		
2,01.08	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (45.0kW)	ea.	2		
2,01.09	Equip, pre-wire and supply and install MCC inserts according to supplied wiring schematics (Main Incomer)	ea.	1		
2,01.10	MCC frame complete with bus bars and wire ways miscellaneous items including serial bus network	Item	1		
2,01.11	Assemble MCC and do factory testing and acceptance	Item	1		
2,01.12	Program and do settings for 29 smart overloads and commission	ea.	33		
2,01.13	Packaging and transport to site	Item	1		
2,01.14	Commissioning assistance per day	day	5		
2,01.15	Offload MCC components	Item	1		
2,01.16	Connect MCC incomer to main power supply	Item	1		
2,01.17	Fabricate mild steel MCC stand and treat and paint	Item	1		
2,01.18	Commissioning attendance and certification of the MCC including testing and integrity confirmation	Item	1		
	TOTAL CARRIED TO COLLECTION		Total 2		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
3,00	<u>Bill No 2</u> <u>Main Plant Electrical Power Cabling</u> <u>LEGEND</u> [S] = Supply and deliver to site [Is] = Install in position and fix on supports (supports measured separately) [E] = Make off ends and terminate including glands + lugs				
3,01	2,5sqmm-3 Core PVC SWA PVC FR				
3,01,1	[S]	m	1500		
3,01,2	[Is]	m	1500		
3,01,3	[E]	ea.	116		
3,02	1,5sqmm-4 Core PVC SWA PVC FR				
3,02,1	[S]	m	5000		
3,02,2	[Is]	m	5000		
3,02,3	[E]	ea.	120		
3,03	2.5sqmm-4 Core PVC SWA PVC FR				
3,03,1	[S]	m	150		
3,03,2	[Is]	m	150		
3,03,3	[E]	ea.	10		
3,04	4sqmm-4 Core PVC SWA PVC FR				
3,04,1	[S]	m	700		
3,04,2	[Is]	m	700		
3,04,3	[E]	ea.	10		
3,05	6sqmm-4 Core PVC SWA PVC FR				
3,05,1	[S]	m	400		
3,05,2	[Is]	m	400		
3,05,3	[E]	ea.	8		
3,06	16sqmm-4 Core PVC SWA PVC FR				
3,06,1	[S]	m	200		
3,06,2	[Is]	m	200		
3,06,3	[E]	ea.	8		
3,07	25sqmm-4 Core PVC SWA PVC FR				
3,07,1	[S]	m	400		
3,07,2	[Is]	m	400		
3,07,3	[E]	ea.	8		
3,08	185sqmm-4 Core PVC SWA PVC FR				
3,08,1	[S]	m	420		
3,08,2	[It]	m	420		
3,08,3	[E]	ea.	12		
3,09	1.5mm ² Tinned BCEW				
3,09,1	[S]	m	5000		
3,09,2	[Is]	m	5000		
3,09,3	[E]	ea.	120		
3,10	2.5mm ² Tinned BCEW				
3,10,1	[S]	m	1250		
3,10,2	[Is]	m	1250		
3,10,3	[E]	ea.	28		
	SUBTOTAL CARRIED TO NEXT PAGE				

	SUBTOTAL CARRIED FROM PREVIOUS PAGE				
3.10	6mm ² Tinned BCEW				
3,10,1	[S]	m	600		
3,10,2	[Is]	m	600		
3,10,3	[E]	ea.	16		
3.10	70mm ² Tinned BCEW				
3,10,1	[S]	m	420		
3,10,2	[Is]	m	420		
3,10,3	[E]	ea.	12		
	TOTAL CARRIED TO COLLECTION		Total 3		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
4,00	<u>BILL NO 4</u> <u>Powder Coated Mild Steel Enclosure Field E-stop and Isolator stations complete with powder coated mild steel drip covers</u>				
4,01	Field Isolator station 0.1 to 5.5kW assembly with components according to Sedibeng Water specification	No	24		
4,02	Installation, testing and commissioning complete with mounting accessories (excluding cabling)	No	24		
4,03	Field Isolator station up to 11kW assembly with components according to Sedibeng Water specification	No	2		
4,04	Installation, testing and commissioning complete with mounting accessories (excluding cabling)	No	2		
4,05	Field Isolator station up to 15kW assembly with components according to Sedibeng Water specification	No	2		
4,06	Installation, testing and commissioning complete with mounting accessories (excluding cabling)	No	2		
4,07	Field Isolator station up to 22kW assembly with components according to Sedibeng Water specification	No	2		
4,08	Installation, testing and commissioning complete with mounting accessories (excluding cabling)	No	2		
4,09	Field Isolator station above 37kW assembly with components according to Sedibeng Water specification	No	2		
4,10	Installation, testing and commissioning complete with mounting accessories (excluding cabling)	No	2		
	TOTAL CARRIED TO COLLECTION		Total 4		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
5.00	<u>BILL NO 5</u> <u>Power cable rack, conduit system based on heavy dut galvanised mild steel made to SANS specifications, complete with mounting accessories and supports</u> <u>LEGEND</u> [S] = Supply and deliver to site [Is] = Install in position and fix on supports (supports and accessories included)				
5.01	CBT HCT 305mm STRAIGHT PER METER HDG				
5,01,1	[S]	m	300		
5,01,2	[Is]	m	300		
5.02	CBT HCT 305mm HORIZONTAL BEND 90 DEG HDG				
5,02,1	[S]	ea.	12		
5,02,2	[Is]	ea.	12		
5.03	CBT HCT 305mm DROPPER 90 DEG HDG				
5,03,1	[S]	ea.	2		
5,03,2	[Is]	ea.	2		
5.04	CBT HCT 305mm RISER 90 DEG HDG				
5,04,1	[S]	ea.	2		
5,04,2	[Is]	ea.	2		
5.05	CBT HCT 305mm TEE HDG				
5,05,1	[S]	ea.	10		
5,05,2	[Is]	ea.	10		
5.06	CBT HCT 605mm STRAIGHT PER METER HDG				
5,06,1	[S]	m	500		
5,06,2	[Is]	m	500		
5.07	CBT HCT 605mm HORIZONTAL BEND 90 DEG HDG				
5,07,1	[S]	ea.	12		
5,07,2	[Is]	ea.	12		
5.08	CBT HCT 605mm DROPPER 90 DEG HDG				
5,08,1	[S]	ea.	2		
5,08,2	[Is]	ea.	2		
5.09	CBT HCT 605mm RISER 90 DEG HDG				
5,09,1	[S]	ea.	2		
5,09,2	[Is]	ea.	2		
5.10	CBT HCT 605mm TEE HDG				
5,10,1	[S]	ea.	10		
5,10,2	[Is]	ea.	10		
	TOTAL CARRIED TO COLLECTION		Total 5		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
6.00	<u>BILL NO 6</u> <u>Distribution Boards</u>				
6.01	<u>New Expansion WTW Small Power and Lighting DB</u>				
6.01.01	Supply DB as per detailed attached specification	Lot	1		
6.01.02	Install DB and commission	Lot	1		
6.02	<u>New Pump Station WTW Small Power and Lighting DB</u>				
6.02.01	Supply DB as per detailed attached specification	Lot	1		
6.02.02	Install DB and commission	Lot	1		
6.03	<u>WTW SCHEME FACILITY MAIN DB (Compact Design - Front only access)</u>				
6.03.01	Supply DB as per detailed attached specification and drawing	Lot	1		
6.03.02	Install DB and commission	No	1		
6.04	<u>PUMP STATION MAIN DB (Compact Design - Front only access)</u>				
6.04.01	Supply DB as per detailed attached specification and drawing	Lot	1		
6.04.02	Install DB and commission	No	1		
	TOTAL CARRIED TO COLLECTION		Total 6		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
7.00	<u>BILL NO 7</u> <u>Primary Electrical Equipment</u>				
7.01	Design and specify, manufacture [S] and supply 600kVAr, with practical steps to achieve unity power factor with automatic control 400/230 V PFC system, tuned and complete with filters, in stand alone panel (Compact Design)	Lot	1		
7.02	Install and commission Power [Is] factor Correction System	Lot	1		
7.03	Do testing commissioning and issuing of COC for expansion works	Sum	1		
7.04	Do lightning protection and earthing of the entire structure including the new workshop building	PC Sum	1		
7.05	Air Conditioning Units for 2 x MCC Rooms	PC Sum	2		
-					
	TOTAL CARRIED TO COLLECTION		Total 7		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
8.00	<u>BILL NO 8</u> <u>Small Power and Lighting</u>				
8.01	- Supply and install 4,0sqmm house wire to the correct colour as per SANS	m	320		
8.02	Supply and install 2,5sqmm house wire to the correct colour as per SANS	m	420		
8.03	Supply and install 2,5sqmm bare copper earth wire as per SANS	m	740		
8.04	Supply and install galvanised 15sqmm mild steel conduit complete with mounting accessories	m	240		
8.05	Suspended type high bay fitting 1 x 250W MH constructed with moulded acrylic prismatic reflector (closed), complete with control gear and lamp IP65	Point	16		
8.06	Exterior wall light fitting 1x26W constructed from die-cast aluminium body with glass lens and eyelid (Black)	Point	8		
8.07	Surface mounted type 1230x52 2x58W fluorescent fitting, ABC base with prismatic acrylic diffuser	Point	22		
8.08	400W Floodlight fitting (Waterproof) with Die cast Aluminium body complete with control gear	Point	8		
	400W Floodlight fitting (Waterproof) with Die cast Aluminium body complete with control gear	Point	16		
8.09	Light switch complete with wiring and conduit measured elsewhere	Point	6		
8.10	SSO complete with wiring and conduit measured elsewhere	Point	4		
8.11	Welding Socket complete with wiring and conduit measured elsewhere	Point	2		
	TOTAL CARRIED TO COLLECTION		Total 8		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
9.00	<u>BILL NO 9</u> <u>Control and Instrumentation</u>				
9.01	<u>- CONDUIT</u>				
9,01.01	25mm HDG Bosal Conduit Complete With PVC Bushes, Spacer Bar. Saddles, Draw Boxes, Bends, Couplings & Adapters.	m	250		
9,01.01	32mm HDG Bosal Conduit Complete With PVC Bushes, Spacer Bar. Saddles, Draw Boxes, Bends, Couplings & Adapters.	m	25		
9.02	<u>CABLE LADDERS ELECTRICAL & INSTRUMENTATION.</u>				
9,02.01	100mm Wire Mesh Cable Tray HDG - Straight Lengths Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	60		
9,02.02	200mm Wire Mesh Cable Tray HDG - Straight Lengths Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	240		
9,02.03	300mm Wire Mesh Cable Tray HDG - Straight Lengths Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	100		
9,02.01	100mm Wire Mesh Cable Tray HDG - Site Manufactured Bends Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	10		
9,02.02	200mm Wire Mesh Cable Tray HDG - Site Manufactured Bends Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	30		
9,02.03	300mm Wire Mesh Cable Tray HDG - Site Manufactured Bends Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	10		
9,02.01	100mm Wire Mesh Cable Tray HDG - TEE Pieces Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	5		
9,02.02	200mm Wire Mesh Cable Tray HDG - TEE Pieces Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	10		
9,02.03	300mm Wire Mesh Cable Tray HDG - TEE Pieces Complete With Splice Sets, Hold Down Clamps, Spring Nuts & Hex Set Screws.	m	5		
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9.03	<u>SUPPORT STEEL & BRACKETRY</u> - Complete With Fixtures & Fittings.			
9,03.01	25mm X 25mm X 5mm HDG Angle Iron.	m	100	
9,03.02	40mm X 40mm X 5mm HDG Angle Iron.	m	100	
9,03.03	50mm X 50mm X 5mm HDG Angle Iron.	m	100	
9,03.04	76mm X 38mm HDG Chanel Iron.	m	30	
9,03.05	25mm X 6mm HDG Flat Bar.	m	50	
9,03.06	40mm X 6mm HDG Flat Bar.	m	50	
9,03.07	50mm X 6mm HDG Flat Bar.	m	20	
9,03.08	Instrument Junction Box Stands Manufactured Of Mild Steel HDG.	ea	14	
9,03.09	CCG Box Mounting Plates.	ea	65	
9,03.10	HDG Cutting, Grinding, Welding And Cleaning Consumables.	lot	1	
9.04	<u>POWER CABLES</u>			
9,04.01	2,5mmsq x 3 core pvc swa pvc fr 600-1000V.	m	150	
9,04.02	2,5mmsq x 3 core pvc swa pvc fr 600-1000V terminations.	ea	100	
9,04.03	2,5mmsq x 4 core pvc swa pvc fr 600-1000V.	m	450	
9,04.04	2,5mmsq x 4 core pvc swa pvc fr 600-1000V terminations.	ea	100	
9,04.05	2,5mmsq x 7 core pvc swa pvc fr 600-1000V.	m	1000	
9,04.06	2,5mmsq x 7 core pvc swa pvc fr 600-1000V terminations	ea	136	
9,04.07	16mm x 4Core PVC SWA PVC Power Cable.	m	150	
9,04.08	16mm x 4Core PVC SWA PVC Power Cable Terminations.	ea	4	
	SUBTOTAL CARRIED TO NEXT PAGE			

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9.05	<u>PLC, SCADA & ENGINEERING HARDWARE & SOFTWARE</u>					
9,05.01	PLC hardware complete with CPU, Power Supply, IO Cards, Network components and Accessories as per the Hardware BOQ and not limited to the requirements for a fully functional control system for the devices specified in the Motor & Instrument List and the Functional specification					
9,05.01.01	PLC - Schneider Modicon Premium					
	Module Type	Model	Description			
9,05.01.02	Central Processor (CPU)	TSXP573634M	573X4 ETH UNY PROCESSOR	ea	1	
9,05.01.03	Power Supply	TSXPSY5500M	100/240VAC 55W POW.SUP.	ea	4	
9,05.01.04	Expansion Rack	TSXRKY6EX	6 SLOT EXT. RACK	ea	1	
9,05.01.05	Central Rack	TSXRKY12EX	12 SLOT EXT. RACK	ea	1	
9,05.01.06	Rack Connection Cable	TSXCBY500KT	BUS X EXT. CABLE 50M KIT	ea	1	
9,05.01.07	Terminal Connector	TSXCBYK9	SUB D MALE 9 P. CONNECT.	ea	2	
9,05.01.08	Bus Terminator	TSXTLYEX	2 BUS X TERMINATOR	ea	1	
9,05.01.09	Fan	TSXFANA5P	PLC FAN MODULE 220VAC	ea	2	
9,05.01.10	Digital Input	TSXDEY32D2K	32I 24VDC SINK CONN	ea	4	
9,05.01.11	Digital Output	TSXDSY32T2K	32Q 24VDC 0,1A TR.BLK	ea	2	
9,05.01.12	Analog Input	TSXAEY800	8I ANA. HIGH LEVEL	ea	2	
9,05.01.13	Analog Output	TSXASY800	8Q ANA. HL NON INSULATED	ea	2	
9,05.01.14	Backup Battery	TSXPLP01	BATTERY FOR TSX 37	ea	1	
9,05.01.15	Program Storage	TSXMRPP224K	SRAM MEM 224KB PROG	ea	1	
	SUBTOTAL CARRIED TO NEXT PAGE					

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9,05.02	UPS Module						
9,05.02.01	Module Type UPS Module (Siemens)	Model 6EP1931-2DC21	Description SITOP DC UPS MODULE 24 V/6 A U	ea	2		
9,05.02.02	Battery Unit	6EP1935-6ME21	SITOP BATTERY MODULE 24 V/7 AH	ea	2		
9,05.03	NETWORKING						
9,05.03.01	Module Type Managed Switch	Model TCSESB083F23F0	Description CONNEXIUM BASIC SWITCH 8TX	ea	8		
9,05.03.02	Patch Cables	TCSECE3M3M10S4	ETHERNET CABLE 10M CAT 5E W/RJ45 - CE	ea	30		
9,05.03.03	Modbus RTU to TCP Gateway		ANYBUS MODBUS RTU to TCP GATEWAY	ea	2		
9,05.04	SCADA HMI Panel mounted Hardware complete licence tags for runtime, network hardware and associated accessories for linking to the Control System CPU.						
9,05.04.01	Module Type HMI Panel	Model HMIGTO4310	Description 7.5 Color Touch Panel VGA-TFT	ea	1		
9,05.04.02	Protective Cover	HMIZG64	Screen protection film for 7"5	ea	1		
9,05.04.03	PC Cable Adaptor	XBTZ925	CABLE USB ADAPTER	ea	1		
9,05.04.04	Programming Cable	XBTZ945	CONFIGURATION CABLE	ea	1		
	SUBTOTAL CARRIED TO NEXT PAGE						

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9,05.05	Engineering Station - Dell Laptop with Single User Unity Software for PLC Programming. HMI Designer complete with programming cable and Licences as per the BOQ					
9,05.05.01	Module Type	Model	Description			
	LAPTOP	DELL LATITUDE	Latitude E5470: One Intel Core i5-6440HQ, Windows 7 Pro	ea	1	
9,05.05.02	PLC Programming SW	UNYSPUSFUV1X	UNITY PRO S SINGLE LIC	ea	1	
9,05.05.03	HMI Designer	VJDSNDTGSV62M	Vijeo Designer, Single License	ea	1	
9,05.05.04	HMI Licence	VJDSNRTMPC	Vijeo Designer V5.1 Magelis iPC RT	ea	1	
	Form 1 single door (800mm wide) CR12 powder coated PLC panel complete with PCS Hardware, Trunking and Terminals, Relays and Power Circuit Breakers as per the typical GA attached. The HMI Panel shall be mounted on the front of the door. All cable entry from the Bottom. Power Earth and Instrument earth to be provided.					
9.06	<u>INSTRUMENT CABLES</u>					
9,06.01	Unitronic Liycy 1,0mmsq x 4 core.			m	1000	
9,06.02	Unitronic Liycy 1,0mmsq x 4 core Terminations.			ea	456	
9,06.03	Unitronic Liycy 1,0mmsq x 7 core.			m	1000	
9,06.04	Unitronic Liycy 1,0mmsq x 7 core Terminations.			ea	336	
9,06.05	Unitronic Liycy 1,0mmsq x 12 core.			m	1000	
9,06.06	Unitronic Liycy 1,0mmsq x 12 core Terminations.			ea	624	
9,06.07	Unitronic Liycy 1,0mmsq x 21 core.			m	1000	
9,06.08	Unitronic Liycy 1,0mmsq x 21 core Terminations.			ea	588	
9,06.09	Ollflex Classic - 110 4 x 1,0mmsq			m	1000	
9,06.10	Ollflex Classic - 110 4 x 1,0mmsq Terminations.			ea	90	
9,06.11	Category 7 Ethernet Cable			m	1000	
9,06.12	Category 7 Ethernet Cable Terminations			ea	80	
9.07	<u>FIELD EQUIPMENT</u>					
9,07.01	IP65 Mild Steel Powder Coated RAL7035 Junction Box Complete With Thermoplastic Slotted Trunking, Heavy Duty Zinc Passivated Din Rail, Terminals & Labels.			ea	14	
9,07.02	20mm CCG Utility Junction Boxes Complete With Terminals			ea	65	
	SUBTOTAL CARRIED TO NEXT PAGE					

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9.08	<u>CABLE NUMBER / WIRE NUMBERS</u>				
9,08.01	General Marking System Labels , Wire Numbers & Cable numbers	lot	1		
9.09	<u>CONTROL AND INSTRUMENTATION INSTALLATION LABOUR</u>				
	NORMAL TIMES				
9,09.01	Supervision x 1	hrs	360		
9,09.02	Artisans x 2	hrs	360		
9,09.03	Semi-skilled Artisans x 2	hrs	360		
9,09.04	Assistants x 3	hrs	360		
	OVERTIME SATURDAYS				
9,09.05	Supervision x 1	hrs	54		
9,09.06	Artisans x 2	hrs	54		
9,09.07	Semi-skilled Artisans x 2	hrs	54		
9,09.08	Assistants x 3	hrs	54		
	OVERTIME SUNDAYS & PUBLIC HOLIDAYS				
9,09.09	Supervision x 1	hrs	25		
9,09.10	Artisans x 2	hrs	25		
9,09.11	Semi-skilled Artisans x 2	hrs	25		
9,09.12	Assistants x 3	hrs	25		
9.09	<u>PROGRAMMING AND SOFTWARE DESIGN</u>				
9,09.01	Project Management, including clarification meetings, Design Reviews, Procurement, Reporting and Tracking	lot	1		
9,09.02	Generation of Functional Specification from the control narrative to include interlocking control loops and sequencing details.	lot	1		
9,09.03	Hardware Design, including GA, Network Drawings and Loop Updates	lot	1		
9,09.04	PLC Detail Design, with Device Function Blocks, System to provide for Modes, Interlocking, PID Loops, Duty Standby Controls and Simple Sequencing	lot	1		
9,09.05	SCADA Detail Design with Device Templates. System to provide interlocking details on templates, Alarm and Trend Logging and Archiving and System Diagnostic page.	lot	1		
	SUBTOTAL CARRIED TO NEXT PAGE				

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9,09.06	Factory Acceptance Testing, including Hardware integration testing, Networking Functionality, Software Acceptance, including Sequencing and Control Loops simulation in the PLC.	lot	1		
9,09.07	Cold Commissioning of the PLC and SCADA System and support for Loop checking through to the SCADA.	lot	1		
9,09.08	Hot Commissioning of the PLC and SCADA System with fine tuning loops and alarms.	lot	1		
9,09.09	Updated As-Built Documentation including Loop Drawings, Specifications and Operator Manuals.	lot	1		
9,09.10	Onsite, site specific training of Technicain and Plant Operators	lot	2		
	TOTAL CARRIED TO COLLECTION		Total 9		

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
10,00	<u>BILL NO 10</u>				
	<u>WORKSHOP BUILDING ELECTRICAL WORKS</u>				
10,01	TESTING, COMMISSIONING AND DOCUMENTATION				
10,01,1	Labelling				
10,01,1,1	Engraved labels on each SSO, Isolator and light switch face plate, glued or screwed	Sum	1		
10,01,1,2	Cable marking with Gravoplast at either end below termination shroud	Sum	1		
10,01,2	- Testing and commissioning				
10,01,2,1	Testing and commissioning of the works covered within the Workshop Building.	Sum	1		
10,01,2,2	Final phase balancing on DB	Sum	1		
10,01,3	- Documentation				
10,01,3,1	Provision of the As-built drawings for the works covered within this bill showing all cable routes, conduit routes, etc	Sum	1		
10,01,3,2	Provision of the Operation and Maintenance manuals for the works covered within this bill including conducting User's training	Sum	1		
10,01,3,3	Provision of the Certificates of Compliance upon completion for the works covered within this bill.	Sum	1		
10,02	GENERAL ELECTRICAL INSTALLATIONS - DISTRIBUTION BOARDS AND SITE RETICULATION				
10,02,1	Distribution Boards				
	Distribution board complete with all MCBs, switchgear, accessories, sheet metal frames, sub-frames, busbars, terminals, wiring, conduit terminations, labelling, fixtures and fittings as specified, with all equipment fitted and equipped in factory all strictly as per the issued schematic diagram. (Please note that the distribution board's shop drawing should be submitted to the Engineer for approval prior to manufacture).				
10,02,1,1	DB-WS (Workshop Distribution Board - Flush Mounted) Supply	No	1		
10,02,1,2	Install	No	1		
	SUBTOTAL CARRIED TO NEXT PAGE				

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10,02,2	Low voltage cables 600/1 000V PVC/PVC/SWA/PVC multi-core copper cable to SANS 1507-3 installed on cable tray, cable ladder, ground and sleeves including all fixings and accessories (cable trays and sleeves measured elsewhere)				
10,02,2,1	120mm² 4 Core				
10,02,2,1,1	Supply	m	200		
10,02,2,1,2	Install	m	200		
10,02,3	Low voltage cable terminations Make off and terminate the LV cable, complete with glands, lugs and shrouds including connection of cable to equipment terminals. Rate to include supply, nuts, flat and spring washers and any other accessories required to make task complete.				
10,02,3,1	120mm² 4 Core				
10,02,3,1,1	Supply	No	2		
10,02,3,1,2	Install	No	2		
10,03	Power skirting Supply and install the following galvanized steel power skirting, complete with end caps, elbows, tees, and associated accessories and covers, colour to be specified by the Architect.				
10,03,1	2-Compartment 2-Cover				
10,03,1,1	Supply	m	50		
10,03,1,2	Install	m	50		
	SUBTOTAL CARRIED TO NEXT PAGE				

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10,04	Power skirting Accessories				
	Aluminium power skirting accessories				
10,04,1	End caps				
10,04,1,1	Supply	No	8		
10,04,1,2	Install	No	8		
10,04,2	Elbows				
10,04,2,1	Supply	No	2		
10,04,2,2	Install	No	2		
10,04,3	Power trunking				
	Supply and install ceiling mounted single compartment galvanized steel trunking complete with covers, tees, bends, hangers, threaded rods, purlin clamps and all other accessories for a complete installation.				
	76 mm wide x 63 mm deep (for lighting circuits, as Cabstrut P8300)				
10,04,3,1	Supply	m	100		
10,04,3,2	Install	m	100		
10,04,3,3	127mm wide x 76 mm deep (for power circuits,as Cabstrut P9000)				
10,04,3,3,1	Supply	m	200		
10,04,3,3,2	Install	m	200		
10,05	Socket outlets				
10,05,1	Socket outlet complete with all necessary chrome fixing screws, steel cover plates, labeling, cradles, including all holes,drilling, etc				
	16A, 230V, 3-pin normal double switched,complying to both SANS 164-1 and SANS 164-2, wall mounted or surface mounted on wall				
10,05,1,1	Supply	No	9		
10,05,1,2	Install	No	9		
	SUBTOTAL CARRIED TO NEXT PAGE				

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10,05,2	Combination outlet, flush mounted, consisting of 16A, 230V, 3-pin blue switched socket outlet, combined telephone and data point, 2pin socket outlet, USB outlet, mounted on power skirting			
10,05,2,1	Supply	No	6	
10,05,2,2	Install	No	6	
10,05,3	3phase, 5-pin industrial switched socket outlet mounted on the wall			
10,05,3,1	Supply	No	4	
10,05,3,2	Install	No	4	
10,05,4	5A, 230V, 3-pin unswitched, trunking mounted (for light fittings)			
10,05,4,1	Supply	No	84	
10,05,4,2	Install	No	84	
10,06	Isolators			
	Isolator complete with box, cover plate and accessories.			
10,06,1	20A DP Single phase isolator, surface mounted, weatherproof, IP65			
10,06,1,1	Supply	No	6	
10,06,1,2	Install	No	6	
10,06,2	20A DP Single phase isolator, ceiling mounted for geyser / hand drier			
10,06,2,1	Supply	No	3	
10,06,2,2	Install	No	3	
10,07	Light switches			
	Light switch complete with all necessary chrome fixing screws, steel cover plates, labeling, cradles, including all holes,drilling, etc inclusive of termination of circuit wiring onto switch terminals.			
10,07,1	16A, 230V, 1 Lever 1 Way			
10,07,1,1	Supply	No	6	
10,07,1,2	Install	No	6	
	SUBTOTAL CARRIED TO NEXT PAGE			

	SUBTOTAL CARRIED FROM PREVIOUS PAGE			
10,07,2	16A, 230V, 2 Lever 1 Way			
10,07,2,1	Supply	No	1	
10,07,2,2	Install	No	1	
10,07,3	16A, 230V, 1 Lever 2 Way			
10,07,3,1	Supply	No	4	
10,07,3,2	Install	No	4	
10,07,4	Photocell Photocell installed in a suitably sized rectangular bulkhead luminaire housing with clear UV stabilised high impact acrylic lens and labelling as specified			
10,07,4,1	16A, 230V, Photocell			
10,07,4,1,1	Supply	No	2	
10,07,4,1,2	Install	No	2	
10,08	Light fittings SABS approved light fittings as per the specification, complete with lamps, machine or wood screws, bolts, installed and connected as specified. All fittings shall be similar or equal to (and subject to approval) the light fittings specified in the schedule of light fittings. Please note that all ceiling mounted lay in fittings shall be delivered with 3m of 1,5mm ² flexible cabtyre with a 5 amp 3 pin plug top fitted.			
10,08,1	Type A - 1200mm Surface mounted LED light fitting, polycarbonate optical cover, 46W lamp, 7062 lumens, 4000K colour temperature, IP65 protection, electronic control gear.			
10,08,1,1	Supply	No	36	
10,08,1,2	Install	No	36	
10,08,2	Type B - Recessed mounted LED downlight, 165mm diameter, aluminium housing complete with specular white trim ring finish, 15W LED lamp, 2100 lumens, 4000K colour temperature, IP20 protection, electronic control gear.			
10,08,2,1	Supply	No	23	
10,08,2,2	Install	No	23	
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10,08,3	Type B1 - Rectangular bulkhead luminaire with high pressure die-cast aluminium base and high impact acrylic diffuser, 8W LED lamp, 1095 lumens, 4000K colour temperature, IP65 protection, electronic control gear.				
10,08,4,1	Supply	No	10		
10,08,4,2	Install	No	10		
10,08,5	Telecommunications distribution board Flush mounted distribution board, lockable, complete with 20mm thick wooden back board				
10,08,5,1	300 x 300 x 150mm deep				
10,08,5,1,1	Supply	No	1		
10,08,5,1,2	Install	No	1		
10,08,6	Telecommunications outlets Galvanised steel epoxy powder coated cradles and covers mounted on power skirting or wall complete with removable blank inserts.				
10,08,6,1	RJ45 socket outlet - Power Skirting Mounted				
10,08,6,1,1	Supply	No	6		
10,08,6,1,2	Install	No	6		
10,08,7	Hand Dryer				
10,08,7,1	Stainless Steel Automatic Hand Dryer as 1400W Exellerator with a motor speed of 20,000rpm and air output temperature of 57 degrees Celsius, or equal and approved				
10,08,7,1,1	Supply	No	2		
10,08,7,1,2	Install	No	2		
	SUBTOTAL CARRIED TO NEXT PAGE				

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10,09	REF	Description			
		Air-Conditioning			
10,09,1	MWU-01	3.3 kW cooling Inverter Split Indoor unit (Inverter, R32) complete with outdoor unit, insulated refrigerant piping, condensate drains, trunking, electric wiring and connection, remote controls and top-up refrigerant			
10,09,1,1		Split Indoor Unit, 3.3 kW cooling capacity complete with outdoor unit	No	2	
10,09,1,2		Wired Controller	No	2	
10,09,1,3		Chord for Wired Controller	m	20	
10,09,1,4		Refrigerant piping	m	10	
10,09,1,5		Condensate Drain piping	m	10	
10,09,2	MWU-02	9.5 kW cooling Inverter Split Indoor unit (Inverter, R32) complete with outdoor unit, insulated refrigerant piping, condensate drains, trunking, electric wiring and connection, remote controls and top-up refrigerant			
10,09,2,1		Split Indoor Unit, 9.5 kW cooling capacity complete with outdoor unit	No	1	
10,09,2,2		Wired Controller	No	1	
10,09,2,3		Chord for Wired Controller	m	10	
10,09,2,4		Refrigerant piping	m	30	
10,09,2,5		Condensate Drain piping	m	30	
SUBTOTAL CARRIED TO NEXT PAGE					

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10,09,3	FWCU-01	9.5 kW cooling Inverter Split Four way Cassette unit (Inverter, R32) complete with outdoor unit, insulated refrigerant piping, condensate drains, trunking, electric wiring and connection, remote controls and top-up refrigerant			
10,09,3,1		Split Indoor Cassette Unit, 9.5 kW cooling capacity complete with outdoor unit	No	1	
10,09,3,2		Wired Controller	No	1	
10,09,3,3		Chord for Wired Controller	m	10	
10,09,3,4		Refrigerant piping	m	10	
10,09,3,5		Condensate Drain piping	m	10	
10,09,4	Sundries		Sum	1	
10,09,5	TC	Testing and Commissioning			
10,09,6		Testing and Commissioning of all Installations	Sum	1	
TOTAL CARRIED TO COLLECTION				Total 10	

Item no	Payment Bill Description	Unit	Bill Quantity	Gross	
				Rate	Amount (R)
11,00	<u>BILL NO 11</u> <u>PRIME COST</u> <u>ITEMS</u>				
11,01	- Provision for the maintance of the existing works to ensure the WTW fuction at it's maximum capacity upon completion	PC Sum	1	3,000,000.0	
11,02	Profit on item above item 11,01	%	3,000,000.0		
11,03	Provision for the supply and installation of streetlight poles for the Bloemhof Reservoir, including cables and a distribution board for the lightining on the reservoir area.	PC Sum	1	1,700,000.0	
11,04	Profit on item above item 11,03	%	1,700,000.0		
	TOTAL CARRIED TO COLLECTION		Total 11		

ITEM	DESCRIPTION	Amount (R)
	COLLECTION	
Total 1	Preliminary and General Provisions	
Total 2	Main plant Motor Control Centre (MCC-02) - MCC Supply and Installation (Compact Design - Front only access)	
Total 3	Main Plant Electrical Power Cabling	
Total 4	Powder Coated Mild Steel Enclosure Field E-stop and Isolator stations complete with powder coated mild steel drip covers	
Total 5	Power cable rack, conduit system based on heavy duty galvanised mild steel made to SANS specifications, complete with mounting accessories and supports	
Total 6	Distribution Boards	
Total 7	Primary Electrical Equipment	
Total 8	Small Power and Lighting	
Total 9	Control and Instrumentation	
Total 10	Workshop Building Electrical Works	
Total 11	Prime Cost Items	
	SUB-TOTAL 1 (SCHEDULES)	
CONTINGENCY ALLOWANCE:		
ADD:	10% of the Sub-Total 1 for CONTINGENCIES	
-	The amount provided here is under the sole control of the Engineer and may be deducted in whole or in part	
-	SUB-TOTAL 2	
ADD:	5% of the Sub-Total 1 for CONTRACT PRICE ADJUSTMENT.	
-	SUB-TOTAL 3 (GENERAL CONDITION OF CONTRACT)	
-	SUB-TOTAL 4 (Sum of Sub-Total 1 to 3)	
ADD:	15% of the above Sub-Total 4 for VALUE ADDED TAX	
-	SUB-TOTAL 5	
	TOTAL TENDER AMOUNT (Sum Sub-Total 4 plus Sub-Total 5)	
	TOTAL CARRIED FORWARD TO FORM OF FORM	

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS

BDM 2007-027C2

C3 Scope of Work

C3.1 General Specification

1. DESCRIPTION OF THE WORKS

1.1. Employer's objectives

The Employer's main objective is to upgrade and extend the existing Bloemhof Water Treatment Works (WTW) by the construction of an additional 10ML/day module. This will increase the capacity of the Bloemhof WTW from the current 14,4 ML/day to 25ML/day. The current plant was commissioned in 1992.

1.2. Overview of the works

The Scope of this Contract shall require that the "Contractor" as defined in the GENERAL CONDITIONS OF CONTRACT FOR CONSTRUCTION WORKS: SECOND EDITION - 2010, hereinafter referred to as GCC 2010; Clause 1.1.25 to have included in his/her tender price for, and is not limited to, the supply of all materials, labour, tools, plant, workmanship, supervision, transport, water, compressed air, electrical power, and whatever else is deemed necessary to ensure due and proper construction and Completion of the Works. The Works shall be completed in accordance with the terms as specified in this Contract Document.

1.3. Extent of the works

The scope of the works at the Bloemhof water treatment works involves the following;

The work for the additional treatment train consists of the construction of an additional 5 ML reservoir, a new 2 x 6 ML/d high rate settlers, 2 x 6ML/d secondary flocculation units, 2 x 6 ML/d dissolved air flotation units and 4 x 3 ML/d declining rate rapid gravity sand filters. A new 1 ML extension to the existing clear water reservoir will also be included together with associated new High Lift Pump Station Building. The new mechanical and electrical workshop building. The scope of the contract is for supply and installation of the the electrical works.

The concise list of the extent of the Works has been dealt with under a civil, separate mechanical contracts and the electrical contract includes the following:

- Site establishment
- Electrical works supply and installation
- Control and Instrumentation supply and installation
- Finishing-off and site clearance
- Re-establishment of site on completion of the works.

1.4. Location of the works

The project is located the town of Bloemhof on the R34 to Schweizer Reneke just north of the intersection with the N12 in the Leekwa Teemane Local Municipality.

DRAWINGS

The following drawings are applicable to the contract:

ELECTRICAL WORKS DRAWINGS	
DRAWING NUMBER	DESCRIPTION
14004-E-MC2-001	GENERAL ARRANGEMENT
14004-E-MC2-003	SLUDGE MIXER(DUTY)
14004-E-MC2-004	SLUDGE TRANSFER NO.1(DUTY)
14004-E-MC2-005	SLUDGE TRANSFER NO.2(STANDBY)
14004-E-MC2-006	WATER RECYCLE PUMP NO.1(DUTY)
14004-E-MC2-007	WATER RECYCLE PUMP NO.2(STANDBY)
14004-E-MC2-008	EXTRACTION FAN NO.1
14004-E-MC2-009	EXTRACTION FAN NO.2
14004-E-MC2-010	CHLORINE BOOSTER PUMP NO.1(DUTY)
14004-E-MC2-011	CHLORINE BOOSTER PUMP NO.2(STANDBY)
14004-E-MC2-012	FIELD ISOLATOR E-STOP STATION
14004-E-MC2-013	BACKWASH PUMP NO.1
14004-E-MC2-014	BACKWASH PUMP NO.2
14004-E-MC2-015	FILTER BACKWASH BLOWER NO.1(DUTY)
14004-E-MC2-016	FILTER BACKWASH BLOWER NO.2(STANDBY)
14004-E-MC2-017	FILTER OVERHEAD CRANE DRIVE
14004-E-MC2-018	COMPRESSOR NO.1(DUTY)
14004-E-MC2-019	COMPRESSOR NO.2(STANDBY)
14004-E-MC2-020	DAF-RECYCLE PUMP NO.1(DUTY)
14004-E-MC2-021	DAF-RECYCLE PUMP NO.2(STANDBY)
14004-E-MC2-022	BRIDGE DRIVE UNIT FOR SECOND TURBO FLOCCULATOR
14004-E-MC2-023	FLOCCULANT DOSING STIRRERS
14004-E-MC2-024	CHEMICAL DOSING BUILDING ,STORES AND INLET WORKS
14004-E-MC2-025	TURBO FLOCCULATOR NO.1
14004-E-MC2-026	FILTRATION ACTUATOR NO.1
14004-E-MC2-027	FILTRATION ACTUATOR NO.2
14004-E-MC2-028	FILTRATION ACTUATOR NO.3
14004-E-MC2-029	FILTRATION ACTUATOR NO.4
14004-E-MC2-030	MAIN SUPPLY INCOMER
14004-E-MC2-031	DAF ACTUATOR ON VARIOUS VALVE DIAMETERS NO.1
14004-E-MC2-032	DAF ACTUATOR ON VARIOUS VALVE DIAMETERS NO.2
14004-E-MC2-033	DAF ACTUATOR ON VARIOUS VALVE DIAMETERS NO.3
14004-E-SLD-034	FACILITY SINGLE LINE DIAGRAM
14004-E-CS-003	ELECTRICAL CABLE SCHEDULE
14004-E-CS-004	C&I CABLE SCHEDULE
14004-E-DBS-005	MAIN DB SCHEDULE
14004-E-DBS-006	NEW PUMP STATION SUB DB- SCHEDULE
14004-E-PCS-037	PROCESS CONTROL SCHEDULE
14004-E-PCA-038	PROCESS CONTROL ARCHITECTURE
031-A01-WTW-ELEC-001	FLOCCULANT DOSING TO POST CHLORINE BOOSTER PUMPS
031-A01-WTW-ELEC-002	PRE CHLORINE TO SLUDGE MIXER
031-A01-WTW-ELEC-003	BACKWASH PUMPS

031-A01-WTW-ELEC-004	OVERHEAD CRANE
031-A01-WTW-ELEC-005	COMPRESSORS TO LOCAL DB
031-A01-WTW-ELEC-006	DESLUDGING ACTUATOR BALL VALVES L1
031-A01-WTW-ELEC-007	DESLUDGING ACTUATOR BALL VALVES L2
031-A01-WTW-ELEC-008	DESLUDGING ACTUATOR BALL VALVES L3
031-A01-WTW-ELEC-009	DAF ACTUATOR BUTTERFLY VALVE
031-A01-WTW-ELEC-010	DAF ACTUATOR KNIFE GATE VALVE
031-A01-WTW-ELEC-011	SAND FILTER CLARIFIED WATER ACTUATED BUTTERFLY VALVE
031-A01-WTW-ELEC-012	SAND FILTER BACKWASH WATER ACTUATED BUTTERFLY VALVE
031-A01-WTW-ELEC-013	SAND FILTER FILTERED WATER ACTUATED BUTTERFLY VALVE
031-A01-WTW-P&ID-001	EXISTING & NEW ABSTRACTION PUMP STATION
031-A02-WTW-P&ID-002	INLET WORK
031-A03-WTW-P&ID-003	HIGH-RATE SETTLERS
031-A04-WTW-P&ID-004	FLOCCULATION AND DAF
031-A05-WTW-P&ID-005	NEW SAND FILTERS
031-A06-WTW-P&ID-006	CLEARWATER AND SERVICE PUMP STATION
031-A07-WTW-P&ID-007	BLOWER AND COMPRESSOR
031-A08-WTW-P&ID-008	CHLORINE CONTACT TANK & HIGH LIFT PUMPS
031-A09-WTW-P&ID-009	SLUDGE HOLDING TANK, SLUDGE TRANSFER & SUPERNATANT PUMP STATION
031-A10-WTW-P&ID-010	SLUDGE DRYING BEDS
031-A11-WTW-P&ID-011	BLOEMHOF COMMAND RESERVOIR & TOWER
031-A12-WTW-P&ID-012	CHEMICAL STORAGE & DOSING SYSTEMS
BWWTW-EL-LL-200	WORKSHOP BUILDING LIGHTING LAYOUT GROUND FLOOR
BWWTW-EL-LL-100	WORKSHOP BUILDING LIGHTING LAYOUT GROUND FLOOR
BWWTW-EL-PL-200	WORKSHOP BUILDING POWER LAYOUT GROUND FLOOR
BWWTW-EL-PL-100	WORKSHOP BUILDING POWER LAYOUT GROUND FLOOR
BWWTW-EL-PL-300	WORKSHOP BUILDING SINGLE LINE DIAGRAM
031-A02-HVAC-DRW-001	WORKSHOP BUILDING HVAC LAYOUT
14004-E-SP-050	MCC ROOM FLOOR PLAN
14004-E-LS-045 (1-3)	LIGHTING LAYOUT
14004-E-CC-046	CABLE CONTAINMENT
8003-ESR-001	SITE PLAN ELECTRICAL RETICULATION LAYOUT

2. PROCUREMENT

2.1. Preferential procurement procedures

The works shall be executed in accordance with the conditions attached to preferences granted in accordance with the preferencing schedule.

2.2. Scope of mandatory subcontract work

No mandatory subcontracted work required.

3. CONSTRUCTION

3.1. Applicable SANS standards for Construction Works.

The following SANS specifications are also referred to in this document and the Contractor is advised to obtain them from Standards South Africa (a division of SABS) in Pretoria.

SANS 10396: 2003:	Implementing Preferential Construction Procurement Policies using Targeted Procurement Procedures
SANS 1914-5 (2002)	Participation of Targeted Labour
SANS 1921-1 (2004):	Construction and Management Requirements for Works Contracts Part 1: General Engineering and Construction Works
SANS 1921-2 (2004):	Construction and Management Requirements for Works Contracts; Part 2: Accommodation of Traffic on Public Roads Occupied by the Contractor.
SANS 1921-3	Construction and management requirements for works contracts; Part 3: Structural Steelworks
SANS 1921-6	Construction and management requirements for works contracts; Part 6: HIV / AIDS Awareness.

The standardised specifications (SABS 1200) must be read in conjunction with the new SANS 1921 family of standards. In case of any discrepancy or conflict between the two, the SANS specification shall take precedence and shall govern.

The term "project specifications" appearing in any of the SABS 1200 standardised specifications is deemed to be equivalent to the term "scope of work" in SANS Specifications.

3.2. Applicable National standards

Although not bound in or issued with this document, the following SABS 1200 Standardised Specification for Civil Engineering Construction as approved by the Council of the South African Bureau of Standards shall apply to this Contract. The Contractor shall be in possession of these Standardised Specifications and their related SANS 1200 Code of Practice that apply equally and shall keep a copy of each on site for reference by him and the Engineer for the duration of the Contract.

For "Workmen's Compensation Act" read "Compensation for Occupational Injuries and Diseases Act, 1993 (Act No.130 of 1993)" wherever it appears. For "Machinery and Occupational Safety Act" and "Mines and Works Act" read "Occupational Health and Safety Act, 1993 (Act 85 of 1993)" wherever they appear.

For "maintenance period" read "Defects Liability Period" in terms of Clause 7.8 of the General Conditions of Contract for Construction Works 2010, wherever it appears.

SANS 1200 Specifications applicable are:

SANS 1200 A -	1986	General
SANS 1200 AB -	1986	Engineer's Office
SANS 1200 C -	1980 (19 May 1982)	Site Clearance
SANS 1200 D -	1988	Earthworks

Copies of SANS 1200 Standardised Specifications are available from the South African Bureau of Standards, Private Bag X191, Pretoria, 0001.

The variations and additions to the Standardised Specifications as well as the Particular Specifications listed above are included in Section 7. The variations are prefixed PS and take precedence over the SABS Standardised Specification.

3.3. Certification by recognised bodies

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

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

3.4. Plant and materials

Where not supplied by the employer, (e.g. as free-issue material), all plant and material required for the implementation of the works must be procured by the contractor.

3.5. Materials, samples and shop drawings

All other materials required for incorporation into the permanent works are to be supplied by the contractor. Where possible these materials should be sourced from within the Dr Ruth S Mompoti District Municipality area, taking into account availability of supply, price and continuity of supply.

3.6. Construction equipment

The contractor shall provide all construction equipment and plant necessary to complete the works. Primary equipment considered necessary for the completion of the installation is listed below: -

- Tractor-Loader-Backhoe
- Boom Lift
- Crane Truck 10 Ton
- Tamping Rammer
- 6m³ Tipper Truck and,
- Other equipment relevant to complete the electrical work successfully.

3.6.1. Requirements for equipment

All construction equipment shall be used for the purpose that it was designed for, should be in good working condition and shall be used in a safe manner and shall comply with all relevant legal and roadworthy aspects.

3.6.2. Equipment provided by the employer

The employer will not provide any plant and equipment required for construction purposed. All equipment and plant required shall be provided by the contractor.

3.7. Existing services

3.7.1. Known services

All known services will be pointed out to the Contractor. This, however, does not relieve the contractor from responsibility of verifying if any additional services are present in the area by searching and probing the terrain in question for any existing services for indications of the presence of such services. The contractor shall at all times exercise the utmost care when working in their vicinity and shall take all necessary steps to protect any existing services bear the cost of the repair of damage to any service the possible existence of which could reasonably have been ascertained by him in good time. All cables shall be considered "live" unless confirmed otherwise by the relevant service authority.

3.7.2. Treatment of existing services

All the work will be carried out in the vicinity of existing services and all such services shall remain in operation at all times, except where arrangements have been made for the interruption of the service for the purposes of carrying out the Works under this Contract.

Existing overhead and underground services may be indicated on drawings held by the respective service department. Should the contractor find evidence of possible buried services, he shall notify the Engineer immediately thereof. The engineer will assess the situation and instruct the contractor on an appropriate course of action to be taken.

The contractor shall be responsible for checking the locations of all services and to ensure that no damage is caused by construction operations.

The contractor, before starting any excavations or where indicated in the scope of work or site information that underground services either cross or are located adjacent to the pipeline that is to be constructed, such services shall be exposed by hand ahead of trenching operations to enable any changes that might be needed in the design of the pipeline to be made timeously. Care shall be taken in exposing such services to avoid damaging them. An item has been allowed for in the Schedule of Quantities for hand excavation or other method to search for existing services.

3.7.3. Use of detection equipment for the location of underground services

The Contractor shall be allowed to use non-intrusive equipment for the location of existing services if so agreed.

3.7.4. Damage to services

Should any existing services be damaged by the Contractor, the Engineer shall be informed immediately. The contractor shall repair the damaged service if so instructed by the Engineer.

3.8. Site establishment

3.8.1. Services and facilities provided by the employer

BENCHMARK INFORMATION			
Name	Y Coord	X Coord	Elevation
BM1	58813,765	3059848,476	Cover CL 1224,479
BM2	58833,257	3059885,134	Cover CL 1224,57
BM3	58833,727	3059891,221	Cover CL 1224,44

3.8.2. Facilities provided by the contractor

(i) Contractor's Camp

The contractor will be responsible for the identification of and arrangements for a suitable site for the Contractors camp. The camp site shall be kept clean and tidy, and at the completion of the contract shall be restored to its original condition at the Contractor's own cost, and to the satisfaction of the Engineer.

In order to facilitate compliance with the Condition of Contract and the Specification, the Contractor may establish storage accommodation, works offices, workshops, mess-rooms kitchens, shelters for watchmen, latrines, ablutions and the like in such positions and under such conditions as may be agreed by the Engineer.

Temporary buildings and fencing are to be neat and presentable and the surrounding areas must at all times be kept in a neat, clean and orderly condition. The contractor shall not make any excavation without written permission of the Engineer.

Covered accommodation for perishable or corrodible material, fittings, and the like shall be adequate and suitable for their purposed, and particularly in the case of cement stores, shall be well ventilated, weatherproof and waterproof with floors raised off the ground, so as to keep the materials perfectly dry and freely aerated. All such accommodation shall be subject to the approval of the Engineer who shall have free access there at all times.

In addition to the above the contractor shall provide one toilet per 15 workmen. Portable toilet facilities shall be made available to workers of both male and female genders, the number provided to be in proportion to the ration of the sexes. The toilets shall be located in the vicinity of the work site, shall be screened from public view and the use thereof shall be enforced. In view of the extended nature of the site, the provision of portable toilets that can be moved to the specific area of operation is advised.

(ii) Storage and laboratory facilities

The contractor shall provide all storage facilities required for the proper execution of the works.

(iii) Other services and facilities

The requirements of the Engineer's Site Establishment are detailed in Project Specification PSA and PSAB.

(iv) Disposal of refuse

The contractor shall be responsible for disposal of refuse and waste generated by his staff on a daily basis. The site is to be kept clean, neat and tidy, to the Employer's satisfaction.

(v) Telephone facilities

The contractor is to provide his own telephone facilities on site, but will not be required to provide a cellular telephone for the use of the engineer, or his representative for the duration of the Contract.

(vi) Housing facilities

The contractor may be required to provide rented accommodation for the Engineer's staff and this will be stated in the Schedule of Quantities. No accommodation for the Contractor's employees will be permitted on site.

3.8.3. Rail facilities

No rail facilities for contractor use are present at the site.

3.8.4. Vehicle and equipment

A vehicle for the use of the Engineer will not be required.

3.8.5. Advertising rights

Not applicable

3.8.6. Notice boards

Notice boards are to be provided as scheduled in the Bill of Quantities.

3.9. Site usage

3.9.1. Working within road reserves, Eskom servitudes, etc.

The contractor is to confine his activities strictly to the indicated working areas and to the spoil sites and the direct access roads to these. He shall not work outside his designated working areas except with the prior approval of the Employer, in writing. It is advised that the Contractor takes note of damaged structures or parts thereof and report these to the Engineer in writing before work starts at or near an existing structure to prevent possible disputes with the occupant or owner. Photographic records will be essential in this regard.

3.9.2. Site safety and precautions against nuisance

The Works are to be conducted within newly registered pipeline servitude over private land, and pedestrian and vehicular traffic may be expected. The watching, barricading, lighting, security and traffic control on site shall be carried out in strict compliance with these specifications. The contractor shall ensure that all safety measures are strictly adhered to.

Plant used on the Works shall be as efficiently silenced as possible and noisy operations will be permitted only between the hours of 07:00 and 17:00. Any work outside normal hours will be permitted only on the written authority of the Engineer.

Wherever excavations or loading of material is liable to form dust, an effective method of spraying water over the excavated area and loaded material shall be instituted. Any rock or debris falling from trucks on the roads shall be removed immediately. Precautions shall be taken to prevent fouling of site and public roads by trucks. The engineer may order the contractor to clean roads where the mud tracking of vehicles or falling debris may constitute a danger to the public or the staff working within the works area.

3.10. Permits and wayleaves

The employer will hand over to the Contractor all wayleaves that would have been obtained prior to commencement of the contract. The contractor will be required to renew wayleaves as necessary and to obtain any outstanding wayleaves. The employer will apply for environmental authorisation and for water use licences. In the event that water use licenses for river crossing are not granted before commencement of construction, the contractor will be required to skip working on the river crossings and return when the licenses are resolved.

3.11. Alterations, additions, extensions and modifications to existing works

The scope of work includes all necessary interventions to or remedial works and modifications to the existing water treatment plant.

3.12. Inspection of adjoining properties

The contractor shall undertake detail inspection of affected adjoining properties noting any and all structural or other defects.

A full photographic record of the status of the affect properties is to be undertaken prior to the commencement of works in the vicinity of such structures. Written record with photographs of such will be given to the land owner and or tenant prior to the commencement of the works.

3.13. Maintenance of Water Treatment Works Operations

Before commencing the operations the contractor shall determine the operation of the plant and submit a written report in duplicate of plant current operation and defects list to the Engineer', who shall verify the facts and return a countersigned copy of the report to the contractor.

During the upgrading and extension work, the WTW is to remain functional so as to ensure a reliable supply of purified water to the residents of Bloemhof.

The Contractor will be required to respect the plants normal operations and will be required to liaise with the plant manager and current plant operators must not be unnecessarily impeded from doing their tasks. Assistance will be given where possible to plant operators when necessary. A works program showing timelines for each section of the upgrading and extension and remedial works for the plant will be drawn up by the contractor and submitted to the Engineer together with the inspection report.

3.14. Methods and procedures

The following shall be notes and shall be provided for in both the programme and the tendered rates:

- The Employer will notify the Lekwa Teemane Local Municipality of the commencement of the refurbishment of the plant 14 working days prior to start of work.
- The Contractor will ensure that the plant remains operational for the duration of the refurbishment works.
- The Contractor will commence with undertaking a full inventory list of all the equipment in the plant.
- The Contractor will then prepare a works procedure and timeline programme for the upgrading and extension of the plant.

The tenderer shall include for refurbishment of all controls, cables, motors, switchgear and starters and other devices necessary for the successful operation of the all the units and mechanism described herein.

The control and mechanical equipment and materials will be compatible with the existing.

3.14.1. Method statement

The Contractor shall prepare method statements before any work take place. A method statement will be required for each and every activity, including site establishment. The following headings will be required for each method statement;

- Goal of activity
- Persons responsible
- Dangers identified
- Safety measures to be instituted
- Work methodology
- Personnel required
- Clearing of site
- Other headings can be included.

3.15. Protection of the Existing Plant and Equipment

The contractor shall in particular ensure that the water treatment plant is kept operational at all times such as to ensure that purified water is supplied to the residents of Bloemhof.

The engineer may take or order the contractor to take additional precautions where he is not satisfied with the contractor's arrangements. The contractor shall not be relieved of his responsibility by reason of the engineer taking or ordering additional precautions, or by his responsibility by reason of the engineer taking or ordering additional precautions, or by reason of the engineer failing to do so. All expenditure incurred by the employer in taking any additional precautions or otherwise in remedying the default of the contractor and making good of the works shall be recovered from the moneys due to the contractor.

3.16. Features requiring special attention

3.16.1. Public Safety

During the performance of the work the Contractor erects and maintains temporary fences, railings and barriers and takes all other precautions including placing proper guards for the prevention of accidents; puts up and maintains signs, notices and sufficient lights. He indemnifies the Employer from all damages and costs due to injury to person or property damage resulting from the Contractor's negligence or carelessness in the implementation of the Works, or in guarding the same, or from any improper materials or equipment used in its construction, or by or on account of any act or omission of the Contractor.

In addition, the Contractor takes all practical precautions to prevent the public from being injured.

3.16.2. Damage to public and/or private property

The Contractor indemnifies and keeps indemnified Employer against all losses and claims for injuries or damage to any person or property whatsoever which arises out of or in consequence of the construction and maintenance of the Works and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

The Contractor confines his activities to the minimum possible width. As far as possible the Contractor avoids unnecessary damage to buildings, structures, reservoirs, canals, roads, pavements, parks, trees, gardens, fences, gates, walls and other ground level services, etc. The liability for all necessary and reasonable damage within a width to be pre-determined by the Project Manager and conveyed in writing to the Contractor is borne by the Employer, the Contractor is liable for all unnecessary and unreasonable damage, the cost of repair and reinstatement of which is deducted from monies due to the Contractor.

3.16.3. Fences and adjacent structures

The pipeline route runs parallel to and affects different types of fences and crosses fences numerous times. If it is in any way possible the fences or walls or part thereof must be kept in place during construction. Measures must be taken to ensure the stability of the fences or walls, kept in the original position, for the duration of construction. Measures must be taken to ensure the safety and stability of the excavation parallel to these fences or walls. Where construction operations require removal of a fence or wall the Contractor obtains the agreement of the owner and occupier of the property bounded by the fence or wall and then submits his proposals to the Project Manager for approval prior to the removal of the fence or wall. On receiving the approval in writing from the Engineer, the Contractor provides a temporary fence or barrier and takes the necessary precautions to prevent children and animals from straying. When the construction at the point is completed the Contractor reinstates and where necessary replaces and/or repairs the fence or wall to the satisfaction of the owner, the occupier, and the Project Manager to the same state or better condition. Different types of fencing have been allowed for in the BOQ.

3.16.4. Inspection of Existing Structure

The Contractor lodges to the Engineer an inspection certificate with details of the conditions and stability of the existing structure, which includes, without derogating in any way from the generality of the terms, gate piers, perimeter fence, lighting, electrical installation and mechanical equipment.

The inspection covering the full plant is required before any refurbishment work is commenced. The inspection lists details of:

- structural cracks in brickwork, masonry, IBR sheeting and structural steelwork;
- plaster cracks, damaged, glazing, ceiling boards and tiling;
- condition of access road and paving with particular imperfections noted;
- any other features such as paintwork, defective plumbing and electrical works.

The structure or building is inspected both externally and internally in the presence of a representative of Engineer and photographs of all existing defects, deterioration and/or imperfections is taken and included in the inspection.

The inspection is drawn up by the Contractor and is signed by the owner of the property and a representative of Engineer who thereby agrees to the contents of the inspection being correct.

3.16.5. Existing services, plant and equipment

The Works are to be carried out inside the existing plant. The Contractor identifies and protects all existing plant and equipment. The plant and equipment should be marked on site with markers and danger tape as applicable. Any damage to existing plant and equipment is reported to the Employer immediately and is repaired by the Contractor. Where the Contractor cannot do this work, the Employer rectifies the damage for the Contractor at the Contractor's account. Plant and equipment is inspected externally in the presence of a representative of Project Manager and photographs of the prevailing condition and all existing defects, deterioration and/or imperfections is taken and included in the inspection. Should damage occur, then the Contractor has to ensure that follow up action is initiated and taken by him/her and the necessary liaison; repair and reporting are done within practical timeframes.

3.16.6. Protection of Cables, Pipes, and Telephone lines, etc.

The Contractor takes special care when while carrying out any work under the contract not to damage any cabling, piping, flexible hoses, equipment and plant.

All cabling, piping and flexible hoses are exposed and clearly visible within the plant.

The Contractor is liable for any damage that occurs to any cable, pipe, etc, and immediately notifies the Engineer of any such damage. The Engineer arranges for the damage to be repaired by the owners of the damaged service and the cost of such repairs is deducted from any monies due to the Contractor.

3.17. Risk management

The Contractor ensures that his risks are managed to enable the successful execution of the project.

The Contractor's risk that occurs or develops during construction is brought to the Employer's attention in writing immediately. A risk register must be kept for the duration of the project.

A general risk analyses is performed prior to starting with the construction work, which must form part of the Safety Plan. All work will be carried out in conformance to the Occupational Health and Safety Act, 1993 (latest amendment) and the Contractor shall adhere to all the legislative requirements as per Construction Regulations 2003.

4. MANAGEMENT

4.1. Applicable SANS 1921 standards

The following parts of SANS 1921 Construction works standards and associated specification data are applicable to the works:

1) SANS 1921-1

The abovementioned South African National Standards make several references to the Specification Data for data, provisions and variations that make these standards applicable to this contract. The Specification Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and these standards.

2) SANS 1921-6

HIV/Aids Awareness

Each item of Specification Data given below is cross-referenced to the clause in the standard to which it mainly applies.

The associated Specification Data is as follows:

SANS 1921-1, Construction and management requirements for works contracts – Part 1: General engineering and construction works	
Clause	Specification data
Essential data	
4.1.7	There are no requirements for drawings, information and calculations for which the contractor is responsible
4.2.1	The responsibility strategy assigned to the contractor for the works is A.
4.2.2	The structural engineer is not applicable
4.3.1	The planning, programme and method statements are to comply with the following: 1) not applicable State requirements for format of programme, level of detail, critical path activities and their dependencies, frequency of updating, etc., if not provided in the contract data. Provide particulars of phased completion, programme constraints, milestone dates for completion, etc., as necessary. State requirements for sequencing, as required. State any requirements for software for programmes.
4.3.3	The notice period for inspection is 2 Days
4.7.3	The overbreak allowances for blasting are provided for in the scope of work. And is 600 mm
4.9.3	The trees and shrubs which are not to be disturbed are identified in the scope of work.as <i>per drawing</i>
4.12.2	The samples of materials, workmanship and finishes that the contractor is to provide and deliver to the employer are: Not applicable
4.12.2	The fabrication drawings that the contractor is to provide and deliver to the employer are: 1) not applicable.
4.14.3	The office accommodation, equipment, accommodation for site meetings and other facilities for use by the employer and his agents are: 1) Site office which shall be used for site meetings and for the contractor's use: As per drawing.
4.14.5	The Contractor is required to provide latrine and ablution facilities.
4.14.6	The requirements for the provision and erection of separate sign boards for consultants and subcontractors are: 1) The boards shall be as per the applicable
4.17.1	The requirements for the termination, diversion or maintenance of existing services are: 1)as per arrangement with the service owner and agreed with the local residents
4.17.3	Services which are known to exist on the site are: Indicated on the drawings.
4.17.4	The requirements for detection apparatus are: 1) manual excavation
4.18	The following standards and specifications shall be in addition to the provisions of 4.18: 1) not applicable.
Variations	

Not applicable			
Additional clauses			
1 Site meetings and procedures The Employer's Representative and the Contractor shall hold meetings relating to the progress of the works at regular intervals and at other such times as may be necessary. The Contractor shall attend all site meetings and shall ensure that all persons under his jurisdiction are notified timeously of all site meetings should the Employer's Representative require their attendance at such meetings. The Contractor shall keep on site a set of minutes of all site meetings, daily records of resources (people and equipment employed), a site instruction book, a complete set of contract working drawings and a copy of the procurement document and make these available at all reasonable times to all persons concerned with the contract. 2 Water and electricity The Employer does not warrant that any water supply or electricity supply that may exist is adequate for the proper execution of the works. The responsibility strategies in terms of the tabulation below that will apply to the contract is: a) water : A b) electricity : A			
Service	Option		
	A Contractor responsibility	B Employer responsibility	C
Water	The Contractor is to provide, and remove and make good upon completion, all the necessary temporary plumbing connections and purchase water from the local authority for the works at his own cost.	The Contractor shall make, and upon completion remove, all the necessary connections to the Employer's water supply at designated points and make use of water free of charge for construction purposes only.	The Contractor shall make, and upon completion remove, all the necessary connections and water meters to the Employer's water supply at designated points and be responsible for costs associated with all water consumed.
Electricity	The Contractor is to provide, and remove and make good upon completion, all the necessary temporary electrical connections and installations and purchase electricity from the local authority / ESKOM for the works at his own cost.	The Contractor shall make, and upon completion remove, all the necessary electrical connections to the Employer's electrical supply at designated points and make use of electricity free of charge for construction purposes only.	The Contractor shall make, and upon completion remove, all the necessary connections and meters to the Employer's electrical supply and be responsible for costs associated with all electricity consumed.

4.2. Unauthorised persons

The Contractor shall keep unauthorized persons from the works at all times. Under no circumstances may any person except guards be allowed to sleep on the building site.

4.3. Construction Programme

The tender must include a programme in bar chart format to indicate the expected duration and completion dates of all tasks.

The Contractor's programme must include:

- Contracted dates
- Sub-Contractor activities and interface points.
- Activity duration
- Activity inter-dependency
- Activity early start and finish dates
- Activity late start and finish dates
- Free and total float for each activity
- Critical path/s indication

It is the Contractor's responsibility to assess the available data and available knowledge explicitly. Any technical detail, policies, imposed organisational conditions, contract conditions; specification, overall programme constraints, resource availability or any other factor of significance to implement the project successfully must be identified by the Contractor.

Based upon the assessment described above, the Contractor decides on what level to breakdown to for his internal planning purposes.

4.4. Quality control

The contractors Quality Management System shall include quality management objectives, policies, procedures and work instruction that comply with the requirements of ISO 9001/2000.

4.4.1. Quality requirements

The contractor complies in full with the employer's quality requirements. During execution of the contract no actions to provide the works are implemented at any part of the site before the relevant quality control documentation is submitted and the engineer accepts the procedures.

The Contractor is responsible for the complete quality assurance requirements imposed on his Sub-Contractors and suppliers, in terms of SANS ISO 9000 Series.

The Contractor is responsible to inspect, expedite, administer and monitor in a pro-active manner Sub-Contractor's and supplier's work and the enforcing of the terms and conditions of their Tenders, except where extraordinary circumstances warrant the inclusion of Employer's participation.

A Quality Control Plan (QCP), which includes hold points and an inspection plan are provided by the Contractor to the Engineer for all fabrication, supply (transport) and installation of components for approval prior to start of manufacturing. The Employer uses or modifies the Contractor's QCP's and this includes inspection hold points, dimensional checks, material quality checks, tagging procedure for items, etc.

4.4.2. Contractor's QA/QC responsibilities:

All machinery, material and workmanship comply with the appropriate specifications and codes, and bear the official mark of such specifications and codes;

The Contractor conducts a continuous programme of construction quality control for all work performed on the Site. All relevant inspections and tests are adequately documented and signed off by the Supervisor;

The Contractor complies with any quality assurance procedures required by the Employer.

The Supervisor monitors the Contractor's adherence to quality requirements independently. Any rejections by the Supervisor based on design, specifications, codes and the like is binding.

4.4.3. Quality audits:

The Employer reserves the right to perform quality audits at any time during the execution of the Works.

The Contractor gives 48 (forty-eight) hours' notice (in writing) to the Supervisor, prior to testing. The Supervisor exercises the option to witness or not, such tests.

4.5. Recording of weather

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

4.6. Format of communication

All contract communication shall be in English and in writing (letters, faxes and electronic mail).

Site and Technical Meetings

The Contractor shall attend site and technical meetings with representatives of the Municipality and the Engineer at dates and times determined by the Municipality. The safety officer will attend all the site meetings.

4.7. Forms for contract administration

The contractor shall maintain a file (hard copy and electronically), which shall contain:

- a) The details of the sub-contractors, if any;
- b) Project programme, with commencement and completion date;
- c) Procurement information;
- d) Progress reports, minutes, letters, faxes, emails of all project or project related correspondence;
- e) Record documentation, reports, designs, and drawings;
- f) A copy of the Health and Safety Plan and the Environmental Management Plan
- g) Record of cost implications, variations, claims and disputes; and
- h) Empowerment records.

At the end of this period of performance the contractor shall hand-over such hard copy files to the employer, including all electronic records, documentation, reports, designs, and drawings,

4.8. Daily records

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

4.9. Payment certificates

Contractor's certificate must be submitted not later than the 10th of each month to the RE with supporting quantities. Quantities must reflect the total quantities up to the previous claim, with calculation for the quantities of the month of the certificate.

4.10. Proof of compliance with the law

The service provider shall ensure that he complies to all prevailing legislation that applies to the provision of his services as part of this contract and indemnifies the employer where he deliberately neglects compliance with such legislation.

5. PARTICULAR SPECIFICATIONS

References to the project in terms of the Occupational Health and Safety Act and Regulations specifications in terms of the construction regulations 4(1)(a) of the Occupational Health and Safety Act No 85 of 1993.

5.1. Background

In terms of the Construction Regulation 4 (1) (a) of the Occupational Health and Safety Act, No. 85 of 1993, the Client is required to compile a Health & Safety Specification for the intended project and provide such specification to any prospective tenderer.

The Client's further duties are as 4(1) to 4(6) in The Construction Regulations, July 2003.

5.2. Scope

Development of a Health & Safety Specification that addresses all aspects of occupational health and safety as affected by the **UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS; ELECTRICAL WORKS.**

5.3. OH&S Management

5.3.1. Structure and Organisation of OH&S Responsibilities

5.3.1.1. Overall Supervision and Responsibility for OH&S

- The Client is to ensure that the Principal Contractor, appointed in terms of Construction Regulation 4(1)(c), implements and maintains the agreed and approved OH&S Plan.
- The Chief Executive Officer of the Principal Contractor in terms of Section 16 (1) of the Act is to ensure that the Employer (as defined in the Act) complies with the Act. **Annexure 2 - "Legal Compliance Audit"** may be used for this purpose.
- Any OH&S Act (85 /1993), Section 16 (2) appointee/s as detailed in his/her respective appointment forms.
- The Construction Supervisor and Assistant Construction Supervisor/s appointed in terms of Construction Regulation 6.

5.3.1.2. Further (Specific) Supervision Responsibilities for OH&S

Appointments required by the Act and Regulations:

- OH&S Representatives (Sections 17/18 of the Act)
- OH&S Committees (Sections 19/20 of the Act)
- Risk Assessor (Construction Regulation. 7(1))
- Accident/Incident Investigations Co-coordinator (General Administrative Regulation 9 (2))
- Form/Support work Supervisor (Construction Regulation 10(a))
- **Batch Plant Supervisor (Construction Regulation 18(1))**
- **Stacking & Storage Supervisor (Construction Regulation 26(a))**
- **Fire Equipment Inspector (Construction Regulation 27(h))**
- Electrical Installations, Machinery & Appliances Inspector (Construction Regulation 22)
- Excavations Supervisor (Construction Regulation 11(1))
- Demolition Supervisor (Construction Regulation 12(1))
- OH&S Officer (where necessary) (Construction Regulation 6(6))
- Person Responsible for Machinery (General Machinery Regulation 2)
- Emergency, Security and Fire Co-coordinator (Construction Regulation 27(h) & Environmental Regulation 9)
- Fire Equipment Inspector (Construction Regulation 27(h) Environmental Regulation 9)
- First Aider (General Safety Regulation 3(2))
- Hazardous Chemical Substances Supervisor (HCS Regulations)
- Ladders Inspector (General Safety Regulation 13A)
- Lifting Equipment Inspector (Construction Regulation 20)
- Operators & Drivers of Construction Plant & Vehicles (Construction Regulation 21 (i))
- Structures Supervisor (Construction Regulation 9)
- Users Operators of Construction Equipment (Construction Regulation 21(i))

- Welding Supervisor (General Safety Regulation 9)
- 5.3.2. Communication and Liaison

- OH&S liaison between the Client, the Principal Contractor, the other Contractors, the Consulting Engineer and other concerned parties will be through the OH&S Committee as in **3.10**.
- In addition to the above, communication may be directly to the Client or his appointed Agent, verbally or in writing, as and when the need arises.
- Consultation with the workforce on OH&S matters will be through their Supervisors, OH&S Representatives, the OH&S Committee and their elected Trade Union Representatives, if any.
- The Principal Contractor will be responsible for the dissemination of all relevant OH&S information to the other Contractors e.g. design changes agreed with the Client and the Consulting Engineer, instructions by the Client and/or his/her agent, exchange of information between Contractors, the reporting of hazardous/dangerous conditions/situations etc.

5.3.3. OH&S File

The Principal Contractor must, in terms of Construction Regulation 5 (7), keep a health and safety file on site at all times that must include all documentation required in terms of the Act and Regulations and must also include a list of all Contractors on site that are accountable to the Principal Contractor and the agreements between the parties and details of work being done. The following documents must be kept in the OH&S file:

- Notification of Construction Work (Construction Regulation 3.)
- Copy of OH&S Act (updated) (General Administrative Regulation 4.)
- Proof of Registration and good standing with a COID Insurer (Construction Regulation 4 (g))
- Copy of health and safety plan (construction regulation 5 (1))
- OH&S Programme agreed with Client including the underpinning Risk Assessment and Method Statements (Construction regulation 5 (1))
- Designs/drawings (Construction Regulation 5 (8))
- A list of Contractors (Subcontractors) including copies of the agreements between the parties and the type of work being done by each contractor (Construction Regulation 9)
- Appointment / Designation forms as per 3.1.1. and 3.1.2. above.
- Registers as follows:
 - Accident/Incident Register (Annexure 1 of the General Administrative Regulations)
 - OH&S Representatives Inspection Register
 - Form/Support work Inspection
 - Excavations Inspection
 - Lifting Equipment
 - Demolition Inspections
 - Designer's Inspection of Structures Record
 - **Batch Plant Inspections**
 - **Arc & Gas Welding & Flame Cutting Equipment Inspections**
 - **Construction Vehicles & Mobile Plant Inspections**
 - **Electrical Installation and Machinery Inspections**
 - **Fire Equipment Inspection & Maintenance**
 - **First Aid**
 - Hazardous Chemical Substances
 - **Lifting Tackle and Equipment Inspections**
 - **Inspection of Cranes**
 - **Inspection of Ladders**
 - **Inspection of Vessels under Pressure**
 - Machinery Inspections
 - Drivers/Operators of Mobile Plant/Construction Vehicles Daily Inspections

The Principal Contractor will be required to submit the abovementioned registers monthly to the chairperson of the OH&S Committee for endorsement.

The Health & Safety File must be handed over to the Client on completion of the contract. It must contain all the documentation handed to the Principal Contractor by any subcontractors together with a record of all drawings, designs, materials used and other similar information concerning the completed project.

5.3.4. OH&S Goals and Objectives and Arrangements for Monitoring and Review of OH&S Performance

The Principal Contractor is required to maintain a Compensation Incidence Frequency Rate (**CIFR**) of at least 8 (Refer **Annexure 3** - "Measuring Injury Experience") and to report on this to the Client on a monthly basis.

5.3.5. Identification of Hazards and Development of Risk Assessments, Standard Working Procedures (SWP) and Method Statements

The Principal Contractor is required to develop Risk Assessments, Standard Working Procedures (SWP) and Method Statements for each activity executed in the contract or project (Refer to **Section 4.** below "Project/Site Specific Requirements")

5.3.6. Arrangements for Monitoring and Review

5.3.6.1. Monthly Audit by Client

The Client will be conducting a Monthly Audit to comply with Construction Regulation 4 (1) (d) to ensure that the Principal Contractor has implemented and is maintaining the agreed and approved OH&S Plan.

5.3.6.2. Other Audits and Inspections by Client

The Client reserves the right to conduct other ad hoc audits and inspections as deemed necessary.

A representative of the Principal Contractor must accompany the Client on all Audits and Inspections and may conduct his/her own audit/inspection at the same time. Each party will, however, take responsibility for the results of his/her own audit/inspection results.

5.3.6.3. Reports

The Principal Contractor is required to provide the Client with a monthly report in the format as per the attached **Annexure 4: "SHE Risk Management Report"**

The Principal Contractor must report all incidents where an employee is injured on duty to the extent that he/she:

- dies
- becomes unconscious
- loses a limb or part of a limb
- is injured or becomes ill to such a degree that he/she is likely either to die, or to suffer a permanent physical defect, or likely to be unable for a period of at least 14 days either to work or continue with the activity for which he/she was usually employed.

OR where

- a major incident occurred
- the health or safety of any person was endangered
- where a dangerous substance was spilled
- the uncontrolled release of any substance under pressure took place
- machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
- machinery ran out of control

to the Provincial Director of the Department of Labour within seven days. (Section 24 of the General Administrative Regulation 8.). The Principal Contractor is required to provide the Client with copies of all statutory reports required in terms of the Act.

The Principal Contractor is required to provide the Client with copies of all internal and external accident/incident investigation reports including the reports contemplated in 3.9. below.

5.3.6.4. Review

The Principal Contractor is to review the Hazard Identification, Risk Assessments and SWP's at each two weekly site inspection/meeting as the construction work develops and progresses and each time that changes are made to the designs, plans and construction methods and processes.

The Principal Contractor must provide the Client, other Contractors and all other concerned parties with copies of any changes, alterations or amendments.

5.3.7. Site Rules and Other Restrictions

5.3.7.1. Site OH&S Rules

The Principal Contractor must develop a set of site-specific OH&S rules that will be applied to regulate the OH&S aspects of the construction.

5.3.7.2. Security and Emergency Arrangements

The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period.

Access control must include the rule that non-employees will not be allowed on site unaccompanied.

The Principal Contractor must develop a set of security rules and procedures and maintain these throughout the construction period.

The Principal Contractor must appoint a competent Emergency Controller who must develop emergency contingency plans for any emergency that may arise on site as indicated by the risk assessments. These must include a monthly practice/testing programme for the plans e.g. January: trench collapse, February: flooding etc. and practiced/tested with all persons on site at the time, participating.

5.3.8. Training

The contents and syllabi of all training required by the Act and Regulations must be included in the Principal Contractor's OH&S Plan.

5.3.8.1. General Induction Training

All employees of the Principal and other Contractors to be in possession of proof of General Induction Training.

5.3.8.2. Site Specific Induction Training

All employees of the Principal and other Contractors to be in possession of Site Specific OH&S Induction Training.

5.3.8.3. Other Training

All operators, drivers and users of construction vehicles, mobile plant and other equipment to be in possession of valid proof of training.

All employees in jobs requiring training in terms of the Act and Regulations to be in possession of valid proof of training.

OH&S Training Requirements: (as required by the Construction Regulations and as indicated by the OH&S Specification and the Risk Assessment/s):

- General Induction (Section 8 of the Act)
- Site/Job Specific Induction (also visitors) (Sections 8 & 9 of the Act)
- Site/Project Manager
- Construction Supervisor
- OH&S Representatives (Section 18 (3) of the Act)
- Training of the Appointees indicated in 3.1.1. & 3.1.2. above
- Operation of Cranes (Driven Machinery Regulations 18 (11))

- Operators and Drivers of Construction Vehicles & Mobile Plant (Construction Regulation 21)
- **Basic Fire Prevention & Protection (Environmental Regulations 9 and Construction regulation 27)**
- **Basic First Aid (General Safety Regulations 3)**
- **Storekeeping Methods & Safe Stacking (Construction Regulation 26)**
- Emergency, Security and Fire Co-coordinator

5.3.9. Accident and Incident Investigation

The Principal Contractor is responsible for the investigation of all accidents/incidents where employees and non-employees were injured to the extent that he/she had to be referred for medical treatment by a doctor, hospital or clinic. (General Administrative Regulation 9).

The results of the investigation to be entered into the Accident/Incident Register. (General Administrative Regulation 9)

The Principal Contractor is responsible for the investigation of all non-injury incidents as described in Section 24 (1) (b) & (c) of the Act and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

The Principal Contractor is responsible for the investigation of all road traffic accidents and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

5.3.10. OH&S Representatives and Committees

5.3.10.1. Designation of OH&S Representatives

Where the Principal Contractor employs more than 20 persons (including the employees of other contractors (sub-contractors) he has to appoint one OH&S Representative for every 50 employees or part thereof. General Administrative Regulation 6 requires that the appointment or election and subsequent designation of the OH&S Representative is executed in consultation with Employee Representatives or Employees. (Section 17 of the Act and General Administrative Regulation 6. & 7.)

OH&S Representatives have to be designated in writing and the designation must include the area of responsibility of the person and term of the designation.

5.3.10.2. Duties and Functions of the OH&S Representatives

The Principal Contractor must ensure that the designated OH&S Representatives conduct a minimum monthly inspection of their respective areas of responsibility using a checklist and report thereon to the Principal Contractor.

OH&S representatives must be included in accident/incident investigations.

OH&S representatives must attend all OH&S committee meetings.

5.3.10.3. Appointment of OH&S Committee

The Principal Contractor must establish an OH&S Committee consisting of all the designated OH&S Representatives together with a number of management representatives (this number is not to exceed the number of OH&S representatives on the committee) and a representative of the Client who shall act as the chairperson without a vote. The members of the OH&S committee must be appointed in writing.

The OH&S Committee must meet minimum monthly and consider, at least, the following Agenda:

- Opening and welcome
- Present/Apologies/Absent
- Minutes of previous meeting
- Matters arising from the previous minutes
- OH&S Representatives Reports
- Incident Reports & Investigations
- Incident /Injury statistics
- Other matters
- Endorsement of Registers and the statutory documents by a representative of the Principal Contractor

- Close/Next Meeting

5.4. Project / Site Specific Requirements

The following is a list of specific activities and considerations that have been identified for the project and the construction site and for which Risk Assessments, Standard Working Procedures (SWP), management and control measures and Method Statements (where necessary) have to be developed by the Principal Contractor:

- Site Establishment including:
 - Office/s
 - Secure/safe storage for materials, plant & equipment
 - Ablutions
 - Sheltered eating area
 - Maintenance workshop
 - Vehicle access to the site
- Dealing with existing structures
- Location of existing services
- Installation and maintenance of temporary construction electrical supply, lighting and equipment
- Adjacent land uses/surrounding property exposures
- Boundary and access control/Public Liability Exposures (NB: the Employer is also responsible for the OH&S of non-employees affected by his/her work activities.)
- Health risks arising from neighbouring as well as own activities and from the environment e.g. threats by dogs, bees, snakes, lightning etc.
- Exposure to noise
- Exposure to vibration
- Protection against dehydration and heat exhaustion
- Protection from wet & cold conditions
- Dealing with HIV/Aids and other diseases
- Use of Portable Electrical Equipment including
 - Angle grinder
 - Electrical drilling machine
 - Skill saw
- **Welding including**
 - Arc Welding
 - Gas welding
 - Flame cutting
 - Use of LP gas torches and appliances
- Loading & offloading of trucks
- Materials delivery
- Manual and mechanical handling
- Lifting and lowering operations
- Driving & operation of construction vehicles and mobile plant including
 - Mobile cranes and the ancillary lifting tackle
 - Parking of vehicles & mobile plant
 - Towing of vehicles & mobile plant
- Use and storage of flammable liquids and other hazardous substances
- Removal and disposal of hazardous waste
- Installation plant and equipment in existing structure
- Pressure testing of existing pipelines
- Protection from exposed power cables
- As discovered by the Principal Contractor's hazard identification exercise
- As discovered from any inspections and audits conducted by the Client or by the Principal Contractor or any other Contractor on site
- As discovered from any accident/incident investigation.

6. AMENDMENTS TO THE STANDARD AND PARTICULAR SPECIFICATIONS

CONTENTS:

PSA:	GENERAL (SANS 1200A-1986)
PSAB:	ENGINEER'S OFFICE (SANS 1200 AB-1986)
PSC:	SITE CLEARANCE (SANS 1200 C 1980-as amended 1982)
PSD:	EARTH WORKS (SANS 1200A-1988 –as amended 1990)
PSDB:	EARTHWORKS (PIPE TRENCHES) (SANS 1200A-1989)
PSDM:	EARTHWORKS (ROADS AND SUBGRADE) (SANS 1200A-1981)
PSG:	CONCRETE (SANS 1200A-1982)
PSH:	STRUCTURAL STEELWORK (SANS 1200A-1990)
PSHB:	CLADDING AND SHEETING (SANS 1200A-1986)
PSHC:	CORROSION PROTECTION OF STRUCTURAL STEELWORK (SANS 1200A-1988)
PSL:	MEDIUM PRESSURE PIPELINES (SANS 1200A-1983)
PSLB:	BEDDING (PIPES) (SANS 1200A-1983)
PSME:	SUBGRADE (SANS 1200A-1981)
PSMF:	BASE (SANS 1200A-1981)
PSMJ:	SEGMENTED PAVING (SANS 1200A-1984)
PSMK:	KERBING AND CHANNELLING (SANS 1200A-1983)

C3.2 PARTICULAR SPECIFICATIONS

7. PARTICULAR SPECIFICATIONS

The following Standard and Particular Specifications, as bound in this document and as amended in the Project Specifications, shall apply

PS 1000: Electrical and Instrumentation Design

PS 2000: Construction Occupational Health – Safety – Environment Audit System

PS 3000: Guidelines for the development of a Health and Safety Plan.

PS 4000: Guide to Risk Assessment

PS 5000: Sedibeng Particular Specifications

PS 1000: PARTICULAR ELECTRICAL SPECIFICATION

ELECTRICAL AND INSTRUMENTATION DESIGN

SCOPE OF WORK SUMMARY

The scope of work for the extension of Bloemhof water treatment works involves the supply, installation and commissioning of the new electrical works for the extension of the WTW. The contractor should do the complete testing of all areas as per SANS regulation to ensure compliance of the installation and to issue a COC for the installation.

1.1 Bulk Power Supply

This new power supply arrangement consisting of a 1000kVA miniature substation will feed the refurbished treatment works, the new upgraded feed to the raw water treatment works and the future expanded water treatment works with a consolidated common supply. This will be implemented by an installation of a new additional miniature substation rated at 1000kVA. The miniature substation will be fed from the 11kV dedicated line fed from Eskom substation.

1.2 Load Estimate

The total electrical load estimate of the scheme is indicated below.

Table 1: Electrical Load Estimate

AREA	MCC PLANT AREA	INS. kW	INS. kVAr	DEMAND kW	DEMAND kVAr	kVA	pf
WTW	Water Treatment Works (Refurbished)	210.1	153.6	126.9	93.1	157.4	0.81
WTWE	Water Treatment Works (Expanded)	991.1	630.5	484.4	313.5	577.0	0.83
RWW	Raw Water Abstraction Works	231.0	151.4	115.9	77.2	139.3	0.83
	TOTALS	1432.1	935.5	727.2	483.8	873.4	0.83

1.3 General Electrical Design Specification

1.3.1 Incoming Power Supply

The calculated load is 873.4kVA ADMD (after diversity maximum demand) from previous section. The required power supply capacity used for the power supply application is 900kVA N.M.D. (Notified Maximum Demand).

1.3.2 Power Reticulation Concept

The incoming supply will be brought into a 1000kVA miniature substation located on the site. This miniature substation incoming supply is at 11kV brought in by an 11kV line from the Eskom substation up to the boundary of the site. At this point an underground 11kV cable is used terminating on the MV side of the miniature substation located on site. Currently all the local low voltage motor control centres and the distribution boards are fed from the low voltage distribution compartment in the miniature substation. When the expansion works are commissioned, the following configuration for the low voltage reticulation will be done; a main distribution kiosk will be installed externally where all the low voltage distribution point to all MCC and DB will originate. The miniature substation supply will be fed

into a changeover panel on the standby generator and the output of the automatic changeover circuit will be feed into the distribution kiosk completing the LV power reticulation system.

1.3.3 Standby Power Supply

Two standby generators have been installed and commissioned for the Bloemhof WTW and the reservoir respectively. Bloemhof WTW Generator - The 800 kva Prime / 1088 kva standby / Three phase 230/400 volt. Reservoir Generator - 350 kva prime / 385 kva standby / three phase, 230/400 volt.

1.3.4 Power Factor Correction (PFC)

The total calculated VAR for the plant is 484Var. This will have a large impact of the power usage costs if this requirement is supplied by the utility at all times. To achieve a near unity power factor for the installation power factor correction equipment will be installed on the LV network to achieve near unity of unity power factor. This will be done with equipment that does power factor correction in steps to cater for different main plant operating points and configurations so that in most instances a unity power factor can be maintained.

1.3.5 Lighting Design Concept

Lighting systems that meet South African Bureau of Standards (SABS) with certification will be used throughout the installation. To achieve a high green building impact. Modern proven lighting systems with a local manufacturing content of 80% will be required and specified.

1.3.6 Cable Containment and Sleeves

Power cable and general wiring above ground will be supported and protected using heavy duty cable galvanised mild steel trays. Cable made of PVC steel wired armour shall be buried in non-clay ground.

Data, telephone, security and fire cable networks will be installed and supported by trunking. The cables will be installed in cable conduit when in masonry meeting quality and performance specifications as stipulated by South African National Standards (SANS) authority. For surface mounted conduit, galvanised mild steel tubing will be used.

1.3.6 Power Cabling and Wire

The main feed cable from the metering point, the supply cable and the reticulation cables to the sub distribution boards will PVC steel wired armour with fire retardant properties all made to SANS specifications and colour coding.

1.3.7 Motor Control Centres (MCC's)

The new 400V motor MCC be provided with circuit breaker contactor arrangements to comply with Type 2 coordination. Standardisation with the existing equipment will be employed where practical but absolute technology will be replaced with more modern technology. The MCC shall comply with specifications used for these scheme and accepted by the client.

1.3.8 Electrical Motors

The electric motors shall comply to the specifications on these project and shall be according to the motor data sheets that are included as part of the equipment supply requirements. The motors shall have class H insulation and run on a B temperature rise. The motors shall be rated for premium efficiency.

1.3.10 Earthing and Lightning Protection

A proper Earthing system will be provided for the entire works. The earth of the low voltage supply from the Municipality will be electrically connected to the Earthing system for the entire works. Adequate

lightning protection will be provided for all building structures as well as all electrical equipment. The Earthing standard shall be according to the prescribed SANS specifications.

Supervision, Control and Data Acquisition (SCADA)

It is proposed that supervision, control and data acquisition (SCADA) systems be provided at all plant areas with a reasonable level of sophistication. It is proposed that a SCADA system be provided for the Bloemhof plant. The benefits and advantages of a SCADA system, to managerial and operational staff, are numerous and it is of great assistance to ensure that maximum production capacity of the plant is maintained. The most basic function of the SCADA system is to provide an interface, which allows the operator to monitor and control the various equipment of the plant. The SCADA system will also provide an important logging (stop and start and running hours of equipment), alarming, trend (flows and chemical dosages) and history facilities, which is essential for a plant of this size. Optimisation of the plant can thus be achieved regarding treatment capacity, water quality and the utilisation of chemicals.

1.3.11 Tele-control and Telemetry

The full functionality of the WTW expansion should have installed telemetry control system. The additional capability to interface with the raw water abstractions works (RWW) and existing water treatment works should be allowed and the automatic control of the pumps at the RWW should be possible. The pumping control to the reservoirs and system condition of the levels in the reservoirs should be integrated into the control system.

1.3.12 Fire Detection and Suppression

An allowance for fire detection and suppression is not allowed for at this stage of the estimate and design phase but the actual final inclusion will be subject to the requirements of the rational fire design concept from the fire consultant input.

A : Particular Electrical Specifications

B: Low Voltage Motor Control Centres

C: Low Voltage Motor Specifications

D: Industrial Installations and Commissioning

A : Particular Electrical Specifications

1.0	SCOPE DESCRIPTION
2.0	REFERENCE DOCUMENTS AND STANDARDS
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2.2	Codes and Standards
3.0	OPERATING ENVIRONMENT
4.0	DESIGN CRITERIA
4.1	Scope
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4.4	Motor Control Centres and Main Distribution Boards
4.5	Motors
4.6	Power and Control Cables
4.7	Lighting
4.8	Local Safety Isolators
4.9	Field Junction Boxes
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4.11	Enclosures
4.12	Variable Speed Drives
4.13	Earthing
4.14	Cable Trays and Accessories
4.15	Local Panels / Panel Equipment
4.16	Instrument Electrical Requirements
4.17	Cables and Cable Tray Identification
5.0	NUMBERING CRITERIA
6.0	ACRONYMS AND ABBREVIATIONS

1.0 **SCOPE DESCRIPTION**

This document specifies the electrical requirements for Plant and Equipment for the Bloemhof Abstraction Water Works and Water Treatment Works Refurbishment Project. The Contractor shall design, supply, deliver, install, test and pre-commission all electrical equipment and materials to provide a fully operational installation.

2.0 **REFERENCE DOCUMENTS AND STANDARDS**

2.1 **Drawings and Specifications**

All relevant parts of the drawings must be in AutoCad or Microstation V8 format and saved in PDF file format.

3.0 **OPERATING ENVIRONMENT**

All electrical equipment and cabling shall be designed to provide continuous, long term service under the ambient and environmental conditions that will prevail on the site.

4.0 **DESIGN CRITERIA**

4.1 **Scope**

This section describes the minimum requirements for the design, supply and installation, workshop testing and commissioning of all electrical aspects of the plant.

4.2 **Plant Power Distribution**

The plant power distribution system and application criteria are as follows:

The miniature substation power transformers will be 11/0.4 kV, 3 phase, 50 Hz (neutral solidly earthed).

400 V, 3 phase, 50 Hz for motors, 0.25kW up to and including 400 kW
400/230 V, 3 phase, 4 wire, 50 Hz for lighting and service outlets.
230 V 1 phase, 50 Hz for MCC control, process control and instrumentation.

The phase identification will be red – white – blue having an anti-clockwise phase rotation.

Individual and total harmonic current distortion shall comply with the recommendations of ANSI / IEEE 519 (1992). In addition to meeting the ANSI / IEEE requirements Contractors shall also comply with the compatibility levels for individual harmonic voltages in Table 1 of NRS048 - 2 (1996).

Diagrams (circuit and connection) mark-ups shall be provided by the Contractor for all equipment within his scope of work.

The Contractor shall employ staged starting, if necessary, to ensure no more than a 10% voltage drop occurs at any MCC during the starting of a number of motors and during system restart following a complete power outage.

The voltage drop on cables shall not exceed 3%, under full load operation.

The space within the main distribution panels shall be designed with a provision for future expansion of 20%.

4.3 **Plant Single Line Diagram(s)**

The Design Engineer shall provide a single line diagram for each 400 V and 11 000 V distribution system and for each sub-area distribution panel or MCC arrangement included in the scope of supply. The information shown shall include at least:

- full load current of each feeder
- circuit type
- metering and protective devices
- motor kW rating
- equipment tag number and description
- busbar 3-phase short circuit level and current rating
- references to layout drawings, cable schedules and other related drawings

These single-line diagrams shall contain adequate information for the Engineer to design and install his electrical supply for the Contractor's requirements and they shall be submitted to the Engineer for approval.

4.4 **Motor Control Centres and Main Distribution Boards**

MCC design and manufacture shall comply to 14004-E-MCC-001 specification.

All power distribution to motor loads shall be achieved by means of MCCs. Each motor shall have a dedicated starter within the MCC where practical.

The MCC may also be used as a means for sub-system power distribution for lighting and heating loads or standalone motor control centres for sump pumps.

Low and medium voltage motor control centres shall be supplied by the Contractor in accordance with these specifications. However, in the interest of Plant wide standardization the Contractor shall obtain these items of equipment from a source to be designated by the Employer. The main distribution switchgear will be furnished by the Contractor and the Contractor shall connect to the Employer's distribution switchgear, or the transformer terminals, as applicable.

4.5 **Motors**

All motors shall be supplied in accordance with technical specification 14004-E-LVM-001 Low Voltage Electric Motors. No direct current motors shall be employed without the express approval of the Engineer.

4.6 **Power and Control Cables**

Cables shall be selected, routed, supported, installed, and terminated as required by Specification 14004-E-IIC-001, Industrial Installation and Commissioning.

Where the ambient temperature will not exceed 50°C and provided that cabling is not subject to repetitive flexure, cables will be copper PVC insulated, PVC sheathed, armoured with steel wire.

Where the ambient temperature, or the temperature of a surface in proximity to which cabling is run, will exceed 50°C but will not exceed 180°C continuously nor 250°C intermittently (5 minutes per 4 hour cycle), cables shall be of silicone rubber insulated /silicone rubber + glass fibre reinforced sheathed construction.

Areas where the ambient or surface temperature will exceed 180°C continuously or 250°C intermittently shall (wherever possible) be avoided by cabling. In special cases the supply (by the Contractor) and installation of mineral insulated (aluminium sheathed) cable will be considered for approval.

Insulation containing asbestos material shall not be used, either alone or in composition.

Cables shall be enclosed, positioned or constructed to protect them from mechanical damage.

The current carrying capacity of the cables shall be not greater than the appropriate values given in the South African Standard Code of Practice SABS 10142 with respect to ambient temperatures, type of excess current protection and volt drop.

All terminals and terminal block ends of all cables and wires, shall be clearly identified with relevant numbers which shall correspond to the numbering shown on the schematic and wiring diagram. Each wire shall be identified by only one number. All terminals shall be easily and readily accessible.

4.7 **Lighting**

In general, the type of luminaires to be used shall be as follows :

Operating area high and low bay	230 V high pressure sodium
Electrical rooms	230 V fluorescent
Control rooms	230 V Special purpose luminaires
Road and yard lighting	230 V high pressure sodium

Emergency lighting shall be provided for the safe exit of personnel from the Plant and where necessary, to stop machinery or shutdown plant or process before evacuating the workplace in an emergency.

The emergency lighting requirements shall be done in accordance with the latest revision of The South African Mine Health Act (Act 29 of 1996).

4.7.1 **Illumination Levels**

In general, unless otherwise specified, the average illumination levels and glare index maxima shall be in accordance with the SANS Code of Practice for Interior Lighting.

In particular the minimum average illumination levels are required for the following areas :

<u>Area</u>	<u>Illumination Level</u>
Electrical rooms	400 lux
Control room	700 lux
Roads, yards and parking	10 lux
Operating plant areas	300 lux

4.8 **Local Safety Isolators**

Locally mounted, motor circuit safety isolators shall be supplied and installed for each motor.

These shall be provided in IP65 protected enclosures and each shall be labelled with the drive equipment tag reference and the drive description.

Each isolator shall :

- a) Be mounted in close visual proximity to the motor.
- b) Be connected into all phase leads of the motor connection.
- c) Be capable of being locked by means of at least 3 padlocks of 8 mm hasp size.
- d) Be provided with an early break potential-free normally-open auxiliary contact for control circuit use.
- e) Have an operating handle mechanism coloured red in a yellow bezel.
- f) Be labelled with the equipment ("tag") reference.

4.9 **Field Junction Boxes**

Cabling may be marshalled at field-mounted junction boxes, located to the Contractor's design, subject to observation of the following requirements :-

- They shall not be located in areas where the ambient temperature will exceed 50°C.
- They shall provide a minimum protection grade classification (to IEC Publication 947) of IP 65, shall be of substantial gauge sheet metal of not less than 1mm thick, diecast or moulded construction, shall be pre-treated and finished -and shall be provided with a screw-fixed stainless steel equipment designation ("tag number") label. Removable covers shall be attached by the use of ISO-form machine screws, or shall be screw-on.

Terminal type shall be DIN-rail mounted ("Phoenix", Klippon" or equivalent) numbered in accordance with associated circuit and connection diagram(s). The presence of a junction box terminal in a connection shall be identified on diagrams by JB/terminal references.

Terminals shall not carry more than one connection per terminal-side. Inter-terminal bridging links (as supplied by the terminal supplier) shall be fitted for commoning of terminals. A terminal shall be provided for each spare, unused cable core.

Adequate provision shall be made in the dimensioning of the enclosure for glanding of cables, routing of cores and fitting of core identification ferrules or sleeves.

Power (400 V) and control circuits (230V) shall not be marshalled within the same enclosure.

An externally accessible (M10) brass earth terminal stud shall be provided to which the enclosure shall be bonded by an internal connection to an internally-welded stud. (Removal of paint coating of the enclosure to achieve a connection will not be acceptable).

Terminal strip mounting rails shall also be connected to the earth stud. Two brass nuts shall be supplied, fitted to the external side of the earth stud.

Where the employment of a junction box entails the use of seven or less terminals within the junction box, the use of circular reinforced plastic moulded units with screw -on see through covers will be permitted.

4.10 **Welding and Power Outlets**

Welding and power outlets will be installed at appropriate locations for supplying power to portable welders, heavy tools, heaters and similar maintenance loads. The receptacles will be standardized throughout the smelter designed with key orientation to prevent improper usage. There will be local protective circuit breakers with earth leakage protection.

Welding receptacles will be rated 400 volt, 63 ampere, 3 phase, 4 pole plug/socket units (3 poles for phases and 1 for earth). Larger ratings will be installed in special cases.

The power outlets will be rated at 32A and have 5 pole plug/outlets (3 poles for phases, 1 for neutral and 1 for earth). These may be fed from lighting and small power distribution boards.

4.11 **Enclosures**

The enclosures for electrical power and control equipment shall provide protection against rain and dust. The minimum degree of protection for the enclosures shall be IP54 for indoors and IP65 for outdoors with shade roofing.

4.12 **Variable Speed Drives**

In the event variable speed drives are used they shall be supplied in conformity with the specification to be requested from the Engineer.

4.13 **Earthing**

The Contractor shall install earthing as required by the Standards and Codes and in accordance with specification 14004-E-IIC-001 Industrial Installation and Commissioning.

4.14 **Cabling Trays and Accessories**

The cable trays and accessories, conduits, and other electrical materials shall be supplied and installed in accordance with the specification 14004-E-IIC-001.

4.15 **Local Panels / Panel Equipment**

Local panels shall be suitably tagged with the correct equipment number.

Panel equipment such as switches, lights and pushbuttons shall be mechanically robust, oil tight, with a positive, easily operated action.

The operation of the selector/push buttons shall remain consistent throughout, e.g. :

- stop/close, contact shall open, colour, RED.

- start/open, contact shall close, colour, GREEN.
- emergency stop, contact shall open with a lock down twist to release feature, colour RED. A guard ring shall be provided and must be key operated.
- on selector switches, the start function shall be to the RIGHT and the stop function to the LEFT.

The Local panel shall be constructed in such a way as to afford protection to all the equipment mounted on it from water, dust and ultra-violet exposure.

Status / Indication lamps shall have coloured lenses according to their application :

- **GREEN** Positive/Activated status, for example RUN, OPEN and existence of a SAFE condition.
- **RED** Negative/De-Activated status, for example STOP, CLOSE and the existence of a HAZARDOUS condition.
- **YELLOW** Interlock Status : status for a PLC related interlock.
- **WHITE** General Information status for information to the operations personnel.

Terminals to be used in the wiring of the local panels shall be from the Klippon range of terminals with specific reference to the SAK 2,5 for termination of cables.

4.16 **Instrument Electrical Requirements**

The following installation practices shall apply for the segregation of the instrumentation and electrical cables :

- control and power cables shall not run in the same conduit/cable racking
- different voltage levels shall not be mixed on the same tray
- parallel runs between power cables (400 V a.c.) and instrument cables shall have a separation of at least 200 mm, while perpendicular runs shall have a separation of at least 350 mm.
- instrument cabling shall be run on a cable rack adjacent to the electrical control cabling

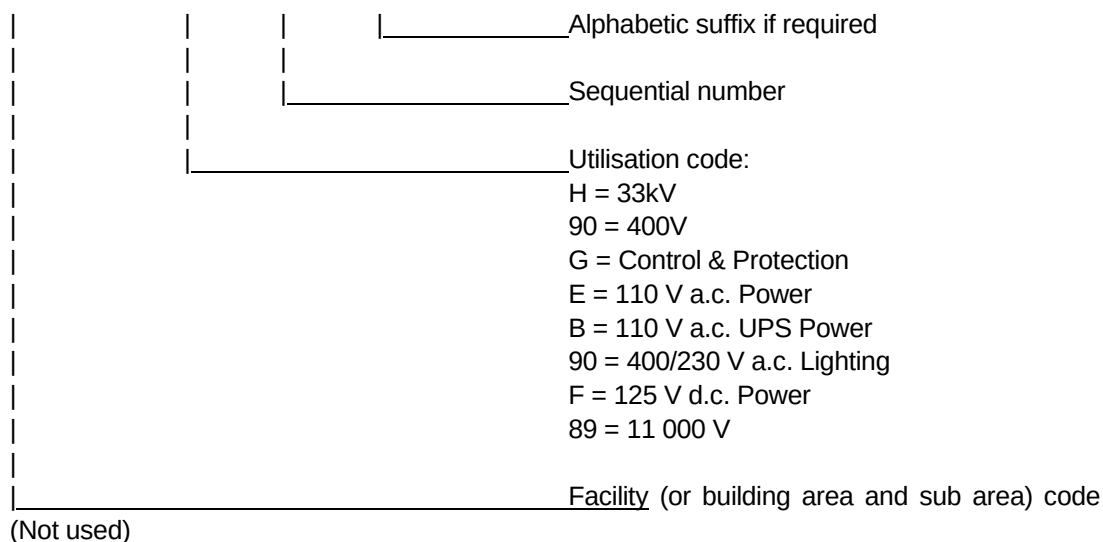
4.17 **Cable and Cable Tray Identification**

Cables and trays shall be identified with a number every ten metres and at the origin/destination points by means of PVC coloured markers suitably fixed to the cable or tray.

Cable numbering:

The identification number of the cables comprises seven or eight characters as follows:

XXXX XX XXX X

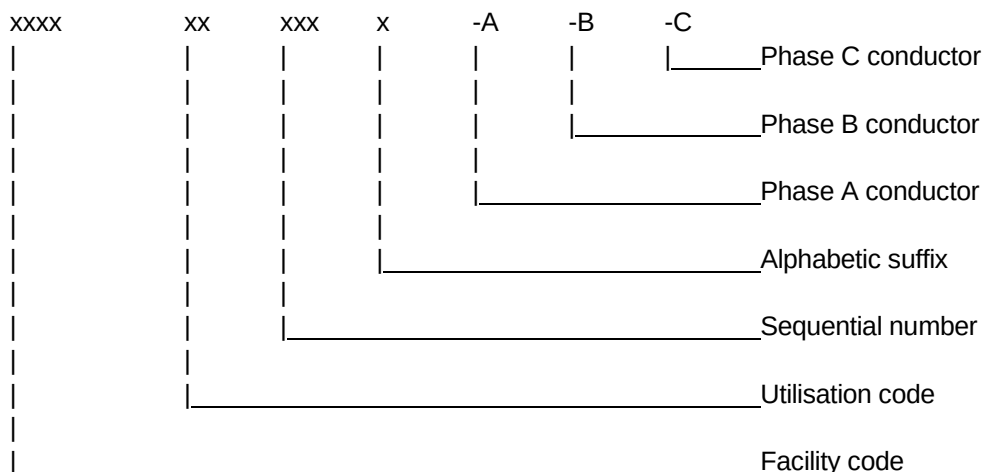


For example a 400V cable located in building 3260 will have the following number:

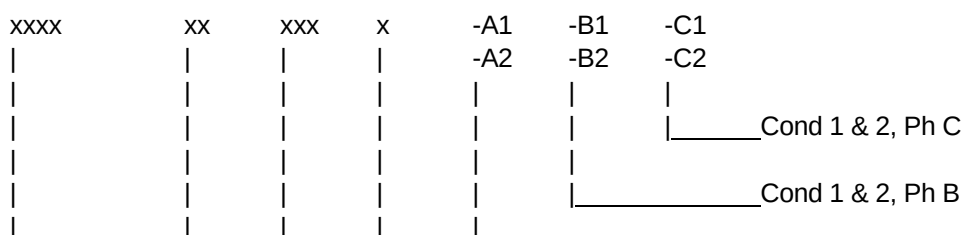
326090002 where

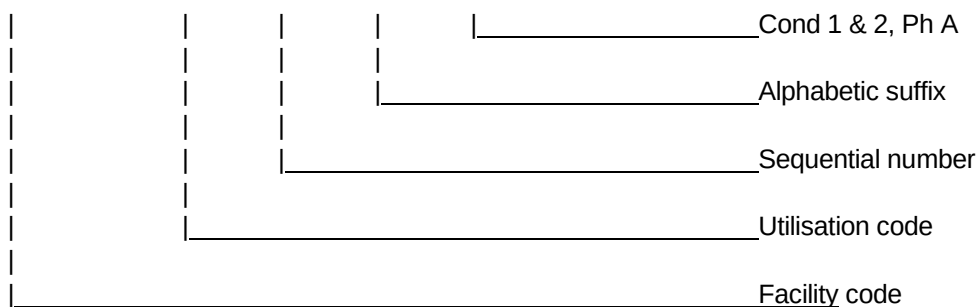
- 3260 is the facility in which the cable is located (May be omitted from label)
- 90 represents a 400V cable and
- 002 is the 2nd cable in sequence in this area for this class of cable

The letters A, B, and C are added at the end of the designation to indicate the phases of the single core cables making a three phase supply to a piece of equipment.



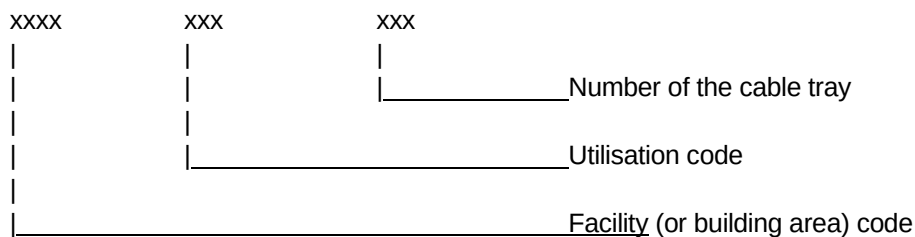
The addition of numbers -1, -2, -3, etc. added to the phase designation letters indicates the number of single core cables in parallel per phase.





Cable tray numbering:

The identification number of the cable tray comprises ten characters as follows:



For example a cable tray used for 11 000 V cable(s) located in building 3260 will have the following number:

3260TMB003 where

- 3260 is the facility in which the cable is located.
- TMB is the commodity code for a cable tray used for greater than 400V power systems and,
- 001 is the 1st cable tray in sequence in this building area for this class of cable.

5.0 **NUMBERING CRITERIA**

Manufacturer's labels or logos are not allowed on panels or boxes.

5.1 All panels to be clearly marked according to Sedibeng Water's list of codes.

5.2 All equipment to be clearly marked with a unique number according to the Standard specifications.

5.3 The following colour coding must be used:

Panel Label: White lettering (12mm) on black background (18mm).

Equipment Labels : White lettering (5mm) on black background (9mm).

Wire Numbers: Black lettering on yellow background.

Cable Numbers: Black lettering on yellow background.

Pump Numbers: Cream lettering (250mm) on brown background (300mm high x 300mm wide).

6.0 **ACRONYMS AND ABBREVIATIONS**

ACB	Air Circuit Breaker
BCEW	Bare copper earth wire
C&I	Control and Instrumentation

CCR	Central Control Room
CCTV	Closed Circuit Television
CT	Current Transformer
CVT	Constant Voltage Transformer
DB	Distribution Board
DOL	Direct on line starter
E&I	Electrical and Instrumentation
HPS	High Pressure Sodium
HV	High Voltage (> 40 kV)
ICEW	Insulated Copper Earth Wire
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
IT	Information Technology
LCF	Load Capacity Factor
LPS	Low Pressure Sodium
LV	Low Voltage (< 1000V)
MCB	Miniature Circuit Breaker
MCC	Motor Control Centre
MCCB	Moulded Case Circuit Breaker
MV	Medium Voltage (>1000V <40 kV)
NEC/R	Neutral Earthing Compensator/Resistor
NRS	National Regulating Standards
OEM	Original Equipment Manufacturer

B: Low Voltage Motor Control Centres

CONTENTS

SECTION I - DETAILED SPECIFICATIONS

1.0	Scope of supply
2.0	Duty description
3.0	Inspection, expediting and quality assurance
4.0	Commissioning and handover
5.0	General specifications
6.0	Technical specifications
7.0	Extent of supply
8.0	Exclusions
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10.0	Weight and Sizes
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12.0	Schedule of Technical Data

1.0 **SCOPE**

This specification covers the design, manufacture, supply, testing, delivery and off-loading of:

- 1.1 LV motor control centres in accordance with this specification for installation in an electrical control room.
- 1.2 The electrical drafting of all GA's, schematics, single line, wiring and instrumentation diagrams, inclusive the cable and component lists. The checking for correctness, in line with specification for all feeders, instruments and drives as per the attached motor and instrumentation list.
- 1.3 The required motor On-load isolators as per specification and local "Stop/Start" stations for each motor drive. The stop push button to have the function of the Emergency Stop button with mushroom head key released of 40 mm diameter.
- 1.4 The required documentation and certification.

2.0 **DUTY DESCRIPTION**

The motor control centres shall be capable of continuous duty at full rating based on environmental climatic conditions in Bloemhof at location.

3.0 **INSPECTION, EXPEDITING AND QUALITY ASSURANCE**

- 3.1 LCE or its representative reserves the right to inspect and expedite any of the equipment at any stage during manufacture and to be present at the final tests.
- 3.2 Prior to shipment, the motor control starters for refurbishment and whole new MCC for abstraction works shall be completely assembled, wired, all protective instrumentation adjusted as per motor list and tested by the supplier. Testing shall include primary injection tests of all current transformers, pressure tests to prove quality of insulation, functional tests of all mechanical and electrical components and electrical circuitry and any other tests required to ensure compliance with this specification. Protective devices like earth leakage relays or Simocode DP protective devices are to be set-up as per the drive list. Type 2 Coordination of all feeders is requested throughout. The supplier shall give one week's notice of readiness for final tests to the Electrical Engineer. The vendor shall ensure that the equipment is ready for final testing before requesting the presence of the Electrical Engineer at such a test. Repeat inspections necessitated by lack of readiness of the equipment may be charged to the vendor at the discretion of the Electrical Engineer.

3.3 All equipment is to be inspected by the Purchaser's Electrical Engineer or his representative on completion at the supplier's work prior to delivery to site unless otherwise agreed to.

3.4 All defects detected as a result of testing shall be replaced or repaired by the supplier at the supplier's expense.

3.5 Quality Control

All MCC's shall be manufactured under the control of an established quality management system (i.e. complying with SABS 0157 and to ensure compliance with this specification and consistency of quality of manufacture.

4.0 COMMISSIONING AND HANDOVER

A rate is to be quoted for assistance, should it be required, during installation and commissioning.

5.0 GENERAL SPECIFICATIONS

5.1 In general, work and materials shall be type tested in accordance with the latest specification, have a mark permit certification and in particular in accordance with the following specifications, and any amendments thereto, the SANS specification taking preference:

SANS 1473-1	Low Voltage Switch and Control Gear assemblies
SANS 60439	Factory-built Assemblies of Low Voltage Switchgear and Control gear
SANS 60947 (1-7)	Low voltage Switchgear and Control Gear
SABS 1222	Enclosures for Electrical Equipment
BSS 6231PVC	Insulated Cables for Switchgear/Control gear wiring
BSS 3858	Binding (Identification Sleeves for Cables and wires)
SABS 1507	Electric cables
BSS 1322	Aminoplastic Moulding Materials
SABS 1411	Materials of insulated electric cables and flexible cords.
SABS 743	Isolating and Safety Isolating Transformers
BSS 3938	Current Transformers

BSS 3941	Voltage Transformers
IEC 51	Indicating Instruments
BSS 142	Protective Relays
SABS 156	MCB's and MCCB's

5.2 The motor control centre will be installed and operated in accordance with the requirements of the following regulations and, therefore, must be so constructed that these regulations are also satisfied:

5.3 Wiring Code (SANS 10142) shall be adhered to

6.0 **TECHNICAL SPECIFICATIONS**

6.1 System Details

6.1.1	Busbar Voltage	:	400V $\pm$ 10%
6.1.2	Phases	:	3
6.1.3	Frequency	:	50 Hz plus minus 4%
6.1.4	Fault Level	:	35 kA rms symmetrical, 1 second
6.1.5	Neutral	:	Solid Earth at miniature substation
6.1.6	Phase rotation	:	R-Y-B-R (anti-clockwise); (U-V-W)
6.1.7	Motor feeder rating	:	Type 2 Coordination

Note: The fault levels specified shall be deemed to be the maximum currents occurring at the motor control centres under symmetrical short circuit conditions on the line side of the final limiting device. The duration of the maximum short circuit currents shall be deemed to be one second.

Evidence (in the form of Certificates by client-recognised Testing Authorities) of the ability of the motor control centres offered to satisfactorily withstand the prospective fault conditions shall be furnished with tenders.

6.2 Mechanical Construction

- 6.2.1 The motor control centre shall generally be of the segregated pattern comprising one or more fully interchangeable, modular, free standing sections in Form 4 b, bolted together to form extensible, rigid, free standing motor control centres of uniform appearance and shall have a maximum height not exceeding 2 400 mm. Each section shall be divided vertically into panels. Each panel shall be divided into one or more cubicles one above the other.

The MCC shall be single sided

The Busbar system to be a COMMON Busbar System

The main incomer of the diesel alternator (Where applicable) must however be mechanically interlocked with the main power supply breaker. The essential drives as indicated in the motor list (MCC A of the motor/ load list) will be fed, in case of a power failure, from an emergency alternator. Where requested.

Provision to interface with the control system is to be allowed for and is part of this specification. Connection from the MCC to the Marshalling cubicle shall be made with individual multi core cables to the PLC for the AWW MCC.

Safety Devices, like conveyor pull wire switches and local Emergency Stop switches are to be hard wired. The MCC is also to house the Lighting transformer for the plant. Protection of the lighting and small power circuitry will be from a separate mounted Lighting and Small Power Distribution Panel.

6.2.2 Cubicle Requirements

This sub-section is particular to rationalise on the feeder size and protection method only, to which the remainder of this specification shall generally apply in all respects:

- 6.2.2.1 For the refurbishment, the same cubicle segregation of drives shall apply.
- 6.2.2.2 AWW MCC cubicle arrangement shall be Form 4a
- 6.2.2.3 Outgoing power wiring shall be terminated directly at the load terminals of the respective overload relay or MCCB. Auxiliary wiring and control power shall be led to each cubicle via a terminal strip secured to the chassis.
- 6.2.2.4 Cubicle doors shall be supported from lift-off hinges. All wiring between door and chassis shall be led via chassis mounted terminals

- 6.2.2.5 Means shall be provided to positively lock the cubicle.
- 6.2.3 A channel frame (minimum 100mm x 50 mm), to match the main MCC section shall be provided under each completed section of transportable length and shall be so constructed that it can be used for lifting the transportable section without distortion taking place. The maximum length of the transportable sections shall not exceed 3 000 mm. This frame shall be solidly fixed to the MCC structure and shall have provision for being anchored to floor on site.
- 6.2.4 All completed sections shall be provided with lifting lugs and have ample strength to withstand all stresses incidental to transportation, installation and operation without distortion or damage.
- 6.2.5 For the AWW the MCC and MCC cubicles shall be arranged as to segregate busbar, cable, starter, incomer, feeder, control gear and alarm gear zones, in such a manner that prospective damage resulting from electrical faults will be minimised and confined to the zone or compartment in which the fault occurs. Power busbar compartments shall be completely separated from any other compartment by removable bolted covers and shall also be separated from the control busbar compartment.
- 6.2.6 Incoming feeder, outgoing starter or feeder, relay, control transformer and meter or instrument cubicles shall have doors suitably constructed to ensure rigidity, and shall be fitted with robust steel or brass (Barker Nelson 41200 EMB or equivalent) hinges with at least two 6mm square recessed quick close/open latches. At least one latch per door shall be lockable. Hinges shall be provided at 500 mm intervals per door with a minimum of two hinges per door. Each door shall be fitted with an equal number of hinges and latches. The cable gland compartments shall have removable covers attached with standard 6mm square recessed quick close/open latches. All non-hinged covers shall be self supporting to facilitate ease of fixing. The above mentioned doors and covers must be gasketed with high density neoprene to form a firm seal. The neoprene seal shall be a nominal 5 mm thickness compressed to 3 mm on closing of the door. The entire MCC shall be effectively dust-proof and splash proof (IP 54). Where fitted, rear access doors shall be hinged and adequately secured by means of square key latches, with hinges and latches arranged as above. Power and control busbar chamber covers shall have captive screws.
- 6.2.7 Cubicle doors on feeder and starter circuits shall be provided with a gasketed

Vari-depth type handle so that the door may be opened only when the circuit breaker or fused isolator is in the 'OFF' position. Note that the connecting rod leading from the actuator to the breaker shall be located in position at its circuit breaker end such that the breaker or isolator mechanism is positively engaged as the door is closed.

A non-apparent interlock defeat shall be provided for the opening of the door with the circuit breaker, or fused isolating switch, in the 'ON' position for testing and maintenance. In addition there shall be provision for attaching three padlocks to each operating handle in the 'OFF' position, which prevent the isolator or circuit breaker from being operated.

- 6.2.8 All devices shall be mounted on sheet steel surfaces and shall be removable from the front. Particular attention must be given to the rigidity of the installation to ensure that no excessive vibration caused by the operation of components is transmitted to other components causing spurious tripping.
- 6.2.9 Attention is to be given to ventilation to prevent the accumulation of ionised gasses. Suitable drip proof, wire-mesh screened, vermin proof openings shall be provided to facilitate air movement by convection, if necessary.
- 6.2.10 Sectionalised removable gland plates of non ferrous material shall be supplied with the MCC and shall be fixed by means of captive nuts or screws. Gland plates shall be so located that ample space is afforded for the satisfactory entry and termination of cables.

Specific attention shall be paid to the gland plate-to-connection-point distance to ensure termination can be effected in a professional manner. In addition gland plates for cable of cross sectional area greater than 70 mm² shall be of minimum 5 mm plate.

Cable entry shall be from the bottom or top as specified in the data sheet of the board.

- 6.2.11 Unless otherwise agreed, all screws, bolts and nuts shall be hexagonal to ISO Metric commercial standards. All bolts, nuts, washers, springs, etc. shall be rustproof and chrome plated. Loose 'bolts and nuts' shall not be used. Self tapping screws shall not be utilized for any purpose on any equipment. All components shall be mounted using screws/bolts with tapped holes in the metalwork. 'Avdel Burnside' blind threaded fastening system bushings or equivalent shall be used for thread sizes M5 and above.

- 6.2.12 The quantity of empty spare cubicles incorporated in the motor control centre

shall be as shown on layout drawing (See Section 9.0)

- 6.2.13 Motor control centre sheet steelwork shall be minimum of 2mm thick and chassis steelwork shall be a minimum of 2,5mm thick steel. All steel shall be cold rolled. Mild steel shall be employed throughout.
- 6.2.14 Cubicle references shall be allocated in an order determined by process flow, interlocking sequence or any other criterion which suits the panel application. Cubicle references are allocated at single line diagram layout stage. Alphabetical references (omitting 'I' and 'O') are used. Should the number of cubicles exceed 24, double letters are used, e.g. AA, AB, etc.
- 6.2.15 Every compartment door shall be labelled with the reference letter(s) of that compartment using a durable designation label with 30 mm high black letters on a white background. Every door/and/or removable cover giving access to a cubicle shall bear a durable designation label suitably inscribed with the description and the equipment number where applicable, using engraved black characters at least 6mm high on a white ground. Incomers shall be labelled as indicated on the SLD.
- 6.2.16 ***An MCC identity label with engraved 30 mm black-on-white characters shall be mounted at the top centre of each motor control centre.***
- 6.2.17 All removable covers protecting 400V live equipment shall be fitted with warning labels. Warning labels shall be similar in construction to cubicle designation labels but the inscriptions shall be red on a white ground.
- 6.2.18 All electrical components/equipment shall be labelled (with designations corresponding to those in the purchaser's schematic diagrams) to facilitate recognition. Engraving details of these labels are at the discretion of the manufacturer but must obviously be legible and durable.

The component labels shall be affixed to the chassis plate adjacent to the equipment to which they refer.

In addition to the above, MCC compartments shall be labelled in a suitable manner using an alphabetic code as specified on the schematic diagrams (See Section 3.2.13). Suitable labels shall be affixed on the front and rear of all compartments, and on all chassis plates.

6.2.19 All labels or label brackets except those for components shall be affixed by screws. Component labels may be affixed by a strong adhesive but shall not be of the pressed plastic strip type.

6.2.20 The MCC' shall be epoxy powder coated. The vendor shall submit his paint system specifications for approval.

The chassis and gland plates shall be white and the general exterior finish shall be B26 Light Orange.

The incoming breaker panel covers (front and rear) shall be Signal Red shade A11 and any bus section panel covers (front and rear) shall be Strong Blue, shade F11. Colour shade references relate to SABS 1091/75.

The panel manufacturer shall supply all glands as per cable list.

6.2.21 Lighting Control panel.

The lighting and small power control panel is to be supplied for circuits and welding outlets as indicated in the single line diagram. The control circuit is to be equipped with a dimmer unit and lockable by- pass switch.

6.2.22 Instrument Control Panel.

All powered instruments are to be fed from a separate lockable distribution panel, housing the individual circuit breakers for powered instrument. Supply voltage shall be 230 volts single phase with 2 A rated circuit breakers.

6.3 Electrical Construction

6.3.1 Electrical Design Scope.

The electrical requirements for each motor control centre shall be as detailed on the following drawings, to be provided by the successful tenderer as per attached motor and load list and shall consist of:

- 6.3.1.1 Motor Control Centre Schematic drawing
- 6.3.1.2 General Arrangement and Layouts drawing
- 6.3.1.3 Single line Circuit Diagrams for each drive or feeder
- 6.3.1.4 Wiring Diagrams for each drive (Showing field connections)
- 6.3.1.5 Motor Control Centre Schematic drawing
- 6.3.1.6 General Arrangement and Layouts drawing
- 6.3.1.7 Single line Circuit Diagrams for each drive or feeder
- 6.3.1.8 Wiring Diagrams for each drive (Showing field connections)
- 6.3.1.9 Auxiliary / service power single line drawing

- 6.3.1.10 Lighting Control circuitry
- 6.3.1.11 Instrument Control circuitry
- 6.3.1.12 Cable list
- 6.3.1.13 Component / Equipment list
- 6.3.1.14 I / O list for PLC programming

- 6.3.2 All solid copper work (main busbars, droppers and control busbars) shall be of constant cross sectional area throughout their length.

Horizontal busbars shall be sized for the current as stated on the single line diagram but with 1000 A minimum rating. Vertical busbars of suitable rating shall be furnished in each panel to supply power to each cubicle and shall have 100 A minimum rating. All busbar joints shall be tinplated high pressure bolted joints. The vertical busbars shall be enclosed within a steel compartment. Busbars of suitable rating shall be used for the connection between the incoming circuit breaker and the main busbars. All busbars shall comply with BSS 159 and shall be of hard drawn high conductivity copper with air clearances but with a maximum current density of 1.66 A/mm². All copper work shall be braced adequately to withstand stresses of the available short circuit current without damage (see Section 6.1). Control busbars shall be located at the top of the motor control centre and shall be at least 40 mm² in cross-section and rigidly supported. They shall be run in a compartment separate from the main busbars.

Notwithstanding the requirements of BSS 159 in this regard, the following minimum air clearances shall be observed for busbars and other current-carrying or live parts:

Phase - Earth: 30mm

Phase - Phase: 45mm

All copper-work including connections to, from and between switchgear equipment shall have applied solid insulation suitable for the rated voltages.

Heat shrink or similarly close fitting insulation shall be used wherever possible.

- 6.3.3 A continuous copper main earth bar shall run along the whole length of the motor control centre. This earth bar shall have a minimum cross sectional area of 70 mm². MCC accessories or auxiliaries (e.g. CTs, control transformers, etc.) shall be effectively earthed to the main earth bar. Hinged doors are to be bonded to their fixed frames by suitable flexible copper conductors. Crimp type terminals for 70 mm² stranded copper shall be provided both ends of the earth bar for connection of the Purchaser's earthing.
- 6.3.4 Each motor control centre shall be wired completely at the factory prior to testing and only after satisfactory testing and acceptance by the engineer shall it be split for transport. All wiring shall be accessible for inspection and maintenance.

- 6.3.5 All power wiring shall be stranded copper PVC insulated and coloured according to phase. Wire sizes shall be as shown on the SLD and Section 6.3.6. Motor control centre power wiring shall not be of a smaller cross sectional area than the maximum cable core size specified for the respective circuit breaker size (see Section 6.3.6) and in any event shall not be less than 10 mm² except for motors up to 7.5 kW which shall not be less than 6mm².

Power wiring on the 'live' side of circuit breakers shall not be of smaller cross sectional area than 25 mm². All wiring shall be insulated to 600/1 000 V grade. All power wiring terminations shall use an appropriate crimped accessory. Pressed tube type accessories are preferred. In addition, hexagonal die type hydraulic crimping shall be used for all wiring greater than 16mm² cross sectional area. Stamped, folded, split barrel and fork type lugs are not acceptable.

- 6.3.6 Control and Instrumentation wiring shall be of flexible stranded annealed un-tinned copper construction and shall comply with the table below. Conductors shall comply with SABS 1411, Part 1, Table 4, and Class 5.

All control and instrumentation wiring shall be 600/1000V Grade to SABS.150 and SABS 1411 Parts I and III.
Silicone insulation shall be used.

6.3.6.1 **CT Wiring**

2.5 mm² phase coloured, common return wire black insulated, earth link yellow/green insulated.

6.3.6.2 **General Control Wiring**

(AC) 1.5 mm² grey.

(DC) 1.5 mm² red.

6.3.6.3 **LEDs and PLC Inputs**

(AC) 0.75 mm² grey.

(DC) 0.75 mm² red.

6.3.6.4 **Control Neutral**

(AC) 2.5 mm² black.

6.3.6.5 **Terminal Links**

2.5 mm² PVC yellow.

Notwithstanding the above requirements the vendor shall ensure wire size used is amply sufficient for the actual current under ambient conditions. All control/instrument panel wiring shall terminate by means of suitably sized compression lugs, except where terminals specifically designed for bare wire termination are used (i.e. WAGO cage-clamp type). Where space permits, wiring shall be run in neat and orderly patterns and shall be supported in plastic trunking. Only when there is a space restriction may one-piece nylon ties be employed. Stick on harness holders and spiral wrap are **not** acceptable. Sufficient space shall be provided in each tier of cubicles for the glanding off of 6 x 4c 2.5 mm² PVC SWA PVC cables for control purposes.

6.3.7 Wiring Identification

Each end of every wire shall be marked with a wire number by means of flexible plastic interlocking ferrules (black lettering on a white or yellow base), or by heat shrink markers.

Cable/wire marking ferrules shall be to the codes laid down in BSS 158 and shall conform to the appropriate schematic or wiring diagrams. Split or open type marking ferrules shall **not** be used, the preferred type being Critchley IZ or equivalent.

Cubicle wiring is sequentially numbered, and prefixed with the cubicle reference letters, e.g. A, B, etc.

For wiring internal to a cubicle the prefix letters may be omitted: all outgoing wires - whether to the field or to another cubicle or device - must carry the full wire number including prefix letters. Exceptions are:

6.3.7.1 **Control Supply Bus Wires**

These carry the same numbers throughout the panel. DC lines carry a plain number. AC lines carry a number with suffix 'L' and the common line is designated '0'.

6.3.7.2 **Hard Wiring between Panel Cubicles**

Wires bear the prefix letters of the cubicle from which voltage is fed, or as shown on the schematic diagrams.

6.3.8 Terminals shall be suitably rated and shall comply strictly with Section 6.4. Terminals with pressure pads between conductor and clamping screws are to be used. Terminal strips/blocks shall be marked with designations as shown on the schematic drawings. Terminal numbers shall be the same as the relevant wire number. No more than two wires may be connected to any one side of a terminal and lugs shall be of the correct pattern to suit the terminal.

Terminals are to be provided in each starter cubicle as indicated on the relevant schematic diagrams. In addition, all door-mounted components shall be wired through chassis-mounted terminals, as shall wiring to other cubicles and to the field. For single sided panels, terminals for field control connections shall be located at the rear of the appropriate cubicle. All such terminals shall be of the tubular screw type with pressure plate and provision for marking terminal numbers. Other terminals shall be mounted on the appropriate chassis plate.

All wiring to other cubicles and to the field shall be wired through terminals, as shall all door mounted components, diodes, etc. Rear-mounted terminals for field and inter-cubicle connections shall be extended from the aforementioned terminals

Rear-mounted 550V terminals shall be in line with control terminals, segregated by at least 50mm.

At least 5 spare terminals (or 10% of the total, whichever is greater) shall be provided on each terminal rail. Refer to Section 6.4 for acceptable terminal types.

Particular care shall be taken to guard against the possibility of accidental contact with live 400V internal components while doors or covers are open. In particular, all terminals shall be shrouded so as to effectively prevent accidental contact with live parts. Stud-type or other open terminals (where these are permitted by the engineer) shall be covered with insulating rubber or PVC boots or, at the engineer's discretion, by means of a suitable fire-retardant transparent cover secured in position by means of captive screws. 400V wiring shall not be connected to terminals in the same terminal strip as for 230VAC control wiring.

- 6.3.9 The control supply for each motor control centre shall be provided by means of direct coupling to the line to neutral supply and not line to line supply.

Due attention is to be paid to the grading of the circuit breakers such that the low voltage circuit breaker trips before the upstream circuit breaker, etc.

- 6.3.10 A wiring duct of minimum dimensions 100 mm wide by 80 mm deep shall be routed in a continuous unobstructed length at the top or base of the MCC in such a manner as to cause no interference to other components of the MCC.

Any inter-cubicle wiring shall be led along this duct by means of either an appropriate un-armoured, numbered multi-core cable (one per circuit) of minimum conductor size 1.5 mm² or by individual wires. All inter-cubicle wiring shall be routed via terminals at each end.

6.3.11 Motor Control Centre Equipment

6.3.12.1.1 Motor control centre units shall be standardised. Each fused switch/circuit breaker/starter unit shall be chassis mounted with associated control devices in an individual compartment.

6.3.12.2 Miniature Circuit Breakers (MCB's) shall be confined to auxiliary circuits such as control and indication in which the prospective let through fault current will not exceed 10 k A at voltages not exceeding 230V. They shall be of the thermal and magnetic trip free type.

6.3.12.3 Moulded Case Circuit Breakers (MCCB's) shall be of the manually operated trip free type with thermal and instantaneous magnetic trips in each pole. Trip functions shall be resettable via the MCCB toggle. Inter-phase flash barriers shall always be fitted where these are necessary to achieve maximum rated insulation levels.

Generally Fused Isolator Switches or MCCB's will be used for current rating 800 A or less, outgoing feeders, and for the dual roles of isolation and back up protection for motor starters.

Each FIS / MCCB shall be fitted with a gasketed Vary-depth type operating handle as detailed in Section 6.2.7.

The thermal trip elements of each MCCB shall be calibrated for the maximum ambient temperature at 40°C. Where the MCCB terminals are inadequate to accommodate the rated conductor size (refer to Table 6.3.14), suitable copper tags shall be interposed for this purpose.

Each MCCB shall be provided with suitable insulation between the terminals of the MCCB and the back plate/chassis onto which the MCCB is mounted, such that any loose nut, screw, etc, which may fall between the MCCB terminals and back plate cannot cause a short circuit.

The incoming terminals or shutters of all 400V circuit breakers shall be effectively shrouded and marked "400V LIVE" with white characters on a red ground. Any screws used to attach these shrouds shall be captive.

6.3.12.4 All fused isolators, circuit breakers, except bus section switches and incomers, shall be connected with the switched side to the load, (i.e. with reference to power flow; incoming to 'LINE' and outgoing to 'LOAD').

6.3.12.5 400V power connections on any equipment shall not use 'Phillips'/Star type screw/socket heads. Allen type socket heads are preferred.

6.3.12.6 Incomers and bus-section switches of current rating greater than 1200A shall be Air Circuit Breakers (ACBs) complying with Section 6.3.15.

6.3.12.7 Where motor control centres are fed via two incoming circuit breakers or where two motor control centres are electrically linked via a bus section switch, the two incomers and bus section breakers shall be mechanically interlocked such that only two of the three breakers can be closed at any time.

6.3.13 **Space Allocation Requirements**

ONE spare compartment for each type of drive employed, fully equipped and wired to terminals. The spare feeder to be tagged and identified accordingly in the GA of the MCC and wiring diagrams.

6.3.14 **FIS and MCCB Requirements**

FIS's (Fused Isolator Switch)/ MCCB's (Motor Control Circuit Breaker) and cables shall be sized as per the Single Line Diagram (Section 9.0)

Integral earth leakage shall not be fitted.

Notes:

1. When selecting FIS's / MCCB's, due cognisance shall be taken of motor starting currents as requested for type two coordination.
2. Fused Isolators / Circuit breakers must be selected on the basis of the prospective fault level prevailing at the installation site: MCC's and starters not intended for installation underground shall however be equipped with 35 kA breakers, notwithstanding fault levels pertaining at the time of installation.
3. Refer to Section 6.3.16.4 for earth leakage requirements.

6.3.15 **ACB Requirements**

ACB's used as incomers and bus section switches shall be standardised as follows:

6.3.15.1 ACB's shall be of the withdrawable type with self aligning disconnecting devices with the disconnecting fingers preferably mounted on the breaker for ease of maintenance.

6.3.15.2 The draw-out mechanism shall hold the circuit breaker rigidly in the fully connected, test and

fully disconnected positions. Safety shutters shall be provided to shield the fixed part automatically when the draw-out part is removed preventing access to the conductors (main and auxiliary circuits). These shutters shall be clearly labelled indicating busbar or cable sections and in addition the 'live' section shall be labelled 400V - LIVE/LIGADO. ACB's shall be equipped with interphase barriers.

- 6.3.15.3 Each bus-section ACB shall be equipped with three appropriate direct acting non-adjustable over-current trip devices.

Each incoming ACB from a transformer shall be equipped with three direct acting, thermal inverse time over-current trip devices with adjustable current set point and three direct acting magnetic short time delay magnetic over-current trip devices with adjustable current set point and short time delay.

- 6.3.15.4 Particular care shall be taken to ensure that ACB protection is correctly co-ordinated with upstream and downstream protective devices.

- 6.3.15.5 Where current and time delay set points on ACB's are adjustable these shall be accessible from the front of the ACB without removing the ACB from its cradle and shall only be adjustable when the cubicle door is open.

- 6.3.15.6 Interlocks shall be provided to ensure the following:

- i) that the circuit breaker cannot be moved from or to the fully connected position unless the ACB is open.
- ii) that the compartment doors cannot be opened should any accessible portion of the ACB frame be energised.
- iii) that the breaker cannot be closed unless in the fully connected, test, fully disconnected positions.

Mechanical deterrents shall be provided to inhibit mismatch of ACB's of different ratings.

- 6.3.15.7 Provision shall be made for the padlocking of any ACB in any one of fully connected, test or fully disconnected positions. In addition all ACB's shall have a padlocking facility to prevent the close push button being operated when padlocked.
- 6.3.15.7 ACB's employed as incomers and bus-section switches in an MCC with two or more incomers shall incorporate mechanical interlocks to prevent paralleling of the supply transformers.

- 6.3.15.8 ACB's supplied shall be three pole, magnetic operated. The mechanism shall be of the stored energy type having hand charged spring and manual release.
- 6.3.15.9 The ACB control/protection unit shall be fitted with a sealable transparent cover to prevent tampering with settings.

6.3.16 Starters

- 6.3.16.1 Contactor sizing assumes AC3 duty to IEC 60947. All feeder and starter units to be designed as per type 2 coordination.
- 6.3.16.2 Although the list provides for conventional air-break contactors throughout the motor size range, vacuum contactors shall be employed on motors of 132kW and above. Surge suppression (low voltage ZORCS) must be applied in this instance. Table 1.1.
- 6.3.16.3 Starters controlling motors shall be as per AC 3 operation with the MIXER drives in AC4 design, equipped with overload relays as follows:
The MCC manufacturer shall ensure correct discrimination between the Fused switch MCCB overload relay and contactor such that type 2 performance to IEC 60947 is achieved. Relays shall be door mounted.

Earth leakage and short circuit trip facilities shall not be incorporated in overload relays.
- 6.3.16.4 Where separate earth leakage relays are specified instead of SIMOCODE , they shall have visible flag trip indication, a test/ reset button, and one normally open and one normally closed output contact. Each earth leakage relay shall be wired to shunt trip the power MCCB in its respective circuit, and shall be door-mounted.
- 6.3.16.5 Earth Leakage relays are to be as follows:
Digital (solid state) type
Adjustable trip, approximately 0,5 to 3A
Adjustable time, 0 to 5 sec
Of a type not sensitive to power system harmonics
Of a heavy duty, high quality, industrial design
- 6.3.16.6 A correctly rated MCB shall be provided for the control circuit of each starter.
- 6.3.16.7 An auxiliary contact shall be provided on the Fused Switch of each starter circuit and wired such that the starter control circuit is de-energised if the unit is in the 'off' or 'tripped' position.

6.3.17 **Feeder Units**

- 6.3.17.1 Each feeder unit shall be equipped with an FID/MCCB complying with Section 6.3.14.
- 6.3.17.2 Earth leakage protection shall be provided for each feeder circuit. The earth leakage unit shall be generally as described in Section 6.3.16.5.

6.3.18 **Incomers and Bus Section Switches**

- 6.3.18.1 Each incomer unit shall be fitted with an MCCB complying with Section 6.3.14 for circuit ratings up to and including 800 A. Higher current ratings require an air circuit breaker as specified on the SLD
- 6.3.18.2 Where called for on the relevant SLD each bus section switch shall be fitted with an FIS complying with Section 6.3.14, or ACB as above for current ratings higher than 800A.
- 6.3.18.3 Special attention is to be given to the provision of suitable termination points for the connection of the cables to incomer ACB's, FIS or MCCB's. In particular a minimum spacing of 75 mm is required between phases and ample spacing with a minimum of 400 mm shall be provided between the gland plate and connection studs to ensure a professional termination can be made.
- 6.3.18.4 Where MCCB's are employed for incomers and bus section switches they shall be fitted with 'Vari-depth' or equivalent type handles.

6.3.19 **Instruments and Meters**

Overall requirements will be as follows:

- 6.3.19.1 Incomers shall be equipped with a microprocessor-based multifunction meter, displaying line currents, phase and line voltages, single- and three-phase power factor, kW, kVA, and kVAR; and kWh, kVAh, and kVArh. The meter shall be fitted with communication facilities via the Profibus communication system. Additionally, incomers shall be equipped with one 96 x 96mm, 5A, combined maximum demand and instantaneous ammeters having a thermal movement with 15 minute time lag and drag pointer having a reset facility. It shall have a built-in saturation transformer for increased overload capacity to 90 times rated current for one second.

A 96 x 96mm voltmeter for monitoring the incoming voltage shall be connected to measure phase to phase voltage.

- 6.3.19.2 Outgoing feeders (where specified) and all motor feeders shall be equipped with a 72 x 72mm ammeter. The ammeter shall have a compressed over-scale. Meters shall be flush-mounted.
- 6.3.19.3 All current transformers shall conform to BS 3938 and IEC 185. For protection purposes, class 10P CTs are to be used; for indicating purposes class 1 5VA CTs are to be used and for metering purposes class 0.5 ; 5VA CTs are to be used.
In general, current transformer mechanical and thermal ratings shall be co-ordinated with the short circuit ratings of the associated equipment.
- 6.3.19.4 Running hour meters shall be included on circuits as indicated in the single line diagrams and/or schematic diagrams, and shall be non-resettable.
- 6.3.19.5 The voltage metering circuits shall be fed from busbar mounted GEC RS fuses via a voltmeter switch.
- 6.3.19.6 All meters shall be fitted with glass faces: polycarbonate is not acceptable.

6.4 **Preferred Component Types**

The following list specifies the preferred components to be used. This list will apply to all panels, but where specific requirements are also given on schematic and/or general arrangement drawings, the latter drawings shall have priority. This however is only a guide line and Tenderers may propose any manufacturer for approval.

6.4.1	Pushbuttons, 30.5 mm dia.	Cutler Hammer/Telemecanique standard//Mitsubishi Emergency button 400 mm dia. with red mushroom type head
6.4.2	Multifunction meters	Northern Design PM390 (Reyrolle)
6.4.3	Control relays	Omron MK3P-5, Omron MK2P Telemecanique CA2D, CA3D
6.4.4	Indication only relays	Omron MK3P-5, Omron MK2P
6.4.5	Timers (Electronic)	Omron H3BA (Pneumatic) Telemecanique Cutler Hammer

6.4.6	Temperature relays	Omron, RKC plug-in	
6.4.7	Indicating instruments	GEC, Hartmann and Braun	
6.4.8	Running hour meters	GEC, Hartmann and Braun	
6.4.9	Limit switches	Cutler Hammer E50	
6.4.10	Selector switches	Santon, Kraus and Naimer, Bulla	
6.4.11	Circuit breakers (MCCBs)	See Section 6.3.14	
6.4.12	Miniature circuit breakers	CBI, Merlin Gerin (MCB's)	
6.4.13	Contactors	See Section 6.3.16	
6.4.14	Overload relays	See Section 6.3.16	
6.4.15	Earth leakage relays	As specified	
6.4.16	Terminals	Field Wiring: Weidmuller SAK6 N	
6.4.17	Wire and cable markers	Critchley IZ, Bowthorpe-Hellerman or heat-shrink	
6.4.18	Diodes	1N4007 (or as specified)	
6.4.19	Alarm	<u>Visual</u>	Audible and Visual Alarms type PSD. <u>Audible</u> Banshee 85 Siren Sirenco E87 hooter. Yodalarm Y03, Y05, Cuttler Hammer
6.4.20		Indicating Lights	Kimden KRE 322F or equivalent L.E.D. cluster

6.5 SPECIFIC NOTES

None

7.0 **EXTENT OF SUPPLY**

7.1 The furnishing of all labour, materials and equipment and the performance of all operations and incidentals necessary for preparation and drafting of the GA and individual circuit schematics, single line and wiring diagrams inclusive ancillary instrumentation devices ,component and cable list. All drawings, schematics, single line and general arrangement drawings are to be accepted, approved and to be signed off by the Professional Electrical Engineer prior manufacture of the MCC's. The designing, detailing, fabrication, delivery and offloading of the motor control centre(s) completely assembled, wired, tested, and motor isolators and local stop / start stations in IP 55 design, ready for installation in accordance with the specification and drawings, documentation.

8.0 **EXCLUSIONS**

- 8.1 Civil work
- 8.2 Erection of the equipment.
- 8.3 External connections to equipment
- 8.4 Cabling

9.0 **SCHEDULE OF KEY DATES**

		Start Manufacture	Available For Inspection / Testing	Dispatch Ex Works	Delivery
Item	Tag	<i>(Weeks After Order)</i>			

10.0 **WEIGHT AND SIZES**

Item	Tag	Weight (kg)	Shipping Dimensions (mm)

11.0 **SCHEDULE OF RECOMMENDED SPARES**

Commissioning Spares				
Item	Description	Recommended Quantity	Unit Price If Purchased With Main Order	Unit Price If Supplied At Later Date
1	Auxiliary relay	5		
2	400V FIS / MCCB's	1 each per size/type		
3	LED Lamps	5		
4	Fuses	10 each per size/type		
5	Contactor	1 each per type/rating		
6	Miniature circuit breakers	1 each per type/rating		
7	O/L relays	1 each per type/rating		
8	110 V Shunt trip coils	1 each per type/rating		
9	ACB complete	1		
10	ACB: OEM-recommended Spares	1 set		
Capital Spares				

Commissioning Spares				
Item	Description	Recommended Quantity	Unit Price If Purchased With Main Order	Unit Price If Supplied At Later Date

12.0 SCHEDULE OF TECHNICAL DATA

Item	Weeks After Award	Vendor Agreement (Y/N)
<i>DATA WITH TENDER</i>		
Preliminary general arrangement drawing	With Tender	NA
2x Technical Specifications	With Tender	NA
2x Proposed manufacturing schedule	With Tender	NA
2x Recommended commissioning & capital spares	With Tender	
2x Type test certificates to IEC 60947	With Tender	
<i>DATA AT AWARD</i>		
<i>Fixed and firm manufacturing schedule</i>	With Tender	
<i>DATA AFTER AWARD</i>		
Drawings and Data for Approval within of order placing – sets: - Itemised list of components - General arrangement - Schematics & Wiring diagram's. - Cable list	4 weeks	3 sets

PLC I/ O list of addresses		
Final Drawings and Data –sets: - Itemised list of components - General arrangement - As-built mark-ups of Schematics - Operating manuals - Simocode Setting List	Prior to delivery	5 sets
Operating and maintenance manuals in bound format.	Prior to delivery	5 sets
Routine test certificates to IEC 60947	Prior to delivery	5 sets

C: Low Voltage Motor Specifications

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SCOPE

This specification covers the minimum requirements for standard LV, 3 phase, 50 Hz squirrel cage and wound rotor, electrical motors.

The requirements for adjustable speed drives are covered in another document.

Compliance by the Vendor and his motor manufacturer with the provisions of this specification shall not relieve the Vendor of the responsibility of furnishing motors and accessories of proper design, electrically and mechanically suited to meet operating guarantees at the specified service conditions.

REFERENCE DOCUMENTS

All design, supply, procedures, materials, tests and analysis shall be in accordance with the latest editions of National and International codes, standards and specifications including all amendments and revisions.

SANS Specifications and Codes of Practice

SANS 1091	-	National Colour Standards for Paint
SANS 948	-	Three Phase Induction Motors (Low Voltage Standard Motors)
SANS 1189	-	Single Phase Induction Motors
SANS 083	-	Sound Power Levels

IEC/BS Specifications

IEC	34	All sections relevant to Rotating Electrical Machines-rating, performance, efficiency, enclosures, cooling, mounting, rotation, noise limits, starting, vibration
IEC	72	Dimensions and Output Rating for Electrical Machines
IEC	85	Classification of Insulation Materials
BS	4999	Specification for General Requirements
BS	5000	Specification for Rotating Electrical Machines of Particular Types or Applications
BS	1486	Lubrication Nipples
ISO	1940/1-1986	Balancing

Units of Measurements

All units of measurements used for the proposed works shall be based on the SI system.

GENERAL REQUIREMENTS

Motors shall be totally enclosed with fan ventilated frame (TEFC), surface cooled type suitable for outdoor installation without any protection covers. The enclosures to IP 55 as per SANS 1222.

Motor frame and end shields shall be manufactured from cast iron unless steel or aluminium is specified in the data sheet.

They shall be suitable for operation in any mounting position. The method of mounting shall be indicated in the motor data sheet.

Bearing shall have a minimum life expectancy of 40 000 hours and 65 000 hours for direct coupled drives. If required the applicator is requested to provide calculations for the bearing type to be used.

Grease relief systems shall be provided for motor frame sizes exceeding frame size 280 but are optional for frame sizes 160 to 250.

Motors up to 400 k W shall bear the SANS Mark.

Information satisfying Appendix A and B of this specification shall be supplied with the tender for each motor drive.

SPECIFIC ELECTRICAL REQUIREMENTS

3.1 Rating and Type

Unless otherwise specified, motor voltages shall be as follows:

- (a) Motors 0.25 kW to 400 kW - 400 V, 3 phase 50 Hz
- (b) Motors Above 400 kW – 6.6 kV, 3 phase 50 Hz
- (c) Very small motors 0.25 kW or less may be 220 V single phase 50 Hz (without centrifugal switch starting).

Motors shall be capable of providing their rated output at a voltage that may vary +/- 10% of their rated voltage. The permissible temperature rise under these conditions is stated in IEC 34-1.

They shall be designed to operate satisfactorily within their limits at 50 Hz, +/- 2.5%, design temperature = 45°C

Furthermore, the motors shall function satisfactorily within their design limits with the bus voltage unbalance of 2%.

All motors shall be designed for full-voltage starting and rated for continuous operations (duty class S1 per SANS 948 and IEC 34-1) unless otherwise specified. The sub transient peak start-up current shall be limited to less than 20 times the nominal rated current.

550 V motors shall be continuously rated squirrel cage and wound rotor induction machines, dimensioned in accordance with SANS 948. Imported motors may be dimensioned in accordance with IEC 72 and 72A.

Motors shall be 1500 rpm, 4-pole arrangement, unless approval is given by the Engineer for an alternative arrangement.

All motor details shall be engraved onto stainless steel plates affixed to the motor casing by means of stainless steel screws

3.2 Stator Frames

Motor frames and bearing end shields shall be constructed of ferrous material. For motors up to and including 1.1kW, aluminium framed motors will be considered and in such cases attention shall be paid to adequate protection against galvanic action between dissimilar materials. Bearing housings shall also be suitably strengthened with steel rings.

3.3 Winding Temperature Detectors

3.3.1 Single Speed Motors

Motors at 400 V which operate in conditions where the temperature is above 45°C, or where considered necessary by the Vendor/Contractor for the conditions in Bloemhof shall also be fitted with temperature detectors. One PTC thermistor shall be fitted per phase and shall be wired in series, with the ends brought out to terminals in the auxiliary terminal box.

3.3.2 Adjustable Variable Speed Drives

LV motors with ratings of 55 kW and higher intended for use in variable speed applications shall be fitted with thermistors for the thermal protection of the windings.

One PTC thermistor shall be fitted per phase and shall be wired in series, with the ends brought out to terminals in the auxiliary terminal box.

Motor cooling shall be adequate at low speed conditions down to 10% of rated speed with additional force cooling where applicable, preferably at the same voltage as the motor.

3.4 **Insulation and Temperature Rise**

The complete insulation system of both 400 V motors shall be to Class H insulation as per IEC 85.

The winding temperature rise for Class H insulation shall not exceed the operating limits of Class B insulation.

3.5 **Power Cable Terminal Box**

The power cable terminal box shall be positioned at the top of the motor.

The terminal box shall be designed to IP 55.

Cable terminal-connection boxes shall be suitable for cable entering from below and each side. Provision shall be made for installation of cable glands.

The mechanical equipment Vendor shall specify oversized terminal boxes to accommodate oversized cables necessitated by the voltage drop, derating considerations and the use of aluminium power supply cables.

The following minimum sizes of cable boxes shall be installed:

<u>Motor Rating</u>	<u>Terminal box minimum volume</u>
1,5 kW and less	750 cm ³
2,2 kW to 7,5 kW	1 260 cm ³
11 kW to 30 kW	5 000 cm ³
37 kW to 110 kW	14 500 cm ³
132 kW to 160 kW	25 000 cm ³
Larger than 160 kW	31 000 cm ³

Cable glands will be supplied by others.

The dimensions of the cable boxes and the spacing of the connection terminal studs of motors above 15 kW shall be sized to accommodate cables having aluminium conductors using bi-metal compression connectors in an acceptable manner.

The cable box and cable inlet dimensions shall be such that they are able to accommodate one or two 4 core copper or aluminium cables, each core having the cross sectional area given in column 2 of the following Table A, appropriate to the full load rated current of the motor.

TABLE A

1	2	3	4	5
Full-load rated current (I) of the motor, A	4 core cable up to 50mm ² , 3 core from 70mm ²			
	Size of Conductor (cross-sectional area), mm ²	Minimum size of cable gland inlet, mm	Conductor Material	Minimum Terminal Box Size
< I ≤ 4,0	2,5		Cu	750 cm ³
4,0 < I ≤ 5,5	2,5		Cu	1 260 cm ³
5,5 < I ≤ 9,0	4		Cu	1 260 cm ³
9,0 < I ≤ 12,5	6		Cu	1 260 cm ³
12,5 < I ≤ 22,5	10		Cu	1 260 cm ³
22,5 < I ≤ 30	16		Cu	5 000 cm ³
31 < I ≤ 60	35		Cu	5 000 cm ³
60 < I ≤ 73	35		Cu	14 500 cm ³
73 < I ≤ 101	50		Cu	14 500 cm ³
101 < I ≤ 143	95		Cu	14 500 cm ³
143 < I ≤ 177	150		Cu	14 500 cm ³
177 < I ≤ 217	185		Cu	14 500 cm ³
217 < I ≤ 265	2 x 95		Cu	25 000 cm ³
265 < I ≤ 315	2 x 120		Cu	25 000 cm ³
315 < I ≤ 355	2 x 150		Cu	31 000 cm ³
355 < I ≤ 425	2 x 185		Cu	31 000 cm ³

3.6 Auxiliary Cable Terminal Box

If specified, auxiliary cable boxes shall be provided for the following services and located on the side of the motor main cable box.
Enclosures to be IP 55.

- (a) Vibration Detectors
- (b) Bearing and Winding RTDs
- (c) Anti-condensation Heaters. (Separate terminal box)

3.7 Rotor

The shaft shall be made of one piece, heat-treated steel.

Shaft extension including keys and key ways shall conform to SANS 948. The rotor assembly including fan shall be balanced in accordance with SANS 948 or ISO1940/1-1986.

3.8 Bearings and Lubrication

3.8.1 400 V Motors

Bearings shall be ball and roller type in metric sizes, with lithium based grease lubrication and suitable for the particular service application and shall have a design bearing life of not lower than 65 000 hours.

Bearings shall be pre-packed with grease on frame sizes smaller than 280. Above that bearings shall be equipped with grease relief valves and seals to prevent grease from contacting the stator windings.

3.8.2 Grease Nipples

The following standards shall apply:
BS 1486 - Lubricating Nipples.

Material - Stainless Steel.

Grease nipples shall be positioned so that they are easily accessible. If necessary, they shall be grouped or have extended lines for improved access. Extended lines shall be 3 mm stainless steel tube with stainless steel fittings.

Their locations shall be prominently displayed on drawings and maintenance manuals.

3.9 Cooling Fans

All cooling fans on motors shall be bi-directional, unless specifically approved by the Engineer. Motors not meeting these requirements shall not be accepted.

3.10 Degree of Enclosure Protection

The degree of enclosure protection for the motors shall be at least:

- (a) IP 55 for motors, IP 55 for the terminal boxes and bearing housings.
- (b) For submerged electric motors and specific drives of seal-less pumps, IP 68 for the applicable parts.

3.11 Rating Plates

Motor rating plate shall be of stainless steel fixed with stainless steel screws and include the serial number and all the information specified in the applicable standards.

3.12 Painting

Painting shall conform to the requirements laid down below. Paint colours shall conform with the requirements in SANS 1091 : National Colour Standard for Paint, and SS 0000-G-002 : Colour Coding and Labelling of Plant.

3.13 Frame Sizes

Frame sizes shall be selected in accordance with SANS 948. Imported motors may be dimensioned in accordance with IEC 72 and 72A. Jacking facilities shall be provided on 6.6 kV motors.

3.14 Earthing

Frames for motors shall be provided with internal and external earthing terminals, size M10 x 25. Both earth terminals shall be on the same side as the main terminal box.

3.15 Noise Limits

In order to limit the overall sound power level from the work area, the noise level from the machines shall not exceed 80 dB(A) as measured in accordance with SANS 083. The sound pressure level, when measured at 1 meter shall be in accordance with the South African Occupational Health and Safety Act (Act 85/93) and regulations as amended.

TESTING**Scope**

Certificates of type tests shall be furnished with tenders, as indicated in relevant documents.

Inspection and testing in Vendor's plant shall include all inspection items and routine tests specified in SANS 948, SANS 1189 and IEC 72.

However, any witnessing/approval by the Engineer shall not relieve the Vendor of his responsibility to supply equipment in good working order capable of meeting the operating conditions specified.

Vendor shall provide copies of inspection reports and test certificates for each motor, together with any data relevant to other requested tests carried out.

Motors rated 160 kW and above, shall not be dispatched unless the test certificates have been approved in writing by the Engineer or his delegate.

TESTS AND INSPECTIONS**4.1 Mandatory tests:**

- a) Measurement of current and power input on light run
- b) Measurement of locked rotor current, voltage applied, power factor and locked rotor torque
- c) Measurement of cold winding resistance
- d) High voltage insulation

Vibration

4.2 Optional tests

The following tests shall be performed if requested by the Engineer:

- a) Full load heat run
- b) Measurement of pull out torque
- c) Measurement of slip at full load
- d) Measurement of starting torque and current
- e) Measurement to allow calculation of efficiency and power factor at half, three-quarters and full load
- f) Momentary overload
- g) The Engineer reserves the right to witness any of the above tests.

4.3 Test certificates

Test certificates for all tests carried out by the Contractor shall be provided for each motor.

The Contractor shall provide type test certificates and full winding data and physical coil sizes for rewinding purposes if requested in Motor Data Sheet.

5.0 **INSPECTION AND QUALITY ASSURANCE**

5.1 **Quality Assurance / Quality Control**

- 5.1.1 The Vendor shall institute and conduct a quality management system.
- 5.1.2 The Vendor shall maintain an effective quality management system in accordance with the requirements of ISO 9001: 2008, so as to ensure and demonstrate that goods and services conform to the specified requirements.
- 5.1.3 The Vendor shall, in addition, ensure that all sub-vendors maintain equivalent systems commensurate with their particular scope of supply. Tenderers shall supply a list of intended sub-vendors for the approval of the Engineer.

6.0 **DOCUMENTATION**

- 6.1 The Vendor shall provide outline drawings only for motors over 160 kW, unless specifically requested by the Engineer.
- 6.2 The motor outline drawings shall include location of the junction boxes, standard mounting and locating dimensions, type of enclosure (degree of protection), lifting lugs, motor mass, type of bearings, and electrical data (kW, rpm, voltage, phases, frequency and service factor).

Motor drawings shall also show the following when these items are specified:

- (a) Anti-condensation heater watts, voltage, phases, terminal wire numbers and connection box.
 - (b) Terminal wire numbers, connection box for RTDs or other embedded temperature detectors.
- 6.3 The Vendor shall complete the following data sheets:
 - 14004-E-LVM-001 - Motor Data Requirements - Mechanical Supplier - for all motors
 - 14004-E-LVM-001 - Motor Data Requirements - Motor Manufacturer - for all motors
- 6.4 The Vendor shall provide the following design data for motors of each type, rated 400 kW and larger, unless otherwise instructed by the Engineer.
 - a) Stator and rotor resistance and inductance (total impedance) at standard, rated slip frequency.
 - b) Torque vs speed and current to enable an equipment supplier to calculate starting and decelerating times and currents.
 - c) Inertia of the rotor
 - d) Stator and rotor withstand time vs current at 80% and 100% rated voltage
 - e) Data for special design requirements as may be requested by Engineer.

APPENDIX A : MOTOR DATA SHEETS - DATA TO BE SUPPLIED BY THE VENDOR

(Where relevant tick the applicable box)

1.1	Output rating at sea level		kW									
1.2	Nominal voltage	<table border="1"> <tr> <td>400</td> <td>550</td> <td>950</td> </tr> </table>	400	550	950							
400	550	950										
1.3	Voltage range (IF other than Zone A and B Appendix G)											
1.4	Phases		3									
1.5	Frequency		50 Hz									
1.6	Altitude (above sea level)		m									
1.7	Ambient temperature (standard 40°C)		°C									
1.8	Duty class (standard continuous S1											
1.9	Class of insulation (standard class F)											
1.10	Insulation temperature rise (Standard class B 80° C)		°C									
1.11	Synchronous speed in rpm (1500 rpm preferred)	<table border="1"> <tr> <td>3000</td> <td>1500</td> <td>1000</td> <td>750</td> </tr> </table>	3000	1500	1000	750						
3000	1500	1000	750									
1.12	Construction materials	<table border="1"> <tr> <td>Iron</td> <td>Steel</td> <td>Aluminium</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	Iron	Steel	Aluminium							
Iron	Steel	Aluminium										
	Frame											
	End shield											
	Shaft - BS 970	<table border="1"> <tr> <td>080M40</td> <td>Other (state)</td> </tr> </table>	080M40	Other (state)								
080M40	Other (state)											
1.13	Terminal box position	<table border="1"> <tr> <td>SIDE</td> <td>TOP</td> </tr> </table>	SIDE	TOP								
SIDE	TOP											
1.14	Details of driven machinery:											
	Type of drive	<table border="1"> <tr> <td>Compressor</td> <td>Pump</td> <td>Fan</td> </tr> </table>	Compressor	Pump	Fan							
Compressor	Pump	Fan										
	Coupled to drive	<table border="1"> <tr> <td>Direct</td> <td>Belt drive</td> </tr> </table>	Direct	Belt drive								
Direct	Belt drive											
	Manufacturer of driven machinery											
	Type :											

APPENDIX A : MOTOR DATA SHEETS - DATA TO BE SUPPLIED BY THE VENDOR
(Continued)

Torque/Speed characteristics

Breakaway torque

Speed of drive rpm

No of consecutive starts from cold (minimum 3)

No of consecutive starts from hot (minimum 2)

1.2 Method of mounting: (See Appendices E and F)

1.2.1 Horizontal shaft

B3	B35	B5	B6	B7	B8	B30

1.2.1 Vertical shaft

V1	V2	V5	V6	V7	V30	V36

1.2 Details of power transmission system (coupling)

1.2 Temperature detectors required

YES	NO

1.2.1 Type

Thermistor	RTD 100	Thermocouple

1.17.2 Position

Overhang	Slots

APPENDIX A : MOTOR DATA SHEETS - DATA TO BE SUPPLIED BY THE VENDOR

(Continued)

1.17.3	Temperature rating °C	120	130	140	150
1.18	Tests in addition to mandatory tests:				
1.18.1	Full load heat run	YES	NO		
1.18.2	Measurement of pull out torque	YES	NO		
1.18.3	Measurement of slip at full load	YES	NO		
1.18.4	Measurement of starting torque and current	YES	NO		
1.18.5	Measurement to allow calculation of efficiency and power factor at half, three-quarters and full load	YES	NO		
1.18.6	Momentary overload	YES	NO		
1.19	Optional extras:				
1.19.1	Slide rails	YES	NO		
1.19.2	Grease relief. Frame size 160 to 250	YES	NO		
1.20	Documentation required:				
1.20.1	Type Test Certificate	YES	NO		
1.20.2	Full winding information	YES	NO		
1.21	Corrosion Protection:				
	Corrosively aggressive environment	YES	NO		

APPENDIX B : MOTOR DATA SHEETS

DATA TO BE SUPPLIED BY EQUIPMENT MANUFACTURER.

ELECTRICAL

All figures quoted below shall be for a machine operating at nominal voltage and frequency.

a) Full load current at sea level rated output	 amps
b) Efficiency at sea level rated output	 %
c) Efficiency at 75% sea level rated output	 %
d) Efficiency at 50% sea level rated output	 %
e) Power factor at sea level rated output	.....
f) Power factor at 75% sea level rated output	.....
g) Power factor at 50% sea level rated output	.....
h) Starting torque (as multiple of normal sea level torque rating)	.....
i) Starting current for D.O.L. start	.....
j) Starting current expressed as a multiple of full load current	.....
k) Enclosure	.....
l) Stator winding connections	.....
m) Stator conductor section	.....
n) Turns per coil	.....
o) Temperature rise at sea level rated output	°C
p) Maximum temperature rise at sea level rated output.	°C
q) Run up time for D.O.L. start for the drive	 secs
r) Rotor bars (Cuprous or Aluminium)	.....
s) Date of approval of insulation system	.....

MECHANICAL

a) Bearing types

NDE

DE

Ball	Roller	No. required

b) Motor frame size

.....

APPENDIX C : MOTOR MOUNTING METHODS - MOTORS WITH HORIZONTAL SHAFTS

Symbol	Figure	Bearing	Frame	Shaft extension	Features of construction	Attachment or mounting
B3		2 end	With feet	Free shaft extension		Mounted on substructure
B35		2 end shields	With feet	Free shaft extension	End shield flange with access to back. Shaft extension at flange end	Mounted on substructure by feet with additional mountings on flange
B5		2 end shields	With feet	Free shaft extension	End shield flange with access to back. Shaft extension at flange end	Supported by flange
B6		2 end shields	With feet	Free shaft extension	As B3 but end shields turned through 90° (if sleeve bearings)	Mounted on a wall. Feet to the left viewing from the drive end
B7		2 end shields	With feet	Free shaft extension	As B3 but end shields turned through 90° (if sleeve bearings)	Mounted on a wall. Feet to the right viewing from the drive end
B8		2 end shields	With feet	Free shaft extension	As B3 but end shields turned through 180° (if sleeve bearings)	Mounted on the ceiling to the right viewing from the drive end
B30		2 end shields	Without feet	Free shaft extension	3 or 4 bosses on 1 endshield, 2	Pad mounted by bosses

					endshields or on frame	

APPENDIX C : MOTOR MOUNTING METHODS - MOTORS WITH VERTICAL SHAFTS

Symbol	Figure	Bearing	Frame	Shaft extension	Features of construction	Attachment or mounting
V1		2end shields	Without feet	Free shaft extension at bottom	Endshield flange with access to back. Flanges at drive end	Supported by flange at bottom
V2		2end shields	Without feet	Free shaft extension at top	End shield flange with access to back. Flange at drive end	Supported by flange at top
V5		2end shields	With feet	Free shaft extension at bottom		Wall mounted or on a substructure
V6		2end shields	With feet	Free shaft extension at top		Wall mounted or on a substructure
V7		2end shields	With feet	Free shaft extension at bottom	End shield flange or end shield spigot access or non-access to back flange at drive	Mounted on a wall with additional mounting on flange at bottom
V30		2end shields	Without feet	Free shaft extension at bottom	3 or 4 bosses on 1 endshield, 2 endshields or on frame	Pad mounted by bosses
V36		2end shields	With feet	Free shaft extension at top	Endshield flange with access to back. Flange at drive end	Wall mounted or on a substructure with additional flange on top

D: Industrial Installations and Commissioning

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1.0	SCOPE
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6.0	MATERIAL
7.0	STANDARDIZATION
8.0	CONDUITS AND FITTINGS
9.0	CABLE RACKS (TRAYS)
10.0	WIRE AND CABLE
11.0	CONNECTORS AND LUGS
12.0	SUPPORTS AND FIXING MATERIALS
13.0	IDENTIFICATION
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15.0	INSTALLATION
16.0	PAINTING
17.0	GALVANIC AND CHEMICAL CORROSION
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19.0	LIGHTING
20.0	QUALITY REQUIREMENTS AND TESTING
21.0	MODIFICATIONS
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23.0	AS-BUILT DOCUMENTS
24.0	CMI FORMS 400 - 433

SCOPE

This Specification describes the minimum requirements for electrical installations on the Bloemhof Water Treatments Works and Abstraction Water Works in Lekwa-Teemane Municipality. The Contractor shall supply and install electrical equipment and materials, install Employer supplied equipment and materials, test and pre-commission and commission the electrical Works forming part of this Contract in accordance with this specification.

GENERAL

- 2.1 Requirements given in this specification are not limiting and all hardware or accessories necessary for the complete installation shall be supplied and installed even though they may not be specifically mentioned.
- 2.2 In addition to the requirements of the Conditions of Contract, the Contractor shall take any precautions and measures necessary for the protection of persons and equipment from energized electrical equipment or lines. He shall supply and install any warning signs, barricades and any other protection required.

STANDARDS AND CODES

- 3.1 The Contractor shall obtain and pay for permits, levies and licenses required for the execution of the work and shall supply any certificates requested by the local authorities.
- 3.2 All material supplied shall conform to these specifications and shall respect applicable municipal by-laws and regulations.
- 3.3 All equipment, materials, installations and tests shall be in accordance with the latest editions of National and International codes, standards and specifications, including all amendments and revisions.

SABS 03	:	Code of Practice for the Protection of Structures against Lightning
SABS 10142	:	Code of Practice for the Wiring of Premises
SABS 163	:	Wall and Appliance Switches
SABS 164	:	Plugs and Socket Outlets for Household and similar purposes
SABS 767	:	Earth Leakage Protection units
SABS 1065	:	Metal Conduits and Fittings (Screwed-End and Plain End) for Electric Wiring
SABS 1091	:	National Colour Standards for Paint
SABS 1180	:	Electrical Distribution Boards
SABS 1213	:	Mechanical Cable Glands
SABS 1411	:	Materials of Insulated Electric Cables and Flexible Cords
SABS 1507	:	Electric Cables with Extruded Solid Dielectric Insulation for Fixed Installations (300/500V to 1900/3300V)

I.E.C. 60408	:	L.V. Load break switches
I.E.C. 60439	:	Factory Built Assemblies for Low Voltage Switchgear and Control Gear
I.E.C. 60529	:	Degrees of Protection Provided by Enclosures (IP Code)
I.E.C. 60947	:	Low Voltage Switchgear and Control Gear

The South African occupational health and safety act including all the applicable amendments.

In case of conflict between the standards, the Contractor shall obtain a ruling by the Engineer prior to beginning the work.

4.0 **AMBIENT CONDITIONS**

The goods shall be designed to provide continuous, long term service under the ambient and environmental conditions that will prevail on the site.

5.0 **PLANT POWER DISTRIBUTION**

The plant power distribution system and application criteria are as follows:-

The mini substation power transformer will be 11/0.4kV, 3 phase, 50Hz (neutral solid earthed)

- a) 11 kV, 3 phase, 50 Hz for motors larger than 400 kW (N/A)
- b) 400 V, 3 phase, 50 Hz for 380 V motors, 0, 25 kW up to and including 400 kW.
- c) 230/400 V, 3 phase, 4 wire, 50 Hz for lighting and service outlets
- d) 230 V, 1 phase, 50 Hz for MCC control, process control and instrumentation.

The phase identification will be red – white – blue having an anti-clockwise phase rotation.

6.0 **MATERIAL**

- 6.1 The Contractor shall take any necessary steps to adequately protect the material and equipment, whether supplied by the Contractor or by others, from adverse weather, dust, dirt, shocks, and acts of vandalism, and any other forms of theft or petty crime.
- 6.2 Unless otherwise indicated in this specification, the Contractor shall take delivery of all material related to this contract supplied by others and install it in conformity with the supplier's instructions and this specification.
- 6.3 All equipment and material supplied by the Contractor shall be new, of good industrial quality, and shall conform to the specifications.
- 6.4 The Contractor shall obtain the Engineers' approval for all equivalent equipment and material specified. Unapproved equivalent equipment and material shall not be accepted. It is the responsibility of the Contractor to order material well in advance to prevent product substitution, since it is the aim to achieve project wide standardisation of material and equipment.

7.0 **STANDARDIZATION**

- 7.1 The Contractor shall not supply materials other than those specified here-in- List of Standard Electrical Material and any list of materials forming part of the contract documents without the prior written approval of the Engineer.

In the interests of standardisation, the Employer will select a sole supplier for the cable racking and accessories

- 7.2 The contractor will supply all the cables required for the project

The Turn key Contractor shall supply 1000/600V cables as per SANS specification and colour coding from the Employer selected supplier or other suppliers.

8.0 **CONDUITS AND FITTINGS**

- 8.1 Conduit and fittings shall be mild steel throughout other than for the following exceptions:-

- a) PVC conduit shall be used when cast into concrete or flush in plastered walls in accordance with clause 8.22 & 8.23.
- b) PVC conduit shall be used where specified due to possible contact with exposed bus bars both internally and externally.
- c) PVC conduit shall be used in the Main Substation area and any other area where contact with exposed busbars may be possible both internally and externally.
- d) PVC conduit shall be used indoors for all surface run applications.
- e) Installation of PVC conduits shall be completed strictly according to clause 8.5.

Note that PVC conduit shall not be used externally other than in the exceptional cases mentioned above. Generally where cable support or conduit is required externally this shall be done using aluminium conduit and fittings.

Conduit bushes shall be made of PVC or nylon, smoothly rounded at the outlet.

- 8.1.1 Conduits in concrete shall be rigid PVC as specified on the drawings.
- 8.1.2 Conduits buried directly in the earth shall be rigid fibre glass or PVC as specified on the drawings.
- 8.1.3 Conduits in underground concrete duct work shall be rigid PVC.
- 8.1.4 PVC conduits shall be used in free spaces of ceilings or office walls, rest rooms, dining rooms, toilets and other similar areas.
- 8.1.5 For connections to motors or other vibrating equipment, the conduits shall be flexible PVC.
- 8.1.6 Where the conduit is outdoor or is exposed to shocks, heat or other severe conditions, galvanised steel conduits shall be used.
- 8.2 The conduits shall be installed in straight lines, parallel or perpendicular to the building axis. They shall be mounted as close as possible to walls, ceilings, columns and beams.

In workshops, control rooms and process areas, the surface conduits shall be completed only after the electrical equipment has been installed.

In all areas the conduits shall be spaced at least 150 mm from steam, hot water, compressed air lines, or other services.

They shall be installed so as not to hinder access to equipment nor of its maintenance.

8.3 Nominal conduit sizes shall be in accordance with SABS 10142 but shall not be less than 20 mm diameter. In particular long or difficult runs, larger diameters shall be used.

8.4 Overhead conduits shall be suitably supported at each bend and end of conduit run before entering any junction box or equipment by arrangements approved by the Engineer.

Long runs shall contain a sufficient number of draw boxes to facilitate wire pulling. The maximum run between pull boxes shall be 30 metres. In office blocks the pull boxes shall be located in service or storage areas.

8.5 The Contractor shall take particular care with the fixing of vertical or horizontal conduits. No slippage due to weight, vibration or thermal cycling will be tolerated. The fixing of surface PVC conduits must be spaced such that no snaking occurs, in any case, as a minimum, saddles shall be spaced NO MORE THAN 1000 mm apart.

8.6 The Contractor shall install an expansion joint at each construction expansion joint and on long straight runs as per supplier recommendations.

8.7 When space or conditions don't allow a single conduit of the required size for a circuit, two parallel conduits shall be used, each carrying phase, neutral and earthing conductors according to the requirements.

8.8 Connections to junctions, draw boxes, or to equipment shall be made with lock nuts and bushes ensuring good electrical earthing continuity and mechanically strong joints. Fittings having watertight "O" ring seals shall be installed at the boxes.

8.9 When conduits are cut it shall be done at right angles. Any rough edges, especially on the inside, must be de-burred and smoothed.

8.10 Site manufactured elbows or bends shall be equal to, or greater in radius than, that specified by the supplier. Deformed, crushed or dented conduits shall be rejected.

8.11 When the conduit does not fill the complete opening through a concrete floor, the Contractor shall block the opening with a fire stop and close the lot with a 50 mm weak mix screed. Any bushings through floors and walls shall provide mechanical protection to the conduit.

8.12 Where condensation is likely to occur within a conduit, the conduit shall be run with a slope and shall be provided with drain holes at the lowest points and ventilation outlets at the highest points.

8.13 The Contractor shall supply and install any spare conduits as specified. A 2 mm diameter polypropylene pull cord shall be installed following which the conduit shall be sealed against entry of moisture or contaminants.

8.14 The Contractor shall install and connect junction boxes and draw boxes for wire pulling.

8.15 All inspection and draw-boxes shall be accessible. When conduit boxes are liable to be exposed to water, the boxes shall be furnished with covers that will prevent the ingress of water.

8.16 When a conduit is connected to an object with movement relative to the conduit, the Contractor shall use flexible conduit with PVC jacket of a minimum length 10 times the

nominal diameter and connected with appropriate fittings while ensuring good electrical earth continuity.

- 8.17 Metal conduits shall be earthed in an effective manner conforming to SABS standard.
- 8.18 Perforated metal tapes, pegs and wires are not acceptable for conduit and equipment supports.
- 8.19 Covers for junction and pull boxes installed in hard to reach locations and which have to be frequently serviced shall be supplied with a retaining device

8.20 **Surface Boxes**

When exposed conduits are used, all fittings and boxes shall be PVC and of a type suitable for their respective use.

- 8.21 When two or more switches or outlets are shown to be mounted together, multiple boxes with an appropriate common face plate is preferred.

8.22 **Flush Conduit Installations**

Where conduits are chased into brick or concrete block walls they shall be adequately secured with crimpers or other devices driven into the wall fabric and shall further be secured at strategic points by mortar. The clearance between the finished wall surface and the conduit shall not be less than 12mm. Only power tool chasing machines shall be used for making chases.

Accessory boxes shall be fixed square and mortared in.

8.23 **Cast In Place Conduit Installations**

Conduits installed within concrete slab beams, columns or walls shall be firmly fixed in position before the concrete is cast.

The general disposition of conduits within the slabs shall be agreed by the Engineer before installation. Furthermore, where such conduits occur in large concentrations, or where large diameter conduits (32 mm diameter or larger) are installed, the Contractor shall obtain the approval of the Engineer for the positioning of such conduits. Generally, however, conduits shall be installed in the middle of the slab thickness and extension boxes or extension rings shall be provided for as necessary.

Conduit boxes, draw-boxes etc. installed on shuttering decks or wall shutters shall be suitably sealed against the ingress of moisture and vibrated concrete with dampened paper rammed in them, and shall be securely fixed to the shuttering by means of lashing with galvanised steel wire or else by temporarily fixing the box to the shuttering by screws through the shuttering into the fixing lugs of the box. It is of the utmost importance that fixing screws or lashings be released immediately after the concrete has been allowed to set and before the shuttering is struck.

The Contractor shall stand by when concrete is being poured in order to rectify any defects that may occur.

All conduit boxes and accessory boxes shall be flush with the finished plaster work, and the Contractor shall co-operate with the building contractor to ensure this requirement is met. Where necessary, extension boxes shall be fitted to meet this requirement.

The Contractor shall notify the Engineer at least four hours before the conduit in concrete is covered so that the conduit installation may be inspected before pouring.

Where conduit runs occur in groups or in large concentrations (e.g. near distribution boards, draw-boxes or in similar situations), they shall be fixed with a clearance between adjacent conduits of not less than one conduit diameter to permit adequate penetration of concrete.

Conduit may be installed in surface beds provided that the conduits are clear of contact with ground and are completely encased in mass concrete.

Conduits may only be installed directly into floor screeds where a cover of at least 40 mm can be effected. For clearances of 20-40 mm, "chicken wire" shall be used as a cover over the conduit to act as a screed binder. For clearance less than 20 mm, the conduit may be chased into the slab subject to the approval of the Engineer.

Conduit crossings in screed shall be avoided as far as possible. Where this is unavoidable, one conduit may be set under the other one and chased into the slab subject to the approval of the Engineer.

Conduits shall be firmly fixed to slabs intended to receive screed by means of half saddles or equivalent fastening.

8.24 **Standard Wiring Trunking**

Wiring trunking and accessories shall be shop fabricated from aluminium or grade 304 stainless steel. All bends, tees, stop-ends and accessories shall be supplied by the trunking manufacturer.

Accessories and sections of trunking shall be coupled with coupling pieces and earth bonded together with copper bonding links. In addition, the links shall be bonded to the trunking main earth wire or largest circuit earth wire with a jumper of at least 2,5 mm².

The maximum number of circuit and earth wires that may be installed into any trunking shall be such that the total overall cross-sectional area of the wiring including the insulation does not exceed 50% of the free area of the trunking.

With the exception of under floor trunking and loosely filled "opening-up" trunking, wiring retainers shall be installed every metre of run and at other positions as required. The trunking shall be installed in a neat and workmanlike manner on ceilings, walls, plant machinery etc. as indicated in the drawings.

9.0 **CABLE RACKS (TRAYS)**

9.1 All cable racks shall be heavy duty wire mesh type unless specified otherwise.

9.2 The Contractor shall supply and install all cable rack supports and galvanic barriers (eg. vinyl faced bitumen self adhesive tape) to prevent corrosion between two dissimilar metals. All cable rack shall be installed in the horizontal plane unless indicated otherwise on the drawings. All cable racks must be solidly supported.

Drilling into Secondary structural steel, other than angled structural bracing, is allowed provided the following are adhered to:

- a) Obtain approval of the engineer
- b) Holes shall be limited to 12,5 mm diameter
- c) Holes shall be drilled where the stress is at a minimum
- d) Painting of structural steel after drilling shall be done
- e) Paint shall be allowed 24 hours to dry before bolting of rack supports
- f) Stainless steel bolts and nuts shall be used in all cases
- g) Direct contact between aluminium cable racks and structural steel even if painted is prohibited. Where this does occur insulation shall be inserted between the dissimilar metal surfaces.

9.3 Unless otherwise agreed, straight cable rack runs shall be supported every 3 m and for sloping racks at least every 1500 mm. For horizontal bends (90° & 60°) with radii of 400 mm or more, there shall be an additional support in the centre. The Contractor shall obtain approval by the Engineer for the type of support he intends to use.

9.4 All cable rack supports and their anchorage shall be sufficiently strong to support the maximum rack loading with a 1,6 factor of safety. The racks with all the cables installed shall not have a deflection at midpoint of more than 10mm.
For cable racks that are wall supported, the Contractor shall start to fill the rack on the side closest to the walls to allow easy rack fill for any additional cables. Vertical cable racks shall be supported every 3 m. The Contractor shall be responsible for adding any supplementary supports to prevent oscillations, sagging, deformation and sagging cables. Concrete anchors shall be 12 mm in diameter, (Hilti) type LSA-R stud anchor stainless steel, or approved equivalent.

All rack supports shall be stainless steel, type 304L.

Cable racks, unless specifically sized in the documents and/or drawings shall be of suitable width to provide sufficient room to accommodate 25% more cables than presently indicated/required.

9.5 Cables of different voltage levels shall be run on separate racks as per groupings shown below, with the highest voltage cable at the top :

- a. 400 V power cabling (Power racks)
- b. 230 V control cabling (which may be run with 400 V) (Power racks)
- c. Instrument cables – 230 V AC digital cables (Separate racks or conduit)
- d. 4 – 20 mA analogue and data cables (Separate racks)

The c and d cables may run in racks adjacent to each other with a separator.

The following spacing shall be observed between rack groupings on horizontal runs unless otherwise shown on the drawings :

- between rack groupings - 600 mm
- between 0.4 kV and instrumentation - 400 mm

Where rack groupings cross Instrumentation racks at 90° a minimum spacing of 600 mm shall apply.

9.6 When the cables leave the cable rack, the Contractor shall support the cables vertically by using well supported U-channels.

9.7 All cable racks shall be earthed by a 70sqmm diameter tinned BCEW at 30m intervals maximum.

9.8 When a cable rack runs vertically through or from a floor, the Contractor shall install a covering plate on the rack extending 300 mm high from the floor. For racks containing 11 kV cables, a label with the inscription "DANGER HIGH VOLTAGE" shall be placed on the cable rack.

9.9 All horizontal cable racks containing 11 kV cables shall be identified with a plate indicating "DANGER HIGH VOLTAGE" every 6 m on the sides of cable racking accessible to personnel.

9.10 Cable racks are to be handled with care to prevent damage. Racks damaged by the Contractor shall be replaced free of charge by the Contractor.

10.0 **WIRE AND CABLE**

10.1 All cables shall be designed, constructed and tested in accordance with SANS : Low Voltage Power and Control Cable.

- 10.2 Cables will be specified on drawings and cable schedules, however, the following describes the basic criteria for the selection of power cables. No substitution of a specified cable may be made without the prior written approval of the Engineer.
- Cables rated 600/1000 V in all sizes shall be copper. The Engineer will only approve copper stranded cables up to 70 mm² in exceptional cases e.g. inside office type buildings due to space restrictions on bending radii.
 - Power cable cross sectional area shall be at least 2,5 mm² and no larger than 300 mm² for multi-core and 630 mm² for single core.
 - When the current demand is greater than a single conductor rating, parallel cables of equal size shall be utilised. This use shall require the prior approval of the Engineer and shall not apply for any conductor size less than 70 mm².
 - Control cables shall be 1,5 mm² unless otherwise specified.
 - All cabling to motors or other intermittently loaded equipment shall be continuously rated at the full load rating.
- 10.3 The cable shall be covered with a RHFR outer sheath with a red stripe indicating the flame retardant property.
- 10.4 The colour of phase insulation in cables shall be red, white and blue, and neutral shall be black. In PVC conduits a green-yellow earth wire shall be installed. Single conductors shall be identified with the required colour. In the event of the black conductor being used as an earth conductor, a green-yellow coloured heat shrink sleeve, 30 mm minimum length, shall be installed adjacent to each terminal point.
- 10.5 The wires entering and leaving a draw box shall have a free loop equal to 40 times the wire diameter.
- 10.6 No lubricant other than those specifically approved, such as Yellow 77 Wire Pulling Lubricant, shall be used for pulling wires and cables. The Contractor shall consider possible temperature changes and leave enough slack to allow for expansion or contraction.
- 10.7 Where specified on the drawings, or on vertical trays to support the cable, cable of sizes 120 mm² and larger installed on cable racks shall be individually fastened every 600mm. For cables less than 120 mm², strapping every 1,5 metres is acceptable. "Insulok" cable ties (Hellermann) or equivalent approved shall be used. The cables shall be installed on cable racks in such a way as to permit adding more cables.
- 10.8 Single cables not supported by cable racks may be held and supported by means of mild steel conduit/profiles.
- 10.9 When the cables pass through a floor, the Contractor shall install a sleeve extending 150 mm above the floor.
- 10.10 All 600/1000 V and 6.3/11kV copper power and multi-core control cable (types LC/MC) will be armoured, PVC/PVC insulation type D2, manufactured to SABS 1507 and SABS 1441, where applicable.
- 10.11 All 600/1000 V and 6380/11000 V copper cable (types LA/MA) will be armoured, XLPE insulation type A or B, manufactured to SABS 1507 and SABS 1441, where applicable. A compatible barrier tape will separate the XLPE insulation from the PVC sheath and care shall be taken during stripping and glanding to prevent contact between these two components and to maintain the barrier tape.

10.12 Power cables shall be grouped as follows :

- multi-core cables up to and including 70 mm², installed on cable racks in one layer with no space between cables
- multi-core cables larger than 70 mm², installed on cable racks in one layer with a space between cables equal to diameter of the cable
- single core cables, 300 mm² and larger, installed on cable racks in a trefoil group with a space between groups equal to diameter of the cable

10.13 The screens of single core cables (single core and type MC/MA) shall be earthed at the source and isolated from earth at the other end. Gland plates for single core cables shall be non-magnetic (aluminium).

10.14 Power cables leaving the main power routes and consisting of two or more cables shall (unless shown otherwise on drawing) be installed on a cable tray. Single cables may be clipped every 500 mm direct to steelwork, walls, etc., or run in an open conduit system.

10.15 Cable and cable tray shall not be routed beneath pipe flanges and must take into account maintenance access to equipment and clearances required for removal of equipment and piping.

10.16 All cables to be supported so that no strain is exerted upon the cable gland and associated equipment.

10.17 Cables must run clear of all process and service pipes. Cable runs are to be kept a minimum of 300mm from any lagged steam or hot process lines. In some places a heat barrier may be required as decided by the Engineer.

10.18 Cable jointing shall only be permitted when indicated on the drawings or with written approval from the Engineer. As a rule, no cables shall be joined, except where the run length exceeds the full cable drum length the coordinates showing the position of the joint shall be recorded on the layout drawing.

10.19 Where equipment to be connected is not in place at the time of cable installation, the cable shall be left neatly coiled. Protective watertight seals shall be applied to the ends of all cables to prevent ingress of moisture until termination is possible.

10.21 Rollers shall be used during cable pulling at all corners and at regular intervals to support the cable so as not to exert any force on the racks. The maximum pulling tension as specified by the cable manufacturer shall not be exceeded.

10.22 The minimum cable bending radius shall be strictly adhered to. For the 33 kV cable, special 1.5m radius bends shall be used to comply with the 15x cable outer diameter requirement.

11.0 **CONNECTORS AND LUGS**

11.1 When cable connections are required in junction boxes for conductors of categories "lighting circuits and outlets", "control", "protection" and "instrumentation", they shall be done on terminal strips Weidmuller, Cabur or equivalent as supplied by the JB supplier, type SAK2.5 or larger.

11.2 Belleville washers shall be used for all bolted connections or studs with lock nuts to ensure constant pressure independent of temperature changes.

11.3 Compression lugs shall be used for connecting wires at motors.

- 11.4 Cables of 11kV shall be terminated using Raychem EPKT kits.
- 11.5 Spare cores of cables shall be left sufficiently long to reach the furthest terminal.
- 11.6 Lugs shall be crimped using the proper crimping tools. The enlarging of holes in lugs is expressly forbidden. Crimping tools for cables up to 35mm² may be hand powered types, but above 35mm² hydraulic tools shall be used. It shall be the responsibility of the Contractor to ensure that lugs, tools and dies are of the correct size for the cables.
- 11.14 All connections shall be done by appropriate bolts, nut and lock washers, use of black steel is not acceptable.

12.0 **SUPPORTS AND FIXING MATERIALS**

- 12.1 The Contractor shall supply all supports necessary to rigidly and securely fasten all accessories, conduits, cable racks, junction boxes, distribution panels and all other electrical system components.
- 12.2 The Contractor may choose to pre-fabricate some supports in a workshop. In this case he shall submit drawings showing the arrangement of the support, the materials used, the fabrication methods and finishes to the Engineer for prior approval.
- 12.3 All cable rack supports and other accessories are to be manufactured from mild steel or stainless steel, grade 304 L. All fittings shall be standard, factory manufactured and shall be used for the purpose intended as supplied by Huletts Hydro Extrusions, O-Line or approved equivalent.
- 12.4 Supports and fixing shall preferably be clamped to structural members by means of caddy clamps and suitable fasteners as supplied by Huletts Hydro Extrusions or Cadweld SA (Pty) Ltd - Erico Cadi Fixing Product Range.
- 12.5 No modifications to the building foundations or its structure shall be made without the prior approval of the Engineer.
- 12.6 All openings in walls and floors for the passage of cable racks, conduits or cables shall be sealed with Pyrocote KBS, Panel Seal or equivalent approved by the Engineer.
Not only shall openings in exterior walls be sealed dust and water tight, but also those made in the walls of electrical and control rooms and in walls between areas where temperature differences greater than 5°C will occur.

12.7 **Fixing Materials**

It is the responsibility of the Contractor to position and securely fix cables, conduits, cable ducts, cable racks and trunking, switchgear, panel boards, fittings and all other equipment or accessories as required for the installation. The Contractor shall provide and fix all supports, clamps, brackets, hangers and other fixing materials. Clamps and brackets used to fix or support equipment such as cable racks and wire ways, or strapping used to fix cables, shall be suitable for the specific installation requirements and installed to the supplier's instructions.

12.8 **Mounting Boxes**

Boxes shall be mounted using clamps for beams, expansion anchor bolts or through bolts. Wood blocks inserted in holes for mounting conduits, equipment or other fitting will not be accepted in any circumstance.

12.9 **Glands**

Cable glands shall be compression type, nickel plated brass or with a chemical resistant plastic body (Pratley Envirogland) and bear the SABBS mark. Under no circumstances are nylon or PVC based glands to be used unless approval is given in writing by the Engineer. All cable glands are to be fitted with PVC shrouds.

12.10 **Screws and Bolts**

Steel screws, bolts and nuts shall be Nickel plated or stainless steel 304L.

Where holes exist in equipment to be fixed, bolts and fixing screws as specified shall be used. Where sizes are not specified the largest bolt that will fit into the hole shall be used.

12.11 **Wall Plugs**

Where the mass of the equipment is less than 20 kg, suitably sized wall plugs may be used to fix conduits, cables and other equipment. "Hilti" type nylon or approved equivalent plugs (that splay open) shall be used. Wooden plugs or plugs with a fixed outer diameter are not acceptable. Plugs installed in joints between bricks are not acceptable. A masonry drill of the correct size shall be used to drill holes for plugs. Screws of the correct diameter to match the specific plug shall be used throughout.

12.12 **Anchor Bolts**

Where the fixing holes are 10 mm and larger or where the mass of the equipment is greater than 20 kg, equipment shall be fixed by means of "Hilti" type or approved equivalent, stainless steel, 304 L expansion anchor bolts, or by means of bolts cast into the concrete or built into walls. Expansion anchors shall not be used for structural steel members and in positions closer than 75 mm from the edge of the concrete structure.

12.13 **Shot Fired Fixing**

Materials such as metal cable ducts or channels may be fixed against walls and concrete slabs by means of "Hilti" type or approved equivalent shot-fired fixings. Should the Contractor propose to use shot fired fixings, he shall propose the materials, tools, procedures and location of use to the Engineer for approval.

It shall be the Contractor's responsibility to ascertain whether this method of fixing will carry the weight of the material including conductors, cables and other items of equipment to be installed later. Should it be found that the method of fixing is inadequate and supports tend to loosen, the Contractor shall fix the material by an alternative method to the satisfaction of the Engineer.

Nails and explosive charges and procedures recommended by the manufacturer of the fixings shall be used throughout.

13.0 **IDENTIFICATION**

13.1 All Contractor supplied items of electrical equipment shall be identified with engraved nameplates. All descriptions shall be in English.

13.2 Nameplates shall be white "Traffolite" sandwich board, consisting of white outer layers and black inner layer such that engraving produces black lettering on a white background. Alternatively, Aluminium with black engraving can be used.

13.3 Nameplates shall, where possible, be screwed to the fixed part of metalwork or structure with aluminium rails.

In the case of items such as field isolators or control stations, nameplates shall be screwed to the equipment housing by means of stainless steel screws if the equipment IP rating is not compromised by using this method. If the IP rating is likely to be

compromised, the nameplates shall be affixed with approved adhesive (Pratley SP020 or equivalent) or attached with stainless steel wires or fixed to the equipment or adjacent wall, metalwork or structure with aluminium rails.
All labels 200 mm and longer shall be installed on sliding aluminium rails fixed to the equipment.

- 13.4** Double sided tape shall not be used to hold labels down.
- 13.5** Minimum letter height of nameplates for switchboards and distribution board shall be 10 mm.
- 13.6** When due to grouping of electrical equipment errors can occur in replacing doors or covers, with consequential technical or safety implications, nameplates shall be affixed not only on the fixed part of metalwork or structure or equipment housing but inside the removable door or cover as well.
- In instances where nameplates are affixed inside panels the preferred method to label these items is to use self-adhesive plastic labels with black lettering on a white background.
- These labels are typically generated by a PC or a portable, hand held machine type Brother P Touch PT200 or equivalent.
- 13.7** If electrical enclosures, conduit boxes, apparatus or instruments which should be easily accessible are hidden, their locations shall be indicated by a suitable symbol or label. A removable access panel or tile shall be provided to the satisfaction of the Engineer.
- 13.8** Each item in a motor control centre, distribution and control panels as well as any remotely installed equipment shall be tagged with the identical numbering as shown on the drawings.
- 13.9** All wire ends at terminal strips of equipment shall have bead type numbered ferrules to correspond with the identification/numbering on the wiring diagrams. Wire identification shall be made by using "Helagrip HGT" (Bowthorpe Hellermann) ferrules or approved equivalent.
- 13.10** Identification labels for electrical conduits or cables shall be done using black PVC tags with oval type sleeve markers specially designed for this purpose. PVC-Ovalgrip HO85WE (Bowthorpe Hellermann) cable markers or approved equivalent shall be used. They shall be installed at each end of the cable or conduit. For cables installed in cable trays, cables shall be marked at the source and the destination.
- 13.11** After completion of the installation, the Contractor shall correctly complete the circuit legend cards of each distribution panel. The legend shall be typed and installed behind a clear plastic holder firmly held in place.
- 13.12** Cable rack identification shall be affixed at each bend, on each side of all passages through walls and floors, by means of stencilled letters 50 mm high every 12 meters.
- 13.13** All electrical equipment, including motors shall be supplied with equipment data labels, indicating the size, equipment identification tag number, serial number, including the type of bearings, voltage, frequency, phases, power in kW for motors, the manufacturer's name and address.
- 13.14** The Contractor shall avoid painting the name plates, and when the equipment has to be lagged/insulated, openings shall be allowed to ensure that the name plates can be clearly seen. The Contractor shall under no circumstances modify the manufacturer's name plate.

13.15 Equipment approval data name plates from SABS or relevant test laboratories shall be installed as required and shall be easily visible as described above.

14.0 **CO-ORDINATION**

14.1 The Contractor shall co-ordinate his activities with those of other contractors working in the same area or on the same piece of equipment.

14.2 The Engineer, at any time prior to the installation, may decide to move auxiliary equipment, such as fans, light fixtures, switches, outlets, breakers and lighting transformers within a radius of three (3) metres at no cost to the Employer.

14.3 No lighting fixture shall be placed over pipes, conduits or any other obstacle in a way that its illumination may be obscured.

14.4 The Contractor shall verify the expected location of junction and pull boxes in wall and floors with the Engineer.

14.5 All conduit fittings shall be selected according to the requirements of SABS 0142 considering the number and size of conductors and conduits concerned.

14.6 The draw boxes and junction boxes shall be located in protected areas but shall be easily accessible.

In the event equipment is installed contrary to the specifications, or is, according to the Engineer, an obstacle or is damaged, it shall be moved or replaced at no additional cost.

1.0 **INSTALLATION**

15.1 The equipment shall be installed straight and level. Visible suspension rods shall be parallel to or at a right angle to the walls. When several rods or supports are used in the same passage way, they shall be perfectly aligned.

15.2 All equipment shall be solidly fixed to the structure by adequate industrial type supports. No equipment shall be supported by its connecting conduits.

In passageways, junction boxes and panels shall not be installed on the top of beam joints.

All electrical equipment mounted on concrete or masonry walls shall be mounted 20 mm off the wall.

15.3 The Contractor shall ensure that all equipment is installed to ensure minimum distances in all directions from doors, windows and frame work.

15.4 In general, the equipment shall be mounted the following distances above the finished floor :

Light switch:	1 350 mm
Embedded outlets:	300 mm
Outlets:	200 mm above counters
Surface outlets:	1 200 mm
Outlets for wall luminaire:	2 100 mm
Telephone outlets:	300 mm
Push buttons:	1 200 mm
Top of panels and other similar boxes:	1 800 mm
Fire alarm boxes:	1 350 mm
Fire alarms:	2 100 mm

- 15.5 All switches shall be placed to be operated by the operator's left hand, the operating handle being located to the right of the switch when facing the equipment.
- 16.0 **PAINTING**
- 16.1 Stainless steel equipment shall not be primed or painted unless otherwise indicated.
- 16.2 Any item damaged by the Contractor shall be repainted to the satisfaction of the Engineer
- 17.0 **GALVANIC OR CHEMICAL CORROSION**
- 17.1 Particular care shall be taken to avoid contact between dissimilar material to prevent galvanic corrosion, such as between aluminium and steel.
- 17.2 Galvanized steelwork which has been welded, cut or drilled shall be cleaned of all dirt and grease and then re-touched with a zinc rich paint such as "Galvicon".
- 18.0 **EARTHING**
- 18.1 All earthing shall conform to the requirements of SABS 10142.
- 18.2 Earthing connections shall be made on clean metal surfaces free of paint, primers or any insulating material using materials designed for the purpose.
- 18.3 Earthing connections shall be made using thermo-weld moulded type connections such as "Cadweld", or equivalent, covered with a coat of zinc rich paint or by compression connectors such as BICC-BURNDY YGL, or equivalent, made with proper compression tools and dies. The Contractor shall leave enough slack to ensure no mechanical constraint.
- 18.4 Earthing connections from the exterior earthing grid to building columns shall be made through sleeves in the concrete.
- 18.5 Earthing systems installed around all buildings shall comprise one 95 mm² stranded copper conductor. These conductors shall be located approximately 1 metre from the building cladding and shall be buried at a depth of 600 to 700 below the finished grade unless otherwise indicated on the drawings. Where ends are to be left for connection to building columns these shall be 1 metre in length and shall be coiled and placed where risk of damage will be minimal.
- The building structure is to be connected to this grid by cables connected every two columns or not greater than 30 metres, unless otherwise indicated on the drawings.
- The earthing connection to steel columns shall be done using a bolted connection, unless otherwise indicated on the drawings.
- 18.6 All non-energized metal parts of electrical equipment such as motors, switches, breakers, junction boxes, splitter boxes, conduits, cable racks, distribution panels, motor control centres, starter enclosures, etc. shall be earthed.
- 18.7 Mechanical equipment including their supporting frames shall be earthed directly to the building earthing grid.
- 18.8 Major equipment such as lighting transformers 250 kVA and larger, motor control centres and switchgear shall have two distinct 95 mm² bare, stranded copper earth connections to the earth grid.

- 18.9 All metallic isolators and push button stations, or metal parts, shall be provided with an earth terminal which shall be bonded to the metal body of the enclosure.
- Where the enclosures are fabricated of PVC or glass reinforced epoxy they shall also be provided with an earth terminal and all exposed metalwork such as push button shrouds etc. shall be bonded to this terminal. The preferred method would be to use a spare core of the cable for this purpose. The above does not apply to double insulated enclosures/pushbutton stations.
- 18.10 All intrinsic safety or computer earths as shown on relative earthing drawings to be copper, single core stranded PVC insulated coloured blue, minimum size 70 mm², single point bonded to the substation main earth bar.
- 18.11 All cable connections to equipment shall be made by means of a tinned crimped cable connector.
- 18.12 Cable routes to the main earthing ring from structures, vessels, etc., are at the discretion of the Contractor and shall be approved by the Engineer.
- 18.13 All auxiliary steelwork used to support earthing cables shall be stainless steel, type 304L. Auxiliary steelwork supports may be clamped to the main steelwork.
- 18.14 Where cable glands enter equipment with a clearance hole and locknut, a 'Star' washer shall be fitted to ensure good electrical contact. All surfaces must be free from paint, concrete, etc., before connections are made.
- 18.15 The Contractor shall establish that positions given for earthrods on earthing layout drawings will not interfere with any underground pipework, drains, etc.
- 18.16 Metal cladding of any insulation (temperature or acoustic) on pipework shall be connected to the nearest point of the earth ring.
- 18.17 All nuts, bolts, studs and washers used for the purpose of earthing are to be brass or stainless steel, type 304L.
- 18.18 All below ground connections shall be Cadwelded. Where above ground connections are required that are not to be Cadwelded, such as joints between aluminium down conductors and underground copper earth conductors, these shall be bolted. Joints between copper bars shall have a minimum of two bolts.
- 18.19 The cross sectional area of branch conductors connecting equipment and structures to the main earth ring shall be;
- to metallic enclosures of HV electrical equipment 95 mm²
 - to metallic enclosures of MV/LV motors above 160 kW 70 mm²
 - to metallic enclosures of LV electrical equipment having a supply cable with a conductor cross section of 35 mm² and more 70 mm²
 - to metallic enclosures of LV electrical equipment having a supply cable with a conductor cross section between 6 and 35 mm² 2mm²
 - to metallic enclosures of LV electrical equipment having a supply cable with a conductor cross section of 6 mm² or less 6 mm²
- 18.20 Cable connections to copper strip shall be a tinned lug crimped onto the cable and bolted onto the copper strip, tinned in the contact area.

- 18.21 "Metal Vent Pipes" must be bonded to "earthed" main plant steelwork or main earth ring using 70 mm² cables. Routing (when applicable) at the discretion of the Contractor, approved by the Engineer.

19 **LIGHTING**

- 14.0 All locations of luminaires, switches, low voltage sockets and all other items shown on drawings must be checked by the Contractor before installation. If any electrical equipment is found to interfere with piping, steelwork, etc., it shall be relocated after agreement with the Engineer.
- 14.0 Cable routes from lighting distribution boards to light fittings/junction boxes are at the discretion of the electrical Contractor. Economical use of cable is required and the use of junction boxes to reduce cable installations is recommended.
- 14.0 Lighting cable runs consisting of more than two cables shall be installed on a cable tray. One or two cables may be clipped direct to steelwork, or run in an 'open conduit' system unless specified otherwise on the drawings. CCG Handi-trak may be used inside buildings in the ceiling void for the support of cables.
- 19.4 All luminaires shall be suitable for a 230 V 50 Hz supply.
- 19.5 All auxiliary steel used to support luminaries and cables shall be mild steel or stainless steel (Grade 304L).
- 19.6 All unused cable entries on luminaires to be screw plugged. All luminaires subjected to weather to remain waterproof after installation is complete.
- 19.7 Luminaire mounting details and arrangements shown and called for on lighting layout drawings are to be adopted and modified by the Contractor and approved by the Engineer to suit the individual application, e.g. offsets, outreach and dropper dimensions.

20 **QUALITY REQUIREMENTS AND TESTING**

- 20.1 The Contractor shall do all checking and testing to mechanical completion as per the standard completion check sheets (CMI forms 400-433 or the Contractor's equivalent after approval by the Engineer) and defined by the Conditions of Contract. Prior to commencing tests on equipment and electrical systems the Contractor shall submit a test program.

The Contractor shall appoint a competent person to execute, supervise and control all testing and checking activities. This person shall liaise closely with the Engineer in order that testing activities may be conducted and sequenced in a manner best suited to the commissioning programme.

Defects revealed during testing and checking shall be made good by the Contractor without delay.

The Contractor shall not energise any equipment without the approval of the Engineer.

Communications cables, thermocouple cables and instrumentation cables shall not be insulation tested.

Cables rated at 600/1000 V shall be tested to 2000 V using a megger.

The Contractor shall supply all instruments and manpower necessary required for conducting the tests.

- 20.2 Before any equipment is to be energised, the Contractor shall clean the equipment, perform continuity and insulation tests, verify the various protection settings, and submit the results to the Engineer for approval.
- 20.3 **Readings**
- Record all instrument readings including the name of its manufacturer and its type number and any other pertinent information taken during the test. The original of these readings shall be approved by the Engineer and he shall be given a copy.
- 20.4 **Electrical Continuity**
- The Contractor shall verify the electrical continuity of the equipment earthing circuits and of all wires and cables.
- 20.5 **Cable Insulation**
- The Contractor shall carry out high voltage tests on 11 kV cables in accordance with the manufacturer's instructions.
- 20.6 **Equipment Insulation**
- All equipment such as 230/400 V distribution panels, motor control centres and motors, shall pass a 2000 V earth insulation test using calibrated megger, each with their breakers and sectionalizing switches closed and all connecting cables isolated. Measurements shall be made between each phase and between each phase and earth with the minimum resistance being 2 mega ohm.
- 20.7 **Phasing**
- The Contractor shall verify that connection to all three phase panels is red phase - left, white phase - centre, and blue phase - right, facing the front of the panel and that the phase rotation is anti-clockwise.
- 20.8 **Verification of Transformer Taps**
- Measure the voltages on the transformers and adjust the off load taps as necessary to achieve 230/400 V at the transformer terminals as required.
- 20.9 **Protection Devices**
- The Contractor shall check and confirm the equipment name plates, its supply equipment and its control functions, verify the size of all circuit breakers and the setting of all magnetic trips or thermal overload protection furnished by himself or by others, prior to energizing the circuit.
- 20.10 **Supply to Equipment Provided by Others**
- The Contractor shall liaise and co-ordinate with other contractors when making electrical connections to any equipment provided by them.
- The power required, the type of connections, the circuit rating, and over voltage and overload protection shall be checked. When no information on the equipment is available, or when an abnormality is found, the Engineer shall be notified.
- 20.11 **Control, Protection and Alarm Circuits**
- Check out all control, protection and alarm circuits before starting the equipment.
- Verify the correct operation of all control, protection and alarm devices.

20.12

Motors

Check the motor nameplate data, tag number and description against the single line diagram and with the settings of all overload and over current protection installed. Simocode is being used in this case. Check that the Tag Number Plate is fixed to the adjacent support structure.

In addition to the tests specified above, check the correct rotation, measure the starting current and record the results.

Submit these records to the Engineer on a data sheet carrying the identification of the equipment.

21

MODIFICATIONS

21

The Contractor shall make any change as required by the Supply Authority at no additional cost, if such change is required to comply with applicable standards and/or local regulations.

21.1

Any system modified shall be tested again at no additional cost.

21.2

Following installation, the contractor shall re-touch all damaged painted surfaces with paint of the same type and colour. He shall also supply touch-up paint for future use for any equipment supplied by himself (non-free issue eqpt.).

CERTIFICATES

- 22.1 The Contractor shall obtain the required approval permits for electrical installation work done under these Contract documents as required by the Conditions of Contract and the requirements of the relevant authorities in South Africa. At the least this should be a certificate of compliance as would be required in South Africa.

23 AS-BUILT DOCUMENTS

- 23.1 The Contractor shall appoint a person to supervise the marking up of a set of the latest drawings, showing all work as actually executed indicating any deletions, additions and modifications with red pencil. The routing of cables on the cable racks shall also be indicated.
- 23.2 This set of drawings shall be made available to the Engineer. Revised drawings shall be submitted for approval at the end of the work. During the work, if major changes are required implicating other contracts, they shall be submitted to the Engineer for approval.
- 23.3 It is an absolute requirement that the Contractor maintain a "daily working copy" set of drawings in the Contractor site office. Such copy is to be marked-up by hand on a daily basis to reflect changes and modifications made both during the construction and pre-commissioning phase. The drawings are to be made available to the Engineer for monitoring and ensuring that drawings are being correctly marked-up during all phases of the contract.
Two sets of mark up drawings shall be handed over to the Engineer at the provisional acceptance.

24 ACRONYMS AND ABBREVIATIONS

ACB	Air Circuit Breaker
BCEW	Bare copper earth wire
C&I	Control and Instrumentation
CCR	Central Control Room
CCTV	Closed Circuit Television
CT	Current Transformer
CVT	Constant Voltage Transformer
DB	Distribution Board
DOL	Direct on line starter
E&I	Electrical and Instrumentation
HPS	High Pressure Sodium
HV	High Voltage (> 66 kV)
ICEW	Insulated Copper Earth Wire
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
IT	Information Technology
LCF	Load Capacity Factor
LPS	Low Pressure Sodium
LV	Low Voltage (< 1000V)
MCB	Miniature Circuit Breaker
MCC	Motor Control Centre
MCCB	Moulded Case Circuit Breaker
MV	Medium Voltage (>1000V <66 kV)
NEC/R	Neutral Earthing Compensator/Resistor
NRS	National Regulating Standards
OEM	Original Equipment Manufacturer

BLOEMHOF WTW EXTENTION |	ELECTRICAL GROUNDING (UNDERGROUND) CHECKLIST		NO:
			DATE:
			PREPARED BY:
			SHEET
PROJECT:		PROJECT NO:	
LOCATION:			
CONTRACTOR:		CONTRACT NO:	DATE ISSUED:
TITLE:		AREA:	
ITEMS TO CHECK		INSTALLATION INSPECTED (Signature and Date)	
1. CONDUCTOR IS CORRECT SIZE AND TYPE			
2. CRIMPED CONNECTIONS CHECKED			
3. GROUND RODS - CORRECT PER DRAWING			
4. GROUND WELL OR GROUNDING MAT LOCATIONS PER DRAWING			
5. GROUND WELL OR GROUNDING MAT CONNECTIONS CHECKED			
6. GROUND CONDUCTOR BURIAL DEPTH PER SPECIFICATION			
7. LOCATION, TYPE AND SIZE OF EQUIPMENT TAPS PER DRAWINGS AND PROTECTED DURING CONSTRUCTION			
8. GROUND CONTINUITY CHECKED			
9. RESISTANCE READINGS RECORDED ON PROPER FIELD TEST RECORD			
10. CONFORMANCE TO SPECIFICATIONS AND DRAWINGS			
REMARKS:			
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ DATE : _____		ACCEPTED BY CONTRACTOR : NAME _____ : _____ SIGNATURE _____ : _____ DATE _____ : _____	

BLOEMHOF WTW EXTENTION	CHECKLIST	NO:	
		DATE:	
		PREPARED BY:	
		SHEET	
LOCATION:		PROJECT NO:	
CONTRACTOR:		TITLE:	
ITEMS TO CHECK	CONTRACT NO:	DATE ISSUED:	
	AREA:		
1. INSPECT ENTIRE ASSEMBLY INCLUDING AUXILIARY EQUIPMENT FOR ANY APPARENT DAMAGE OR MISSING PARTS		INSTALLATION INSPECTED (Signature and Date)	
2. CHECK PHASING OF BUSES. IDENTIFICATION (BUS TIE BREAKER)			
3. REMOVE SHIPPING SUPPORTS			
4. CHECK AND INSPECT FOR COMPLETENESS OF ALL COMPONENTS			
5. ALL DEVICES INSTALLED SUCH AS GROUND FAULT RELAYS, VOLT METERS, AMMETERS, BREAKERS, FUSES, ETC			
6. CHECK CONTROL WIRING (ESPECIALLY FIELD CONNECTIONS AT SHIPPING SPLITS)			
7. MEGGER BUSES AND RECORD ON FIELD TEST RECORD AND			
8. MEGGER CONTROL AND POTENTIAL TRANSFORMER PRIMARY AND RECORD ON FIELD TEST RECORD			
9. CHECK AND RECORD CONTROL TRANSFORMER FUSE AND SIZE			
10. CHECK AND RECORD POTENTIAL TRANSFORMER FUSE TYPE AND SIZE			
11. CHECK PRIMARY RATINGS OF ALL TRANSFORMERS INCLUDING CONTROL TRANSFORMERS			
12. CHECK FOR PROPER GROUNDING OF CASE AND NEUTRAL BAR			
NOTE: SITE PERSONNEL SHOULD ENERGIZE ELECTRICAL EQUIPMENT ONLY WHEN CALLED FOR IN THE PROJECT SPECIFICATIONS AND WITH EMS PERMISSION ALL SAFETY RULES MUST BE STRICTLY ENFORCED			
REMARKS:			
ACCEPTED BY LCE:			
NAME : _____		ACCEPTED BY CONTRACTOR :	
SIGNATURE : _____		NAME _____ :	
DATE : _____		SIGNATURE _____ :	
		DATE _____ :	

BLOEMHOF WTW EXTENTION	ELECTRICAL SWITCHGEAR CHECKLIST	NO:
		DATE:
		PREPARED BY:
		SHEET
PROJECT:		PROJECT NO:
LOCATION:		
CONTRACTOR:	CONTRACT NO:	DATE ISSUED:
TITLE:	AREA:	
ITEMS TO CHECK		INSTALLATION INSPECTED (Signature and Date)
13. VERIFY TORQUE OF BOLTED BUS CONNECTIONS		
14. TAGGING CORRECT OF CUBICLES, WIRES, CABLES, DEVICES		
15. CUBICLE CLEAN		
16. INSTRUMENTS ZEROED		
17. CHECK BREAKER FOR CLEARANCES, CONTACT ALIGNMENT LUBRICATION AND CONTROL FUSES. MEGGER PHASE TO PHASE AND PHASE TO GROUND		
18. SHORTING BARS REMOVED FROM CURRENT TRANSFORMERS		
19. ALL RELAYS HAVE CORRECT TAP AND DIAL SETTING PER RELAY CALIBRATION DATA SHEET AND CO-ORDINATING CURVES		
20. SPACE HEATERS ARE CONNECTED AND OPERABLE		
21. ADJUSTABLE MAGNETIC TRIPPING DEVICES ON CIRCUIT BREAKERS ARE CORRECTLY SET		
22. INSERT AND REMOVE BREAKERS IN VARIOUS UNITS TO INSURE INTERCHANGEABILITY		
23. CHECK CONTINUITY OF ALL FUSES		
24. ELECTRICALLY OPERATE (MUST BE OPERATED MANUALLY FIRST), CLOSE & TRIP FROM ALL DEVICES (PUSH BUTTONS, RELAYS, UNDER VOLTAGE TRIPS, ETC)		
NOTE: SITE PERSONNEL SHOULD ENERGIZE ELECTRICAL EQUIPMENT ONLY WHEN CALLED FOR IN THE PROJECT SPECIFICATIONS AND WITH PERMISSION		
ALL SAFETY RULES MUST BE STRICTLY ENFORCED		
REMARKS:		
ACCEPTED BY LCE:	ACCEPTED BY CONTRACTOR :	
NAME : _____	NAME _____ :	
SIGNATURE : _____	SIGNATURE _____ :	
DATE : _____	DATE : _____	

BLOEMHOF WTW EXTENTION	CHECKLIST - ELECTRICAL LOW VOLTAGE DISTRIBUTION BOARD		NO:	
			DATE:	
			PREPARED BY:	
			SHEET	
PROJECT:			PROJECT NO:	
LOCATION:				
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:
TITLE:		AREA:		
NO.	ITEMS TO BE INSPECTED	INSPECTED BY CONTRACTOR	INSPECTED BY SLMR	
1.	Tag number, voltage and current rating checked against single line drawings.			
2.	Nameplate, number of circuits and distribution board location as per drawing.			
3.	Enclosure approved for area classification.			
4.	Complete assembly checked for damage and missing parts.			
5.	Verify socket outlet circuits are connected to E.L.C.B.'s.			
6.	Lighting panel feeder and branch circuit conductors size, insulation, colour and identification per drawings.			
7.	Neutral feeder has taped ends or insulation per specification.			
8.	Correct cable glands installed and tightened.			
9.	Earthing conductor installed, connected, unit tested and results recorded.			
10.	Fixtures, socket outlets, or other loads have been terminated to circuit breaker specified on panel schedule.			
11.	Verify panelboard has been cleaned out.			
12.	Installations in accordance with drawings and specifications.			
13.	All field revisions recorded on "As Built" drawings.			
14.	Manufacturer's commissioning procedures available and followed.			
REMARKS :				
DEVIATIONS : (Attach list if necessary)				
DATE OF RECTIFICATION :				
ACCEPTED BY LCE:		ACCEPTED BY CONTRACTOR :		
NAME	:	NAME : _____		
SIGNATURE	:	SIGNATURE : _____		
DATE	:	DATE : _____		

BLOEMHOF WTW EXTENTION		CHECKLIST - ELECTRICAL BATTERIES AND BATTERY CHARGERS		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:			
NO.	ITEMS TO BE INSPECTED			INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1.	Tag number, size and voltage checked against single line drawings.				
2.	Location and orientation per drawing.				
3.	Battery charger nameplate, number and size of batteries. Accessory equipment, such as; hydrometer thermometer, special wrenches and spare electrolyte comply with the purchase specifications.				
4.	Batteries and rack are properly mounted, supported and installed.				
5.	Correct number of cells and cell-to-cell connections made.				
6.	Batteries filled with electrolyte to proper level and checked with hydrometer for specific gravity in accordance with specification.				
7.	Battery charger is properly mounted, supported and installed.				
8.	Battery charger control and alarm cables are of the correct size, insulation, colour and identification as specified in the drawings.				
9.	Battery charger output, power cable, receptacle, batteries and distribution panel interconnecting cables are of the correct size, and have been polarized and terminated.				
10.	Earthing conductors installed, continuity to earth tested and results recorded.				
11.	Charger operates in accordance with manufacturer's specifications. Voltage output is correct and can deliver maximum rated output.				
12.	Verify proper operation of low DC voltage relay and alarm contacts.				
13.	Verify operation of charger output failure relay and alarm contacts.				
14.	Verify proper operation of AC failure relay and alarm contacts.				
15.	Verify ground detection relay and lights operate properly.				
16.	Booster charge as per manufacturer's instructions.				
17.	Batteries battery racks and charges cleaned. Terminals and interconnectors covered with protective cover where applicable. <u>Note</u> : Batteries are to be protected while work is being performed around them. Metal objects laid or dropped on them could cause a short or explosion. DO NOT cover with Tarpaulin, plastic or similar material should not be used because batteries in service require ventilation.				
18.	Check gland washers, filler cap springs and connectors for damage.				
19.	Verify torque settings for battery terminal nuts.				
20.	Manufacturer's commissioning procedures available and followed.				
REMARKS :					
DEVIATIONS : (Attach list if necessary)					
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ DATE : _____			ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____		

BLOEMHOF WTW EXTENTION		ELECTRICAL UPS SYSTEM		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:			
NO.	ITEMS TO BE INSPECTED			INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1.	Location, orientation and layout as per drawing.				
2.	Visually inspected for evidence of impact damage during shipment, cleanliness, no chips, cracks, other apparent damage or rust.				
3.	Correct earthing conductor connected. Test continuity to earth and record.				
4.	Correct size, location, support termination connection and phasing of power incoming and outgoing power cables.				
5.	Check for tight screw and crimp-on solder connections on wire termination.				
6.	Equipment tested according to manufacturer's specifications and ready for operation.				
7.	Test certificates, approved list of materials, dimensional drawings and catalogue are on file.				
8.	Test data recorded and verified.				
9.	Manufacturer's commissioning procedures available and followed.				
REMARKS :					
DEVIATIONS : (Attach list if necessary)					
DATE OF RECTIFICATION :					
ACCEPTED BY LCE			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE : _____			SIGNATURE : _____		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION	ELECTRICAL ALARM ANNUNCIATOR	NO:	
		DATE:	
		PREPARED BY:	
		SHEET	
PROJECT:		PROJECT NO:	
LOCATION:			
CONTRACTOR:	CONTRACT NO:	DATE ISSUED:	
TITLE:	AREA:		
NO.	ITEMS TO BE INSPECTED	INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1.	Location and orientation as per drawings.		
2.	Enclosure approved for area classification.		
3.	Complete assembly checked for damage and missing parts.		
4.	Mounting and supports checked according to drawings.		
5.	Verify input power voltage level, source, cable size, number and terminations as per drawings.		
6.	Alarm input signal cable type, number, of conductors, insulation, terminations and wire identification are in accordance with drawings.		
7.	Alarm input signal cable destination, type, number of conductors, insulation, terminations and wire identification are in accordance with drawings.		
8.	Energize alarm panel and simulate alarm conditions. Verify that each light operates and alarm signal output is individually tested.		
9.	All field revisions recorded on "As Built" Drawing.		
10.	Verify earthing of annunciator frame to main earth loop in accordance with drawings.		
11.	Manufacturer's commissioning procedures available and followed.		
REMARKS :			
DEVIATIONS : (Attach list if necessary)			
DATE OF RECTIFICATION :			
ACCEPTED BY LCE: NAME : _____ SIGNATURE _____ : DATE : _____		ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____	

BLOEMHOF WTW EXTENTION	ELECTRICAL EARTHING	NO:	
		DATE:	
		PREPARED BY:	
		SHEET	
PROJECT:		PROJECT NO:	
LOCATION:			
CONTRACTOR:		CONTRACT NO:	DATE ISSUED:
TITLE:		AREA:	
NO.	ITEMS TO BE INSPECTED	INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1.	Earthing installations conform to drawings and specifications.		
2.	Terminations to equipment conform to project standard drawings.		
3.	Location type, size and insulation colour as per drawings. (Wire protected during construction).		
4.	Thermal connections checked. (No cold joints or burn outs).		
5.	Thermal connections are insulated.		
6.	System earthing rod resistance to earth measurements in accordance with specifications. Record these measurements.		
7.	Bonding to equipment and structural steel installed as per drawing. Measure resistance between earth conductor and tagged equipment bus bars, tagged equipment enclosures, structural steel surface in addition to all other items designated on the drawings. Record test results.		
8.	Continuity between earth conductor and conduit, metal junction boxes and between sections of cable tray verified.		
9.	High quality earth installation conform to specification.		
10.	All revisions recorded on "As Built" drawings.		
11.	Manufacturer's commissioning procedures available and followed.		
REMARKS :			
DEVIATIONS : (Attach list if necessary)			
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ DATE : _____		ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____	

BLOEMHOF WTW EXTENTION		CHECKLIST - ELECTRICAL ABOVEGROUND CABLE		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:			
NO.	ITEMS TO BE INSPECTED			INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1.	Inspect and megger cables on the reel prior to installation and record.				
2.	Cable size, type, locations, installations and routing is as per drawings.				
3.	Bend radius correct per specifications and free of deformities.				
4.	Cable support spacings as per specifications and drawings.				
5.	Installation neat and evenly spaced.				
6.	Spacing between instrumentation conduits or cable and power cables according to specifications.				
7.	Junction boxes size and type are level and located correctly as per drawings.				
8.	Verify cable is free of surface damage.				
9.	Megger record all power, control and instrumentation wire and cable.				
REMARKS :					
DEVIATIONS : (Attach list if necessary)					
DATE OF RECTIFICATION :					
ACCEPTED BY LCE:			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE : _____			SIGNATURE : _____		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION		CHECKLIST - ELECTRICAL ABOVEGROUND CONDUIT		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:			
NO.	ITEMS TO BE INSPECTED			INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1.	Conduits clean, stub-ups protected, conduit seals installed on all open ends, damage during construction repaired.				
2.	Field bend radius correct per specification. Bend free of deformities.				
3.	Supports and spacing as per specification and drawings.				
4.	Supports adjacent to terminal fittings.				
5.	Expansion joints as shown on drawings.				
6.	Installation neat and evenly spaced and in accordance with specifications and drawings.				
7.	Spacing between instrumentation conduit or cable and power cables shall be according to specification.				
8.	Spacing from hot pipes and hot surfaces has been maintained according to specifications.				
9.	Proper fittings installed with threads fully engaged, proper sealing used, no wrench cuts, conduit ends have bushings and covers installed.				
10.	Seals and drains installed per drawings.				
11.	Conduit permanently and effectively earthed.				
12.	Aluminium, PVC and PVC coated conduits installed as per drawings.				
13.	Flexible conduit installed with proper bending radius and with standard fittings.				
14.	Junction boxes levelled and supported as per drawings with proper hubs, locknuts and bushings installed.				
15.	Installation in accordance with the code of practice for the wiring of premises.				
DEVIATIONS : (Attach list if necessary)					
DATE OF RECTIFICATION :					
ACCEPTED BY LCE:			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE : _____			SIGNATURE : _____		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION	CHECKLIST - ELECTRICAL UNDERGROUND CABLE CONCRETE & EARTH TRENCHES		NO:	
			DATE:	
			PREPARED BY:	
			SHEET	
PROJECT:			PROJECT NO:	
LOCATION:				
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:
TITLE:		AREA:		
NO.	ITEMS TO BE INSPECTED	INSPECTED BY CONTRACTOR	INSPECTED BY SLMR	
1.	Each layer of trench is clean and free from debris.			
2.	Inspect, megger and record all cables on reels before they are laid in trench.			
3.	Cable size, type, orientation and location conform to specifications and drawings.			
4.	Cable spacing is as specified in drawings.			
5.	Cable bend radius correct as per drawings. Bends free of deformities. Cable ends sealed.			
6.	Cable identification tags are installed as per drawings.			
7.	Verify cable is free of surface damage, particular attention should be given to the underside of the table.			
8.	Megger all cables before sand backfilling and record.			
9.	Cable backfilled with fine sand. Check for correct depth of sand and cleanliness.			
10.	Cover tiles installed. Check for evenness of lay. An excessive variation of tile lay requires a repeat of step 10 in the immediate vicinity according to drawings.			
11.	Hi-pot test all medium and high voltage cables after termination and splicing.			
12.	Megger and record all power, control and instrumentation wire cable.			
13.	All revisions recorded on "As Built" drawings.			
REMARKS :				
DEVIATIONS : (Attach list if necessary)				
ACCEPTED BY LCE:		ACCEPTED BY CONTRACTOR :		
NAME : _____		NAME : _____		
SIGNATURE : _____		SIGNATURE : _____		
DATE : _____		DATE : _____		

BLOEMHOF WTW EXTENTION		CHECKLIST - ELECTRICAL UNDERGROUND CABLE SLEEVES		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:			
NO.	ITEMS TO BE INSPECTED			INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1.	Trenching checked for location, elevation, levelness and is free of debris.				
2.	Trench location, elevation, depth and form and pipe size conform to drawing.				
3.	Stub-up dimensions and cable protection pipe.				
4.	Pipe Field bend radius is correct as per drawings. Check that bends are free of all deformities.				
5.	Trenching checked for interference with underground piping.				
6.	Pipe and seals are installed on all exposed pipe ends pouring concrete.				
7.	Road crossings for installation of spare sleeves as called for on drawing. These spare pipes shall have screwed caps on the ends.				
8.	After concrete is in place, sleeves inspected for damage or stoppages.				
9.	Backfill work and compaction test performed as required.				
10.	After cable installation pipe ends to be filled with specified sealant.				
11.	Under roadways and at location where there are cable sleeves, installation conforms to the requirements specified.				
12.	Split locations are recorded on "As Built" drawings.				
13.	All revisions recorded on "As Built" drawings.				
REMARKS :					
DEVIATIONS : (Attach list if necessary)					
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ DATE : _____			ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____		

BLOEMHOF WTW EXTENTION	CHECKLIST - ELECTRICAL MEGGER READINGS (ELECTRICAL EQUIPMENT - EXCLUDING MOTORS)						NO:
							DATE:
							PREPARED BY:
							SHEET
PROJECT:							PROJECT NO:
LOCATION:							
CONTRACTOR:		CONTRACT NO:				DATE ISSUED:	
TITLE:		AREA:					
a) Use 500 Volt Megger for 600 Volt equipment and below use 2 500 Volt Megger for equipment rated above 600 volts. <u>Meggar Type :</u>							
b) Minimum accepted value - 1 Megohm per Kilovolt.							
EQUIP- MENT TAG NO.	READINGS IN MEGA OHMS						SIGNATURE/ DATE
	R - E	W - E	B - E	R - W	R - B	W - B	
REMARKS :							
DEVIATIONS : (Attach list if necessary)							
DATE OF RECTIFICATION :							
ACCEPTED BY LCE: NAME : _____ SIGNATURE _____ : DATE : _____				ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE _____ : DATE : _____			

BLOEMHOF WTW EXTENTION		CHECKLIST - ELECTRICAL MEGGER READINGS - MOTORS		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:			
NO.	ITEMS TO BE INSPECTED			CONTRACTOR	SLMR
1.	Serial No.				
2.	kW	FLC	A No. Load A		
3.	Voltage v				
4.	RPM				
5.	Mounting		Make		
6.	Meggar Type :				
7.	Motor and Cable :				
	R-E	R-W	R-W		
	W-E	R-B	R-B		
	B-E	W-B	W-B		
REMARKS :					
DEVIATIONS : (Attach list if necessary)					
				DATE OF RECTIFICATION :	
ACCEPTED BY LCE:			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE _____ :			SIGNATURE _____ :		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION	CHECKLIST - ELECTRICAL MEGGER READINGS - EARTHING		NO:	
			DATE:	
			PREPARED BY:	
			SHEET	
PROJECT:			PROJECT NO:	
LOCATION:				
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:
TITLE:		AREA:		
EQUIPMENT TAG NO. OR ITEM DESCRIPTION		RESISTANCE READING	TESTERS SIGNATURE	DATE
REMARKS :				
DEVIATIONS : (Attach list if necessary)				
			DATE OF RECTIFICATION :	
ACCEPTED BY LCE:		ACCEPTED BY CONTRACTOR :		
NAME : _____		NAME : _____		
SIGNATURE _____ :		SIGNATURE _____ :		
DATE : _____		DATE : _____		

BLOEMHOF WTW EXTENTION		(2) CHECKLIST ELECTRICAL HIGH VOLTAGE CABLE				NO:											
						DATE:											
						PREPARED BY:											
						SHEET											
PROJECT:						PROJECT NO:											
LOCATION:																	
CONTRACTOR:			CONTRACT NO:				DATE ISSUED:										
TITLE:			AREA:														
CABLE		SIZE		LENGTH		OPERATING kV											
GROUNDING	UNGROUNDING	RATED kV	INSULATED TH.	WALL TH.	INSULATION TYPE	JACKET THICKNESS		JACKET TYPE									
SHIELD (TYPE)					CABLE MANUFACTURER												
TEMPERATURE			HUMIDITY			TERMINATION (TYPE)											
TYPE SPLICE AND LOCATION																	
MEGGER DATA				HI-POT DATA				MEGGER DATA									
MEGOHMS BEFORE HI-POT TEST				CURRENT (MICRO AMP)				MEGOHMS AFTER HI-POT TEST									
DURATION		PHASE		% TEST kV	DURATION		PHASE		DURATION		PHASE						
													1	2	3	1	2	3	1	2	3
15 SECONDS				20	0 SECONDS				15 SECONDS								
30 SECONDS				40	15 SECONDS				30 SECONDS								
45 SECONDS				60	30 SECONDS				45 SECONDS								
1 MINUTE				60	45 SECONDS				1 MINUTE								
15 SECONDS				100	80 SECONDS				15 SECONDS								
30 SECONDS				100	1 MINUTE				30 SECONDS								
45 SECONDS				100	2 MINUTES				45 SECONDS								
2 MINUTES				100	3 MINUTES				2 MINUTES								
3 MINUTES				100	4 MINUTES				3 MINUTES								
5 MINUTES				100	5 MINUTES				5 MINUTES								
				TEST WITNESSED BY						DATE							
				TEST PERFORMED BY		DATE		NAME				REPRESENTING					
ACCEPTED BY LCE:						ACCEPTED BY CONTRACTOR :											
												NAME : _____					
												SIGNATURE : _____					
												DATE : _____					

BLOEMHOF WTW EXTENTION	(2) CHECKLIST ELECTRICAL MOTOR STARTER	NO:																																																	
		DATE:																																																	
		PREPARED BY:																																																	
		SHEET																																																	
PROJECT:		PROJECT NO:																																																	
LOCATION:																																																			
CONTRACTOR:	CONTRACT NO:	DATE ISSUED:																																																	
TITLE:	AREA:																																																		
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 75%;"></th> <th style="width: 12.5%; text-align: center;">CONFORM</th> <th style="width: 12.5%; text-align: center;">NON-CONFORM</th> </tr> </thead> <tbody> <tr> <td>CABLE CONNECTION.....</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>POWER AND CONTROL FUSES</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td></td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td></td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td></td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>GROUNDING</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>OVERLOAD.....</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td colspan="3" style="padding-top: 10px;">MOTOR</td> </tr> <tr> <td>CABLE CONNECTION.....</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>GROUNDING</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>IDENTIFICATION (FACE PLATE)</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>EMERGENCY SWITCH</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>THE MOTOR IS READY FOR TESTING.....</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>ROTATION DIRECTION.....</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>VIBRATION LEVEL</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> </tbody> </table>					CONFORM	NON-CONFORM	CABLE CONNECTION.....	☐	☐	POWER AND CONTROL FUSES	☐	☐		☐	☐		☐	☐		☐	☐	GROUNDING	☐	☐	OVERLOAD.....	☐	☐	MOTOR			CABLE CONNECTION.....	☐	☐	GROUNDING	☐	☐	IDENTIFICATION (FACE PLATE)	☐	☐	EMERGENCY SWITCH	☐	☐	THE MOTOR IS READY FOR TESTING.....	☐	☐	ROTATION DIRECTION.....	☐	☐	VIBRATION LEVEL	☐	☐
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ROTATION DIRECTION.....	☐	☐																																																	
VIBRATION LEVEL	☐	☐																																																	
REMARKS - 																																																			

BLOEMHOF WTW EXTENTION (b)		ELECTRICAL MEGGER READINGS (NON-ELECTRICAL EQUIPMENT GROUNDINGS)		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:			
ITEMS TO CHECK				INSTALLATION OK (Signature & Date)	
EQUIPMENT TAG No.	RESISTANCE IN OHMS	AMBIENT TEMPERATURE °C		WEATHER	
REMARKS:					
ACCEPTED BY LCE:			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE _____ :			SIGNATURE _____ :		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION	ELECTRICAL MEGGER CONTINUITY READINGS d) (ELECTRICAL EQUIPMENT INCLUDING MOTORS)						NO:
							DATE:
							PREPARED BY:
							SHEET
PROJECT:							PROJECT NO:
LOCATION:							
CONTRACTOR:		CONTRACT NO:				DATE ISSUED:	
TITLE:		AREA:					
ITEMS TO CHECK							INSTALLATION OK (Signature and Date)
EQUIPMENT TAG No.	EQUIPMENT TAG No.						NOTE: USE 500 VOLTS MEGGER FOR 600 VOLTS EQUIPMENT AND BELOW. USE 2400 VOLTS MEGGER FOR EQUIPMENT RATED ABOVE 600 VOLTS
	A to G	B to G	C to G	A to B	B to C	C to A	
REMARKS:							
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ DATE : _____					ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____		

BLOEMHOF WTW EXTENTION		CABLE TEST REPORT				NO:						
						DATE:						
						PREPARED BY:						
						SHEET						
PROJECT:						PROJECT NO:						
LOCATION:												
CONTRACTOR:			CONTRACT NO:				DATE ISSUED:					
TITLE:			AREA:									
CABLE	SIZE			LENGTH		OPERATING kV						
GROUNDING	UNGROUNDING	RATED kV	INSULATED WALL TH.		INSULATION TYPE		JACKET THICKNESS		JACKET TYPE			
SHIELD (TYPE)						CABLE MANUFACTURER						
TEMPERATURE			HUMIDITY			TERMINATION (TYPE)						
TYPE SPLICE AND LOCATION												
MEGGER DATA				HI-POT DATA				MEGGER DATA				
MEGOHMS BEFORE HI-POT TEST				CURRENT (MICRO AMP)				MEGOHMS AFTER HI-POT TEST				
DURATION		PHASE		% TEST kV	DURATION		PHASE		DURATION		PHASE	
		1	2				3	1			2	3
15 SECONDS				20	0 SECONDS				15 SECONDS			
30 SECONDS				40	15 SECONDS				30 SECONDS			
45 SECONDS				60	30 SECONDS				45 SECONDS			
1 MINUTE				60	45 SECONDS				1 MINUTE			
15 SECONDS				100	80 SECONDS				15 SECONDS			
30 SECONDS				100	1 MINUTE				30 SECONDS			
45 SECONDS				100	2 MINUTES				45 SECONDS			
2 MINUTES				100	3 MINUTES				2 MINUTES			
3 MINUTES				100	4 MINUTES				3 MINUTES			
5 MINUTES				100	5 MINUTES				5 MINUTES			
				TEST WITNESSED BY						DATE		
				TEST PERFORMED BY		DATE	NAME		REPRESENTING			
ACCEPTED BY LCE:						ACCEPTED BY CONTRACTOR :						
NAME : _____						NAME : _____						
SIGNATURE : _____						SIGNATURE : _____						
DATE : _____						DATE : _____						

BLOEMHOF WTW EXTENTION (b)		CHECK LIST		NO:	
				DATE:	
				PREPARED BY:	
				SHEET OF	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:		EQUIP. NO:	
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTOR	INSPECTED BY MRES	
1	ARE OF CORRECT TYPES FOR THE ENVIRONMENT, AS SPECIFIED ON THE DRAWINGS				
2	ARE PROPERLY INSTALLED IN CORRECT LOCATIONS				
3	ARE "PLUGGED" WHERE NECESSARY				
4	ARE FREE FROM DAMAGE, AND ENCLOSURES HAVE NOT BEEN COMPROMISED IN TERMS OF IP RATINGS				
5	TERMINALS USED ARE OF THE SCREW/CLAMP TYPE				
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
REMARKS					
DEVIATIONS					
ACCEPTED BY LCE: NAME : _____ SIGNATURE _____ : DATE : _____			ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE _____ : DATE : _____		

BLOEMHOF WTW EXTENTION	220V SOCKET OUTLETS AND SWITCHES	NO:		
		DATE:		
		PREPARED BY:		
		SHEET		
PROJECT:		PROJECT NO:		
LOCATION:				
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:
TITLE:		AREA:		EQUIP. NO:
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1	Are free from damage			
2	Are of correct types as specified on the drawings			
3	Are properly installed in correct locations			
4	Are properly earthed			
5	Test earth leakage operation			
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
REMARKS:				
DEVIATIONS:				
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ DATE : _____		ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____		

BLOEMHOF WTW EXTENTION	CHECK LIST - LIGHT FITTINGS		NO:	
			DATE:	
			PREPARED BY:	
			SHEET	
PROJECT:			PROJECT NO:	
LOCATION:				
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:
TITLE:		AREA:		EQUIP. NO:
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTOR	INSPECTED BY SLMR
1	(c) Are free from damage			
2	Are of correct types as specified on the drawings			
3	Are properly installed in correct locations			
4	Are correctly circuited as per SLDS			
5	Are properly earthed			
6				
7				
8				
9				
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14				
15				
16				
17				
18				
19				
20				
REMARKS				
DEVIATIONS				
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ : DATE : _____		ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____		

BLOEMHOF WTW EXTENTION		CHECK LIST MOTOR STARTER CONTROL PANELS		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:		EQUIP. NO:	
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTO R	INSPECTED BY MRES	
1	Unit is correct type according to drawings				
2	Free from damage				
3	All terminations are tight				
4	All unused cable entries are correctly blanked				
5	Unit is correctly earthed				
6	Indicating lights not damaged and all lamps of correct voltage fitted				
7	All push buttons, selector switches and isolators operate freely and correctly				
8	Ammeter is not damaged and red line corresponds to motor full load current				
9					
10					
11					
12					
13					
14					
15					
16					
REMARKS					
DEVIATIONS					
ACCEPTED BY LCE:			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE _____ :			SIGNATURE _____ :		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION		CHECK LIST FIELD MOUNTED EQUIPMENT		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:		EQUIP. NO:	
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTO R	INSPECTED BY MRES	
1	Correct type according to drawings and specifications				
2	Mounted correctly in accordance with drawings				
3	Free from damage				
4	Mechanically operates freely				
5	Cables terminated correctly				
6	All terminations are tight				
7	Mechanical indicators operate freely				
8	Electrical indicators are undamaged and fitted with correctly rated lamps				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
REMARKS					
DEVIATIONS					
ACCEPTED BY LCE:			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE _____ :			SIGNATURE _____ :		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION		CHECKLIST LV BUSBARS TRUNKING SYSTEMS		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:		EQUIP. NO:	
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTOR	INSPECTED BY MRES	
1	Voltages and current ratings as per drawings				
2	Inspect entire assembly for transit or installation damage, chips or scratches in finish and missing parts (include any auxiliary equipment)				
3	Shipping blocks and supports removed				
4	Check bus enclosure for correctness of mechanical assembly and installation including adequacy of supports, rigidity and alignment				
5	Inspect bus insulator supports for cracks, broken or dirty condition				
6	Ensure that busbar joints have been silver plated				
7	Ensure that bus duct routing and location of bus duct supports are to drawings				
8	Drain holes unplugged. Rain covers installed as per drawing				
9	Weatherproofing gaskets installed on all outdoor sections and covers				
10	All covers are present and correctly fitted				
11	Weatherproofing wall seals installed correctly				
12	Busbar connections have been tightened to correct torque settings				
13	Insulating sleeving installed on flexible trunking/transformer connections and freedom of movement is possible				
14	Phasing of busbars is correct throughout entire length				
15	Bus duct and termination chambers are clean and dry				
16	Megger test busbars phase/phase and each phase to earth before completing transformer connections and record readings (1000 volt Megger)				
17	Anti-condensation heaters connected and operability checked where applicable				
18	All field revisions recorded on "As Built" drawings				
19					
20					
REMARKS:					
DEVIATIONS: (Attach list if necessary)					
ACCEPTED BY LCE:			ACCEPTED BY CONTRACTOR :		
NAME : _____			NAME : _____		
SIGNATURE : _____			SIGNATURE : _____		
DATE : _____			DATE : _____		

BLOEMHOF WTW EXTENTION		CHECK LIST POWER TRANSFORMERS ABOVE	NO:		
			DATE:		
			PREPARED BY:		
			SHEET		
PROJECT:		PROJECT NO:			
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:		EQUIP. NO:	
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTOR	INSPECTED BY MRES	
1	Tag number, voltage and kVA size per plan and one line drawing				
2	Transformer nameplate and special design requirements checked against specification				
3	Location and orientation per drawings				
4	Visually inspect for evidence of impact damage during shipment, cleanliness, no chips, cracks or other apparent damage to bushings				
5	Complete assembly for damage and missing parts. Temporary shipping blocks and protective crating removed				
6	Verify transformer is equipped with all the accessories and components specified in drawings and specs. Items such as fans, current transformers, buchoiz relay, temp. gauges, tap changer, etc. check for correct quantities				
7	Fit breather as per manufacturer's instructions				
8	Remove an oil sample from bottom of tank, test and record dielectric strength. Also check oil for moisture content				
9	Verify that oil level gauge is operating correctly				
10	Inspect for oil leakage on complete assembly				
11	Transformer enclosure earthing, earthing resistor and lightning arrestors correctly installed and connected to main earthing system per drawings. Test continuity to earth and record				
12	Test for continuity in the primary and secondary windings				
13	Megger test between transformer primary to tank, secondary to tank & primary to secondary. Using low resistance range megger test primary & secondary winding continuity and record all readings. Perform these tests before any power connections are made to transformer				
14	Correct size, insulation, colour and identification of alarm and control cabling including power conductors to cooling fans and tap changer motors. Spot checks wire termination for tight connections. From the record, verify that these conductors have been megger tested				
15	Inspect transformer primary & secondary cables or bus duct for correct size, rating, insulation, routing and support				
16	Verify correct termination and phasing polarity of primary & secondary windings, bus duct or cables has been made. Torque terminals bolts to manufacturer's specifications				
17	Verify cooling fan lubrication and freedom of rotation				
18	Verify tap changer lubrication and freedom of motion				
19	Spare knockouts, plugged, handhold covers tightly secured. Refinish paint scratches				
20	All field revisions recorded on "As Built" drawings				
REMARKS:					
DEVIATIONS: (Attach list if necessary)					

ACCEPTED BY LCE: NAME : _____ SIGNATURE _____ : DATE : _____	ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____

BLOEMHOF WTW EXTENTION		CHECK LIST CABLE RACKING		NO:	
				DATE:	
				PREPARED BY:	
				SHEET	
PROJECT:				PROJECT NO:	
LOCATION:					
CONTRACTOR:		CONTRACT NO:		DATE ISSUED:	
TITLE:		AREA:		EQUIP. NO:	
NO.	ITEMS TO BE INSPECTED	DWG NO./ SPEC REF	INSPECTED BY CONTRACTOR	INSPECTED BY MRES	
1	Type of racking conforms to specifications/drawings				
2	Location, orientation, routing, to and from destination, elevation, layout and size are to drawings				
3	Separation between power/control/instrumentation racks in accordance with specification				
4	Droppers to each item of equipment of adequate size and sufficiently supported				
5	All bend radii in racks and droppers are in accordance with specification				
6	Expansion joints correctly installed				
7	All braces and supports are in accordance with specified spacing requirements and of adequate size for the mass of the rack and cable				
8	Expansion joint cross bonds and earth bonds installed				
9	All welding has been neatly done, slag and spatter removed and welds ground off where required				
10	Racks are free of sharp edges or obstructions which could damage cable				
11	Racking system has been finished to the relevant painting or other specification				
12	All field revisions recorded on "As Built" drawings				
13					
REMARKS					
DEVIATIONS					
ACCEPTED BY LCE: NAME : _____ SIGNATURE : _____ DATE : _____			ACCEPTED BY CONTRACTOR : NAME : _____ SIGNATURE : _____ DATE : _____		

PS 2000: CONSTRUCTION OCCUPATIONAL HEALTH - SAFETY - ENVIRONMENT**AUDIT SYSTEM**

(Based on the New Construction Regulations)

*** Denotes items applicable to both Construction sites and Contractors Plant/Storage****1. ADMINISTRATIVE & LEGAL REQUIREMENTS**

Section/Regulation	Subject	Requirements	Yes/No
Construction. Regulation 3	Notice of carrying out Construction work	Department of Labour notified Copy of Notice available on Site	
General Admin. Regulation 3	*Copy of OH&S Act (Act 85 of 1993)	Updated copy of Act & Regulations on site Readily available for perusal by employees	
COID Act Section 80	*Registration with Compens. Insurer	Written proof of registration / Letter of good standing available on Site	
Construction. Regulation 4 & 5(1)	OH&S Specification & Plan	OH&S Specification received from Client OH&S plan developed Updated regularly	
Section 8(2)(d) and Construction. Regulation 6	*Hazard Identification & Risk Assessment	Hazard Identification carried out/Recorded Risk Assessment and Plan drawn up/Updated Risk Assessment Plan available on Site Employees/Subcontractors informed/trained	
Section 16(2)	*Assigned duties (Managers)	Responsibility of complying with the OH&S Act assigned to other person/s by CEO.	
Construction. Regulation 5(2)	Designation of Person Responsible on Site	Competent person appointed in writing as Construction Supervisor	
Construction. Regulation 5(5)(a)	Designation of Subordinate Person	Competent person appointed in writing as Sub-ordinate Construction Supervisor	
Section 17 & 18	*Designation of Occupational Health & Safety Representatives	More than 20 employees - one OH&S Representative, one additional OH&S Rep. for each 50 employees or part thereof. Designation in writing, period and area of responsibility specified. Meaningful OH&S Rep. reports. Reports actioned by Management.	
Section 19 & 20	*Occupational Health & Safety Committee/s	OH&S Committee/s established. Members appointed in writing. Meetings held monthly. Minutes kept. Actioned by Management.	
Section 37	*Agreement with Mandatories (Sub-Contractors)	Written agreement with Subcontractors. List of Subcontractors displayed. Proof of Registration with Compensation Insurer/Letter of Good Standing Construction Work Supervisor designated Written arrangements concerning OH&S Reps & OH&S Committee Written arrangements regarding First Aid	
Construction. Regulation 7	Fall Prevention & Protection	Competent person appointed to draw up and supervise the Fall Protection Plan Proof of appointees competence available on Site Risk Assessment carried out for work at heights Fall Protection Plan drawn up/updated Available on Site	
Construction. Regulation 8	Roofwork	Competent person appointed to plan & supervise Roofwork. Proof of appointees competence available on Site	

Section/Regulation	Subject	Requirements	Yes/No
		Risk Assessment carried out Roofwork Plan drawn up/updated Roofwork inspect before each shift. Inspection register kept Employees medically examined for physical & psychological fitness. Written proof available	
Construction. Regulation 9	Structures	Information re. the structure being erected received from the Designer including: - geo-science technical report where relevant - the design loading of the structure - the methods & sequence of construction - anticipated dangers/hazards/special Measures to construct safely Risk Assessment carried out Method statement drawn up All above available on Site Structures inspected before each shift. Inspections register kept	
Construction. Regulation 10	Formwork & Support work	Competent person appointed in writing to supervise erection, maintenance, use and dismantling of Support & Formwork Design drawings available on site Risk Assessment carried out Support & Formwork inspected: - before use/inspection - before pouring of concrete - weekly whilst in place - before stripping/dismantling. Inspection register kept	
Construction. Regulation 11	Scaffolding	Competent persons appointed in writing to: - erect scaffolding (Scaffold Erector/s) - act as Scaffold Team Leaders - inspect Scaffolding weekly and after inclement weather (Scaffold Inspector/s) Written Proof of Competence of above appointees available on Site Copy of SABS 085 available on Site Risk Assessment carried out Inspected weekly/after bad weather. Inspection register/s kept	
Construction. Regulation 12	Suspended Scaffolding	Competent persons appointed in writing to: - erect Susp.scaffolding (Scaffold Erector/s) - act as Susp.Scaffold Team Leaders - inspect Susp.Scaffolding weekly and after inclement weather (Scaffold Inspector/s) Risk Assessment conducted Certificate of Authorization issued by a registered professional engineer available on Site/copy forwarded to the Department of Labour The following inspections of the whole installation carried out by a competent person - after erection and before use - daily prior to use. Inspection register kept The following tests to be conducted by a competent person: - load test of whole installation and working parts every 12 months - hoisting ropes/hooks/load attaching devices quarterly. Tests log book kept Employees working on Susp.Scaffold medically examined for physical & psychological fitness. Written proof available	
Construction. Regulation 13	Excavations	Competent person/s appointed in writing to supervise and inspect excavation work Written Proof of Competence of above appointee/s available on Site Risk Assessment carried out Inspected: - before every shift	

Section/Regulation	Subject	Requirements	Yes/No
		- after any blasting - after an unexpected fall of ground - after any substantial damage to the shoring - after rain. Inspections register kept Method statement developed where explosives will be/are used	
Constructions. Regulation 14	Demolition Work	Competent person/s appointed in writing to supervise and control Demolition work Written Proof of Competence of above appointee/s available on Site Risk Assessment carried out Engineering survey and Method Statement available on Site Inspections to prevent premature collapse carried out by competent person before each shift. Inspection register kept	
Construction. Regulation 16	Materials Hoist	Competent person appointed in writing to inspect the Material Hoist Written Proof of Competence of above appointee available on Site. Materials Hoist to be inspected weekly by a competent person. Inspections register kept.	
Construction. Regulation 17	Caissons & Cofferdams	Competent person appointed in writing to supervise, control & inspect the construction, installation/dismantling of caissons/coffer dams Written Proof of Competence of above appointee available on Site Risk Assessment carried out To be inspected daily by a competent person. Inspections register kept	
Construction. Regulation 18	Explosive Powered Tools	Competent person appointed to control the issue of the Explosive Powered Tools & cartridges and the service, maintenance and cleaning. Register kept of above Empty cartridge cases/nails/fixing bolts returns recorded Cleaned daily after use	
Construction. Regulation 19	Batch Plants	Competent person appointed to control the operation of the Batch Plant and the service, maintenance and cleaning. Register kept of above Risk Assessment carried out Batch Plant to be inspected weekly by a competent person. Inspections register kept	
Construction. Regulation 20/ Mine Health & Safety Act (29 of 1996)	Tunnelling	Complying with Mines Health & Safety Act (29 of 1996) Risk Assessment carried out	
Construction. Regulation 21/ Driven Machinery Regulations 18 & 19	Cranes & Lifting Machines Equipment	Competent person appointed in writing to inspect Cranes, Lifting Machines & Equipment Written Proof of Competence of above appointee available on Site. Cranes & Lifting tackle identified/numbered Register kept for Lifting Tackle Log Book kept for each individual Crane Inspection: - All cranes - daily by operator - Tower Crane/s – after erection/6monthly - Other cranes – annually by comp. person - Lifting tackle(slings/ropes/chain slings etc.) - 3 monthly Risk Assessment carried out	
Construction. Regulation 22/Electrical Machinery	*Inspection & Maintenance of Electrical Installation & Equipment (including portable electrical tools)	Competent person appointed in writing to inspect/test the installation and equipment. Written Proof of Competence of above appointee available on Site.	

Section/Regulation	Subject	Requirements	Yes/No
Regulations 9 & 10/Electrical Installation Regulations		Inspections: - Electrical Installation & equipment inspected after installation, after alterations and quarterly. Inspection Registers kept - Portable electric tools and - lights and extension leads identified/numbered. - Monthly visual inspection by User/Issuer/Storeman. Register kept.	
Construction. Regulation 2 Diving Regulations	Water Environments	Competent person appointed in writing to supervise diving operations and ensure maintenance, statutory inspection and testing by an Approved Inspection Authority of equipment used Written Proof of Competence of above appointee available on Site Proof of registration of all divers present on site available Risk Assessment carried out Diving Manual produced. Available on Site Record of Voice Communications kept Diving Operations record kept Each Diver keeps a personal logbook. Entries countersigned by the Diving Supervisor Decompression tables available on Site Records of any Decompression illness kept Certificate of Manufacture of any Compression Chamber or Diving Bell in use available on Site	
Construction. Regulation 30/ General Safety Regulation 8(1)(a)	*Designation of Stacking & Storage Supervisor.	Competent Person/s with specific knowledge and experience designated to supervise all Stacking & Storage Written Proof of Competence of above appointee available on Site	
Construction. Regulation 31/ Environmental Regulation 9	*Designation of a Person to Co-ordinate Emergency Planning And Fire Protection	Person/s with specific knowledge and experience designated to co-ordinate emergency contingency planning and execution and fire prevention measures Emergency Evacuation Plan developed: - Drilled/Practiced - Plan & Records of Drills/Practices available on Site Fire Risk Assessment carried out All Fire Extinguishing Equipment identified and on register. Inspected weekly. Inspection Register kept Serviced annually	
Construction. Regulation 32/ General Safety Regulation 3	*First Aid	Every workplace provided with sufficient number of First Aid boxes. (Required where 5 persons or more are employed) First Aid freely available Equipment as per the list in the OH&S Act. One qualified First Aider appointed for every 50 employees. (Required where more than 10 persons are employed) List of First Aiders and Certificates Name of person/s in charge of First Aid box(es) displayed. Location of F/Aid box/es clearly indicated. Signs instructing employees to report all Injuries/Illness including first aid injuries	
Construction. Regulation 33/ General Safety Regulation 2	Personal Equipment (PSE) Safety	PSE Risk Assessment carried out Items of PSE prescribed/use enforced Records of Issue kept Undertaking by Employee to use/wear PSE	

Section/Regulation	Subject	Requirements	Yes/No
Construction. Regulation 34/ General Safety Regulation 9	*Inspection & Use of Welding/Flame Cutting Equipment	Competent Person/s with specific knowledge and experience designated to Inspect Electric Arc, Gas Welding and Flame Cutting Equipment Written Proof of Competence of above appointee available on Site Equipment identified/numbered and entered into a register Equipment inspected monthly. Inspection Register kept	
Construction. Regulation 35/ Hazardous Chemical Substances (HCS)	*Control of Storage & Usage of HCS	Competent Person/s with specific knowledge and experience designated to Control the Storage & Usage of HCS Written Proof of Competence of above appointee available on Site Risk Assessment carried out Register of HCS kept/used on Site	
Construction. Regulation 36/Vessels under Pressure Regulations	Vessels under Pressure (VUP)	Competent Person/s with specific knowledge and experience designated to supervise the use, storage, maintenance, statutory inspections & testing of VUP's Written Proof of Competence of above appointee available on Site Risk Assessment carried out Certificates of Manufacture available on Site Register of VUP's on Site Inspections & Testing by Approved Inspection Authority (AIA): - after installation/re-erection or repairs - every 36 months. - Register/Log kept of inspections, tests. Modifications & repair	
Construction. Regulation 37	Construction Vehicles & Earth Moving Equipment	Operators/Drivers appointed to: - Carry out a daily inspection prior to use - Drive the vehicle/plant that he/she is competent to operate/drive Written Proof of Competence of above appointee available on Site Record of Daily inspections kept	
Construction. Regulation 38/ General Safety Regulation 13D	*Inspection of Ladders	Competent person appointed in writing to inspect Ladders Ladders inspected at arrival on site and monthly thereafter. Inspections register kept	
Construction. Regulation 39/ General Safety regulation 13B	Ramps	Competent person appointed in writing to Supervise the erection & inspection of Ramps. Inspection register kept.	

PS 3000: GUIDELINES FOR THE DEVELOPMENT OF A HEALTH & SAFETY PLAN

1. Project Background

In terms of the Construction Regulations [Regulation 4 (1) (a)] of the Occupational Health and Safety Act, No 85 of 1993, the Client is required to compile an Occupational Health and Safety specification for each of its projects and the Principle Contractor, appointed by the Client in terms of Regulation 4 (1) (c), is required to prepare an Occupational Health and Safety Plan. This plan has to be prepared in terms of Regulation 5 (1) as well as the Client's Occupational Health & Safety Specification. In terms of Regulation 4 (2), the Client and the Principle Contractor are required to agree on the Occupational Health and Safety Plan before any work may commence.

2. Framework for an Occupational Health and Safety Plan

2.1 Introduction

The Principal Contractor has to demonstrate to the Client that he has a suitable and sufficiently documented Occupational Health and Safety Plan as well as the necessary competencies, experience and resources to perform the construction work safely. The Principle Contractor could be required to submit the following documentation for perusal and verification by the Client:

- *Management Structure*
- *Quality Plan*
- *Human Resources Plan*
- *Registered Workplace Skills Plan*
- *“Letter of good standing” from the Compensation Commissioner or licensed compensation insurer.*
- *Proof of induction and other training of employees*
- *Example copy minutes of previous Occupational Health and Safety Committee meetings and copies of Incident Investigation Reports*

2.2 Contents of an Occupational Health and Safety Plan

2.2.1 Occupational Health and Safety Management Programme

- Management of Occupational Health and Safety risks
- Occupational Health and Safety structures and appointments
- Programme of Occupational Health and Safety inspections
- Occupational Health and Safety Representatives
- Occupational Health and Safety committee

2.2.2 Communication and Management of the Work

- Management structure and responsibilities
- Occupational Health and Safety goals for the project and arrangements for monitoring and review of Occupational Health and Safety performance.
- **Arrangements for:**
 - Regular liaison between parties on site
 - Consultation with the workforce

- The exchange of design information between the Client, engineer, supervisors and contractors on site
- Handling design changes during the project
- Selection and control of contractors
- The exchange of Occupational Health and Safety information between all contractors
- Security
- Site induction and onsite training
- Facilities and first-aid
- The reporting and investigation of accidents and incidents
- The production and approval of risk assessments and method statements
- Site OH&S rules
- Fire and emergency procedures
- Reporting to the Client i.e. results of Occupational Health and Safety inspections, incident
- and incident investigations and committee meetings
- Reporting of incidents to the Department of Labour and Compensation insurer where appropriate

2.2.3 Arrangements for controlling significant site risks

The following are some examples of the arrangements for controlling the most significant site risks:

- Safety risks
 - Services, including temporary electrical installations
 - Preventing employees from falling into excavations, from trucks etc.
 - Work with, on or near fragile materials
 - Control of lifting operations
 - The maintenance of plant and equipment
 - Poor ground conditions
 - Traffic routes and segregation of vehicles and pedestrians
 - Storage of hazardous materials
 - Dealing with existing unstable structures/land
 - Accommodating adjacent land use
 - Other significant safety risks as and when identified

- **Health risks**
 - Storage and use of hazardous chemical substances
 - Dealing with contaminated land or material
 - Manual handling
 - Reducing noise and vibration
 - Provision of adequate lighting
 - Ventilation considerations
 - Extreme heat and cold temperature considerations
 - Dealing with HIV/Aids and other illnesses
 - Provision of and maintaining ablution and eating facilities
 - Other significant health risks as and when identified

2.2.4 Preparation of an Occupational Health and Safety Operational Reference File/Manual

The following are some of the requirements to be addressed:

- Layout, format and content requirements
- Arrangement for the collection and gathering of information
- Storage and archiving of all the information
- Copy to the Client at completion of project

Suggested Contents of an OH&S File/Manual

- OH&S Policy
- Notice of new project
- Site start-up
- Security measures
- Written designations & appointments
- Arrangements with contractors/mandataries
- OH&S rules and procedures
- Induction
- OH&S training
- OH&S promotion
- OH&S representatives
- OH&S committees
- Workplace facilities e.g. ablutions, sheltered eating areas etc.
- Protective equipment
- Workplace inspections and audits
- Investigation & reporting of incidents/accidents
- Mechanical safeguarding
- Electrical safeguarding
- Safeguarding against hazardous substances
- Lifting machinery & equipment

- Construction vehicles & mobile plant
- Welding, heating & flame cutting
- Excavations
- Protection of the environment affected by construction activities
- Keeping of records in terms of the OH&S Act (85 of 1993)

PS 4000: GUIDE TO RISK ASSESSMENT

1. HOW TO DO IT ?

2. Steps to Effective Risk Assessment

- Step 1 : Identifying the hazards
- Step 2 : Aim to identify major hazards, don't waste time on the minor & detail
- Step 3 : Involve as many people as possible in the process especially those at risk
- Step 4 : Gather all the information and analyse it
- Step 5 : Look at what actually occurs including non-routine operations
- Step 6 : Use a systematic approach to ensure all hazards are adequately addressed
- Step 7 : Assess the risks arising taking into account the effectiveness of controls
- Step 8 : Ensure the process is practical and realistic
- Step 9 : Always record the assessment in writing including assumptions and why

3. HOW SERIOUS IS IT?

PROBABILITY

- A Common
- B Has Happened
- C Could Happen
- D Not Likely
- E Practically impossible

CONSEQUENCES

- 1 Fatality or permanent disability
- 2 Major injury
- 3 Average Lost Time Injury
- 4 Minor Injury
- 5 Medical Treatment or less

PROBABILITY

C O N S E Q U E N C E S		A	B	C	D	E
	1	1	2	3	4	5
	2	2	3	4	5	6
	3	3	4	5	6	7
	4	4	5	6	7	8
	5	5	6	7	8	9

Risk Rating:	1 – 3 =	Serious	e) ACTION
	4 - 5 =	High	Immediate (within 1 week)
	6 – 7 =	Moderate	Within 1 month
	8 – 9 =	Acceptable	> 4 weeks No action

SAFCEC – SA Federation of Civil Engineering Contractors

LIST OF RISK ASSESSMENTS AVAILABLE (as at 2003.07.07)

Access Towers	Hand & Spray Painting
Acid Washing	Hand ToolsJacking – with Hydraulic Pump
Aggregate/Sand Delivery	Hanging scaffolding
Angle Grinder	Hauling
Arc Welding	High cut operations
Armco Barriers - installation	Jacking Hydraulic Pump (1)
Assem. of elements by boilermaker	Jacking Hydraulic Pump (2)
BackFilling	Kerb Laying
Bag Filling	Landscaping
BandSaw	Lathe
Banksman	Layering of (Road work) Materials
Batch Plant	Layering Process
Bench Grinder	Laying Kerbs
Bin Scraper	Laying of stormwater drains
Block Feeder	Levelling – of materials
Block Machine	Lifting Concr. Beams on to trailers
BoomScraper	Loading supervisor
Bricks – Laying of	Loading/Unloading - of Trucks
Brickwork	Loffels – placing/laying
Bulk Earthworks	Machine operator
Cement Spray Truck	Making of steel items
Clearing & Grubbing of Area/Site	Material delivery
Compr. Gas Cylinders-handling	Materials Handling
Compressors – Air	Mixer operator
Concrete – placing of (1)	Mobile Cranes
Concrete – placing of (2)	Pedestal Drill
Confined Spaces – Working in	Pedestal Grinder
Conveyors	Placing Concrete
Cutting – of Earthworks	Plastering
David Arm	Portable Electric Drill
Deck Panels – placing	Portable Electric Tools
Depalletor Operator	Portable Ladders
Diss. Assembly Rejects	Post Tensioning
Distribution Boards – Electrical	Radial Arm Drill
Drivers – of Vehicles	Refuelling Vehicles/Plant
Dry Tile Deracking	Reinforcing Steel – placement (1)
Dumpers - Concrete	Reinforcing Steel – placement (2)
Electrical Installation – Maintenance of	Road Traffic Signs – placement of
Elevated Positions	Roadworks - Deviations
Erecting – Instal/ Shutters	Roof Truss erection
Excavations (1)	SandBlasting
Excavations (2)	Scaffolding
Explosive Powered Tools	Shuttering – Erection
Finger Car	Shuttering – Stripping
Fire Fighting Prevention	Site Establishment (1)
Fire Prevention & Protection	Site Establishment (2)
Formwork	SkillSaw
Friction Saw	Spray Painting
Front End Loader	Stormwater pipes - laying
Fuel Supply	Structural Steel – Erection
Gas Cylinders – Handling of	Structural Steel – Laydown
Gas Welding-cutting oper.	Surveying
Gas Welding-cutting operations	Suspended Scaffolds
Guillotine	Termite Proofing

Tile Machine
Tile stacking
Timber Feeder
Tower Cranes
Traffic Accommodation
Traffic Control/Regulation
Trench Excavation
Use of angle grinder
Use of Port. Elec. Tools.
Wet tile racking
Work confined spaces
Work in Elevated Positions
Working Platforms
Workshops

f) **OH&S – RISK ASSESSMENT**

RISK ASSESSMENT: SITE ESTABLISHMENT

TYPE OF WORK PERFORMED: _____

DATE COMPLETED: _____

ASSESSMENT PERFORMED BY: _____

Step No.	Activity Rules	What can cause injury/damage ?	Result of cause (injury/damage)	Preventative Measures (tools, PPE, equipment)	Controls (test, check list)	Weights		
1.	Access to be a main consideration when positioning offices, stores and parking areas on site during planning stage. Possible one way traffic to be introduced	Restricted access to parking and delivery areas to storage areas.	Damage to transport and plant	Proper layout of site by Construction Manager and Site Agent taking into consideration all transport plant and material movements and storage on site.	Site Agent to check layout Drg. To compare with OHS Act requirements and whether they are to Concor's standards.			
2.	Oxygen and acetylene store to be a minimum distance of five metres away from other buildings. It needs to be well ventilated and have a roof to keep direct exposure to the sun.	Fire explosion leaking gas may spread if to close to other buildings.	Damage to property and plant. Health of employees.	See item 1.	See item 1.			
3.	Diesel tanks to be a distance of 10 metres away from any building and parking areas. A slab with a bund wall capable of carrying 110% of the tank capacities must be constructed for the tanks to stand in.	Fire may spread to adjacent buildings and plant if is too close.	Burns on all parts of body. Damage to plant and property.	See item 1. Persons in charge of tanks should be inducted regarding all the hazards involved and how to control them	See item 1. Supervisor to monitor on an ongoing basis if rules are complied with			

Step No.	Activity Rules	What can cause injury/damage?	Result of cause (injury/damage)	Preventative Measures (tools, PPE, equipment)	Controls (test, check list) During erection & ongoing	Weights		
						Safety	Health	R/R
4.	All cables from distribution board to offices, store and for security to be under-ground. The distribution board is to stand on a firm level base and should be locked at all times.	Damaged cables loose wires exposed.			g)			
5.	Security fencing minimum height of 1.8 meter around site area together with two double gates.	Theft of property. Access to unauthorised persons.	Loss of property. Injury to persons.	Security guards to be appointed to keep watch.	Supervisor to put system of control in place			
6. 6.1 6.2 6.3 6.4 6.5	Services to be available during site establishment. Fire fighting equipment. First aid boxes. First aider. Drinking water. Toilets.	Not having the essential services at hand.	Health of employees. Loss of property through fire.	6.1 to 6.5 are to be included on first order placed for contract. Dry chemical powder ABCDE fire extinguishers to be ordered 4 off for start.	Site Agent to see that these requirements are on site from start of site establishment.			
7.	Water tank tower to consist of very well cross braced pipe structure standing on concrete base.	Badly constructed water tower under designed structurally could cause tower to collapse.	Injury to persons. Damage to property.	Supervisor to erect as per design office specifications.				

Step No.	Activity Rules	What can cause injury/damage?	Result of cause (injury/damage)	Preventative Measures (tools, PPE, equipment)	Controls (test, check list) During erection & ongoing	Weights		
8.	Safety sign & notice board to be placed close to entrance of main gate	Not informing employees and public what the site rules are.	Injury to persons. Damage to property.	Concor standard notices/ Posters to be displayed. Available from Head Office.	Site manager to check that board has been erected.			
9.	Laydown areas to be sufficient in size. Timber poles to be available to stack materials on.	With inadequate space various materials will be stacked on top of each other causing unstable stacks.	Injury to persons loading, unloading materials.	Allow sufficient space for laydown area during planning stage of site layout. Access to be considered important.	Site agent to discuss with Foreman regarding his requirement at planning stage.			
10.	Toilets are to be well ventilated.	No ventilation in toilets may cause germs to propagate.	Possible health problems due to germs.	Extraction fans to be fitted if required.	Supervisor to check if he is satisfied with ventilation.			

ASSESSMENT: 1 – 10 (HIGH)

11 – 16 (MEDIUM)

17 – 25 (LOW)

RISK ASSESSMENT: EXCAVATIONS (PLANT & MANUAL)

TYPE OF WORK PERFORMED: _____

DATE COMPLETED: _____

ASSESSMENT PERFORMED BY: _____

Step No	Activity Rules	What can cause injury/damage	Result of cause (injury/damage)	Preventative measures (tools, PPE, equipment)	Controls (test, checks)			
	When using a machine to excavate, observe the following:					Safety	Health	Finan.
1	Operator must ensure there are no employees working in this area.	Employees not visible to operate or moving machine.	An injury to all parts of the body and as well as more serious fatal injuries.	Operator must work under close supervision. He must inspect the work area prior to commencing work.	Supervisor to ensure employees are informed and operator works under his supervision.			
2	Machine not to operate while employees are working in same excavations.	Danger of injury of employee by machine.	Bruises, scratches, fractures and fatal.	Supervisor must instruct operator when to commence work.	Supervisor to control and enforce procedure.			
3	All excavated materials must be discharged not closer than 2m from the edge of the excavation. When excavating manually, observe the following. See original	Materials can fall onto employees and the excavation may need extra work.	Injuries to employees and the excavation may need extra work.	Supervisor must instruct operator where to place discharged soil and gravel.	Supervisor to control.			
4	Using a pick and a shovel.	Unsafe use of a pick or a shovel.	Injury to employees.	Induct employees on safe working procedures.	Supervisor and charge hand to control.			
5	Check sides of excavations.	Unstable / loose material causes unsafe condition.	Injury to employees and damage to excavations.	Supervisor to inspect sides on a regular basis.	Supervisor / charge hand to control.			
6	Excavated material to be placed away from side of excavation.	Materials can fall onto employees when working inside the excavation.	Bruises, scratches, fractures and fatal.	Employees to be instructed not to place loose soil on edge of the excavation.	Supervisor to control.			
7	All excavations deeper than 1,5 m must have an access ladder available for employees to get into	Employees not able to enter or exit the excavation safely.	In case of an emergency too many employees may be buried as a result of inadequate access.	Providing a ladder makes access into and out of the excavation area easy and safe.	Supervisors to ensure employees are given safe			

	and out of the excavation safely.		Employees may also strain muscles to get into or out of an excavation without safe and convenient access.		and convenient access to excavations.			
8	Sides of excavation to be shored (if necessary) and barricaded immediately.	Sides may collapse. Employees may NOT BE AWARE OF THE EXCAVATION AND FALL INTO IT.	Damage to the excavation. Injury to employees,	Put adequate shoring and strong physical barricades in place immediately.	Supervisor and chargehand to control.			
9	Excavations must be backfilled as soon as possible after excavation.	Excavations could collapse. Employees could trip and fall in. Vehicles and machinery could damage excavations.	Damage to excavations. Injury to employees. Damage to plant and machinery.	Keep area barricaded with a strong physical barricade and backfill as soon as possible.	Supervisor and chargehand to control.			

PS 5000: SEDIBENG PARTICULAR SPECIFICATIONS

5000-1 PUMP SPECIFICATION

5000-2 MOTOR SPECIFICATION

5000-3 ELECTRICAL SPECIFICATION

5000-4 INSTRUMENT SPECIFICATION

5000-5 VALVE SPECIFICATION

5000-6 PAINT SPECIFICATION



PUMP SPECIFICATIONS

CLAUSE	DESCRIPTION	PAGE
1	GENERAL	2
2	INTERPRETATIONS	2
3	MATERIALS	3
4	PLANT	4
5	MANUFACTURE	4
6	TOLERANCES	12
7	INSPECTION, TESTS AND COMMISSIONING	13
8	MEASUREMENTS AND PAYMENT	17
9	PUMP AND MOTOR CLASSES FOR PROTECTION	19

1. GENERAL

- 1.1 This specification covers the manufacture, testing, protection, supply and off-loading of pumps and base-plates used for the pumping of raw or potable water at ambient temperature.
- 1.2 Sedibeng Water prefer:
 - a. KSB or SULZER pumps to be used in all pump stations where possible, unless

approved otherwise by Sedibeng Water's Projects division.

- b. Mono or Howden pumps to be used in boreholes where possible, unless approved otherwise by Sedibeng Water's Projects division.

2. INTERPRETATIONS

2.1 Abbreviations

For the purposes of this Specification the following abbreviations will apply:

BS	British Standard Institution
SABS	South African Bureau of Standards
DIN	German Standards Institute
ISO	International Organisation for Standardisation
SIS	Swedish Standards

2.2 Standards

Pumps shall comply with this Specification and with the current and most recent issues of the following standards where applicable:

BS 970	Wrought steel in the form of blooms, billets, bars and forging.
BS 1400	Copper alloy ingots, copper and copper alloy castings.
BS 3100	Steel casting specifications for general engineering purposes.
BS 3468	Austenitic cast iron.
BS 4360	Specification for weldable structural steel.
BS 4675	Mechanical vibration in rotating and reciprocating machinery.
BS 4999	General requirements for rotating electrical machines.
BS 5316	Acceptance tests for centrifugal mixed flow and axial flow pumps.
BS 4504	Flanges and bolting for pipes, valves and fittings.
SABS 20	Copper alloy ingots and castings.
SABS 1123	Steel pipe flanges.
SIS 05 59 00	Pictorial surface preparation standards for painting steel surfaces.

3. MATERIALS

3.1 General

All materials shall possess qualities adequate for the purpose for which they are to be used. All the materials and properties claimed for these materials shall, unless specified otherwise in this document, comply with the requirements of the most recent edition of the appropriate South African or other internationally recognised standard specification.

For each type of equipment, the Manufacturer shall indicate the materials used for each of the proposed sub-assemblies.

The equipment shall be manufactured using new prime quality materials taking into account the latest technical innovations.

All components shall have a surface finish in relation to their importance, position and intended purpose.

Rolled steels and all castings shall be clean and free of blisters, porosity, shrinkage, holes, cracks or other flaws that may be detrimental to their use.

The Tenderer shall indicate in his tender the proposed materials for each component of the assembly.

3.1.1 Castings

No repair of cast components will be permitted without the prior approval of the Client. Highly qualified welders shall carry out the filling of casting defects according to the latest welding techniques.

Any cast component requiring filling at any fabrication stage after the first annual shall be subjected for further annealing treatment unless stipulated otherwise.

Cast components shall not be warped or distorted in any way and shall not show any increase in dimensions (beyond that shown on the fabrication drawings) likely to cause interference with other components in the erection of the item of equipment for which they were made. The structure of cast components shall be homogeneous and free of non-metallic impurity. If, at critical points of a cast component, there is to great a concentration of impurities or alloy, the component shall be rejected.

3.1.2 Pump Casings

Pump casings shall be of cast iron or cast steel.

3.1.3 Impellers

Impellers shall be cast in either phosphor bronze (PBI according to BS 1400 or IC according to SABS 200), aluminium bronze (ABI according to BS 1400 or IE according to SABS 200) or chrome steel (316C11 according to BS 1300, or DIN 1.4313), unless otherwise specified in the Project Specification. Cast iron or leaded gunmetal shall not be permitted.

3.1.4 Pump Shafts

Pump shafts shall be of EN 26 steel to BS 970 or similar.

3.1.5 Stainless Steel

The stainless steel used shall be of the type easily jointed or fitted by electric welding. Stainless steel which cannot withstand the effects of welding or associated heat treatment will not be accepted.

3.1.6 Fasteners

All high tensile bolts and studs used shall bear the letter HTS stamped or engraved on the end. Washers shall be provided under all bolt heads and nuts. The threads of bolts and studs shall be cleaned and coated with a graphite / grease compound before assembly. The threads of all bolts and studs used with the equipment supplied shall be

to the same standard.

The Tenderer shall indicate in his tender the materials proposed for each part of assembly.

4. PLANT

The Tenderer shall satisfy Sedibeng Water of the sufficiency of the manufacturer's workshops to handle the manufacture, testing and protection of the pumps strictly in accordance with specifications.

5. MANUFACTURE

5.1 General

5.1.1 Preference will be given to Pumps with non-overloading characteristics and a shaft rotational speed not exceeding 1500 rpm. Speeds of 3000 rpm. will not be disqualified, but must be approved beforehand by Sedibeng Water's Project division.

5.1.2 Pumps shall be of the highest quality and suitable for continuous operation over long periods with the minimum of maintenance at high-sustained efficiency.

5.1.3 End-suction pumps constructed on the back pullout principle shall be provided with spacer pump motor couplings to enable the pump bearing housing, shaft and impeller to be removed without disturbing the pipe work or alignment.

5.1.4 The proposed layout of the pump station shall be indicated on the drawings accompanying the documents. They shall be studied carefully and all alterations to the lay-out, pipe work or buildings required to suit the pump offered, shall be set out clearly in letters and drawings accompanying the tender. The final layout shall be agreed upon by the Contractor and Sedibeng Water prior to the commencement of manufacture of any of the equipment.

All equipment offered as well as all work carried out, shall comply fully with the requirements of the Occupational and Health Act 85/1993, Machinery and Operational Safety Act 6/1983.

5.1.5 Taking into consideration specific speeds calculations, efficiencies and reliability of the pump sets the proposed pump types shall be justified in the Tender. Double Suction Axially Casing Split Pumps will be preferred unless otherwise specified in the Project Specification.

5.1.6 Arrangements incorporating multiple pump units coupled in series to achieve the duties specified in the particular specifications will not be favourably considered unless otherwise specified.

5.1.7 The arrangements of impellers shall be such as to reduce the residual axial thrust to a minimum. Designs incorporating a double suction will be preferred.

5.1.8 A design and arrangement of the pump casing, which ensures that it, is not necessary to disconnect the delivery pipe work for the purpose of removing or replacing the complete rotating element will receive favourable consideration.

- 5.1.9 Suction and delivery details: The orientations of the suction and delivery pipes shall be such as to facilitate maintenance whilst being designed for minimum losses and no air traps.

5.2 Pump Characteristics

- 5.2.1 The pumps shall have stable, non-overloading characteristics.

- 5.2.2 The Tender shall submit with this Tender for each pump offered the following characteristic curves:

with respect to flow (in 1/s)

- total head: in meters (0% to 120% of duty flow)
- power absorbed: in kilowatts (50% to 120% of duty flow)
- efficiency: (0% to 120% of duty flow)
- net positive suction head (NPSH) requirements, critical and 3% 'head loss', relative to pump shaft centre line, in the case of horizontal spindle pumps; with respect to speed;
- torque requirements rated in absolute units.

- 5.2.3 Alternatively, NPSH requirements related to 3% drop in head may be given, if preferred, as long as the method of presentation is clearly stated.

- 5.2.4 The Contractor may be called upon to provide further curves at the request of the Client, especially for starting and stopping analysis, in connection with surge analysis in the rising mains.

- 5.2.5 The efficiency curve shall be flat over wide range in order to provide efficient working with various pump operating conditions. It shall conform to the requirements of the Project Specification.

- 5.2.6 Unless specified to the contrary, the proposed pumps shall be able to operate without perceptible signs of cavitation in the full range of heads specified, running singly or in parallel. Throttling shall not be allowed.

5.3 Pump Casings

- 5.3.1 No welding, burning, filling or plugging of defective castings shall be permitted without Sedibeng Water's permission in writing, following and inspection of the defects.

- 5.3.2 The inspection and testing of castings and test bars shall be in accordance with BS 3100.

- 5.3.3 The dimension and drillings of the suction and discharge flanges integral with the pump castings shall be to SABS 1123 to design pressures specified.

- 5.3.4 The pressure rating of the delivery flanges shall be at least equal to the maximum suction static pressure, plus the pump shut-off pressure. The minimum pressure rating of the flanges shall be 1 Mpa (10 bar).

- 5.3.5 All pump casings shall be hydrostatically tested at the Manufacturer's workshop and in

the presence of Sedibeng Water or his Representative.

5.3.6 Suitable lifting rings shall be provided on the casings.

5.4 Impellers

5.4.1 The castings shall be free of blowholes and other defects. No welding, burning filling or plugging of defective castings shall be permitted without prior approval being obtained from Sedibeng Water in writing, following an inspection of the defects.

5.4.2 All water passages shall be polished to a smooth finish. Water passages, which cannot be machined shall be hand ground and filed to template.

5.4.3 Each impeller shall, after final machining and dressing, be independently statically balanced and the completely assembled rotating element with coupling shall be dynamically balanced.

5.4.4 The critical speed of the rotating element shall be considerably higher than the running speed.

5.5 Pump Shaft, Sleeves and Diffusers

5.5.1 Pump shafts shall be of an approval material, and of sufficient dimensions to transmit the power to which they will be subjected without undue torsional or bending stresses and deflection.

5.5.2 The shafts shall be stress-relieved after initial machinery, and ground to final size.

5.5.3 The shafts shall be suitably designed for the reception of the impeller, which shall be adequately secured to the shaft in such a manner as to be readily removable without damage to either the shaft or the impeller.

5.5.4 The Contractor shall ensure that both the critical speed and torsional oscillation characteristics of the combined pump and motor rotating elements are satisfactory for all possible conditions of operation.

5.5.5 The shafts shall be adequately protected with replaceable sleeves of an approved bronze or other similar approved non-corrodible material at all areas where wear and/or corrosion could possibly be expected. These sleeves shall be readily removable without causing damage to either the shafts or the sleeves.

5.6 Shaft Coupling

5.6.1 The pump and motor shall be connected by a geared coupling in such a manner that it shall not uncouple whichever way the impeller may be rotating.

5.6.2 The coupling shall accommodate small axial, lateral and angular misalignments without imposing undue stresses on the shaft and bearings.

5.6.3 The coupling shall be enclosed in a stationary solid-plate guard to Sedibeng Water's satisfaction.

5.7 Pump Bearings and Lubrication

5.7.1 Bearings and Lubrication

The bearings in the pump casing together with its lubricating systems shall be suitable for the particular circumstances. The particular type and system offered by the Tenderer shall be fully specified.

Grease used will be Engen Genlex EP 42 MT.

Oil used will be Engen OTC 46.

- 5.7.2 The pump rotating element shall be positively located in the axial direction. If specified thrust bearings shall be of the tilting pad-type (Michell or similar).
- 5.7.3 Journal bearings consisting of the white metal lined bronze sleeves split on the horizontal centre-line and lubricated with an oil ring shall be preferred.
- 5.7.4 All bearings shall be suitable for shaft rotation in both directions.
- 5.7.5 Preferably the same type of bearing will be chosen for motor and pump.
- 5.7.6 If not, the necessary allowance shall be made when aligning pump and motor.
- 5.7.7 Adequate provision shall be made for the cooling of oil for bearings, particularly as the pumps may run continuously in ambient temperatures of the order of 40° C. The bearing metal temperatures shall not exceed 60° C during continuous operation.
- 5.7.8 Oil reservoirs of sufficient capacity shall be fitted with easily accessible oil level indicators, clearly marked to indicate the standing and running oil levels.
- 5.7.9 All internal surfaces in continuous contact with the lubricating oil such as oil reservoirs, piping, etc., shall be thoroughly cleaned either chemically or by shot blasting and protected by a method to be approved by Sedibeng Water until such time as the system is charged with oil. No site welding of oil circulating pipes will be permitted.
- 5.7.10 The entire lubricating system shall be fail-safe with alarms set to indicate automatic changeover to the stand-by unit.

5.8 Mechanical Seals

- 5.8.1 Mechanical seals shall require no separate water supply and shall be suitable for the water to be pumped. Seal selection shall be done in collaboration with the seal manufacturer and proof that this has been done may be requested. Sedibeng Water prefers the use of Burgmann seals.

Mechanical seals shall be balanced and spare wearing components shall be supplied and delivered when the pump is installed, the cost being included in the price of the pump.

Areas where mechanical seals are fitted must be stainless steel 316 micro-welded.

5.9 Pump Vent and Drain Fittings

- 5.9.1 Stainless Steel vent cocks shall be provided and fitted at all local high points on each pump casing. These cocks shall be of adequate size to enable the entrapped air to be released freely. Stainless Steel pipes shall be neatly led from priming cocks, gland and casing drain points to a suitable main trunk. Galvanised drainage pipe works of adequate size shall be provided and installed to collect the waste water from each pump set and to lead it to the drain leading to the pump house sump.

5.10 **Base-plate**

- 5.10.1 The pump and motor base-plate shall be rigid. The upper face of each base-plate upon which the pump and motor are located, shall be machined flat and smooth to ensure that the pump and motor are bedded properly without the use of spacers.
- 5.10.2 For every motor, two jacking bolts at right angles with a lock nut shall be provided at every corner. Grouted stainless steel bolts must be used to hold down the base plate.

5.11 **Monitoring Devices**

- 5.11.1 Full details of the sensing equipment (PT100's, etc.), and of the associated control and monitoring or indicating equipment shall be submitted with the tender offer. Evidence shall be submitted that adequate spares and services are readily available in this country.

5.11.2 **Temperature Sensors**

Separate temperature probes shall be installed at the sleeve and/or rolling bearings of each pump. Pumps must be supplied with a 3/8" BSP tapped hole at each bearing for sensor installation. These holes must be on the same side as the holes on the motor.

Each pump casing shall be provided with a 1" BSP tapped hole for installation of a Fenwall thermo switch to safeguard the pump in the event of inadvertent sustained operation against a closed discharge valve. The thermo switches shall be calibrated to switch when the temperature of the water in the pump casing exceeds 40° C.

5.11.3 **Automatic air vents**

If an automatic air vent is specified for the pump casing, it shall be fitted with an indicator to show the open and closed positions of the air vent.

5.12 **Corrosion Protection**

5.12.1 **Internal protection**

All traces of rust, slag, silica or other contaminants shall be removed by mechanical wire brushing. The entire surface shall in addition be degreased with a suitable water emulsifiable degreaser (Plascon Code GR or similar). Surfaces shall be left clean and dry prior to coating.

One coat of temporary corrosion preventative shall be applied, (Plascon Code REF 1055 or similar) by brusher spray to a dry fill thickness of 25um.

5.12.2 External protection

All sharp edges, laminations and protrusions shall be removed by mechanical grinding, where after all traces of rust, slag, silica or other contaminants shall be removed by mechanical wire brushing. The entire surface shall be degreased using a suitable water emulsifiable degreaser. Surfaces shall be left clean and dry prior to coating.

One coat of zinc phosphate high build primer shall be applied (Plascon Code UC 183 or similar) by airless spray to a dry film thickness of 75um, and left 8 hours to dry.

The primer shall be followed by one coat of universal undercoat, (Plascon Code UC 1 or similar) applied by brush, roller or airless spray to a dry film thickness of 30um. This coat shall be left to dry for 16 hours.

The final coat shall be one coat of universal gloss enamel, (Plascon Code G or similar) applied by brush, roller or airless spray to a dry film thickness of 25um. This shall be left to dry for 20 hours. Colour will be to Plascon Broken White.

5.12.3 Designation and Information Plates

Each pump shall be supplied with an information plate-preferably chromium plates-secured to the pump casing in a visible position indelibly marked with the following details:

- Marker's name, pump type and serial number
- Year of manufacture
- Impeller size
- Rated duty of pump in l/s or m³/H
- Head in meters at rated duty
- Pump speed in revs per minute

- Mass of completely assembled pump in kilogram
- Types and sizes of Bearings
- Letters and figures shall be engraved, or embossed, not stamped

5.13 Interchange ability

Where two or more similar pump units are required, these units shall be identical in all respects.

5.14 Operating and Maintenance Manual

Three copies of the Operating and Maintenance Manual shall be supplied by the Contractor not later than at the time of commissioning of the installation. This manual will be a prerequisite for final acceptance of the plant and a separate manual shall be compiled for each installation.

5.14.1 Contents

- a) The manual shall cover the following aspects in detail, with illustrations and drawings:

Index: Each volume shall have an index following the title page. If there is more than one volume, the first volume shall contain a master index.

A Brief description of the plant and installation.

- b) Pre-commissioning checks: These shall be clear, concise, easy to follow and shall include pre-start checks (e.g. check oil and water, remove locking pin, etc.), safety checks (E.g. personnel cleared from vicinity of water outlets, guards in place, etc.)
- c) Detailed operating instructions: These shall be clear, concise, easy to follow and shall include starting procedure, running checks (e.g. no vibration, pressures normal), shut down procedure, emergency shutdown procedure and action to be taken in response to alarm signals.
- d) Proposed preventative maintenance schedules and programme covering all plant and equipment; the Maintenance chart.
- e) Fault diagnosis and repair procedures: These shall include details of all servicing, replacement and repairs which Artisans or Operating personnel would be expected to carry out on Site. In this section the reader may be referred to supplier's brochures elsewhere in the Manual for specific detail.

Schedule of manufacturing drawings.

Detailed schedule of plant components giving material specifications, part numbers, etc.

Where possible, drawings shall be positioned opposite the appropriate text.

Sub-contractor's/Supplier's brochures and instructional literature.

The requirements for the Operation and Maintenance Manual for electric motors are covered elsewhere

5.14.2 Non availability

Acceptance Tests will not be performed and payments may be deferred if complete and final Operating and Maintenance Manuals are not available.

5.15 Drawings and Documentation

5.15.1 Drawings

The drawings included in the Tender Documents are Sedibeng Water's proposal for the plant Layout. Proposed alternatives by the Tenderer indicated on drawings submitted by the Tenderer, shall be considered in allocating the contract.

- 5.12.2 Before any work is carried out by the Contractor, the Contractor shall submit detailed working drawings to be approved by Sedibeng Water. Approval of these drawings does not relieve the Contractor from his responsibility for the correctness of the drawings.
- 5.15.3 Fully dimensioned outline and layout drawings of all plant and equipment shall be supplied including ancillary equipment, giving fully particulars as to the sizes and positions of all anchor bolts, bolt holes and other recesses; vents and drains; oil, gland or cooling and service water; anchor blocks, supports, foundations and embedded parts, including all necessary clearances around items of equipment and the lifting requirements and any other information which may effect the construction of the Pump Station structure.
- 5.15.4 The magnitude and direction of the thrust forces to be resisted by the foundations or anchor blocks shall be clearly given.
- 5.15.5 Detailed dimensioned outline drawings of each electric motor, junction box and control console shall be included, showing the position of each panel, clearance space required and the height of each cable gland above the floor.
- 5.15.6 The above-mentioned information shall be binding once it has been approved by the Client. All costs due to alterations made after this approval will be invoiced to the Contractor. The Contractor will be required to formally approve the civil drawings made by others.

6. TOLERANCES

The tolerances as specified in this Specification or the appropriate SABS or BS Standards, shall apply.

7. INSPECTION, TESTS AND COMMISSIONING

7.1 General

- 7.1.1 Contractors shall make available for inspection, their internal Quality System Manual, their Standard Procedure Manual and their Work Instructions.
- 7.1.2 Inspection and tests required from the Contractor include the tests and inspections in the workshops and the inspections and tests on Site.
- 7.1.3 Depending on the results of the tests and inspections, penalties may be applied and, in certain cases, part or all of the equipment may be rejected, as set out hereinafter.

The cost of all tests and inspections shall be included in the Tender. For instance, the cost of commissioning and testing on Site shall be stipulated in the Price Schedule under the section provided or included as part of the cost of erection. (Except for the cost of power and water consumed.) No claim for travelling expenses or further time required for testing will be allowed.

- 7.1.4 Tenders shall fully acquaint themselves with the properties of the water to be pumped. Any wear of portions of the pump or ancillary equipment that will affect its operating efficiency during the Period of Maintenance will result in the pump set being rejected.
- 7.1.5 Sign of cavitation pitting on pump parts will not be acceptable.
- 7.1.6 Leakage from any oil, water or air circuit will not be acceptable.

- 7.1.7 Leakage of Mechanical Seals will not be acceptable.
- 7.1.8 Operation of pumps shall be free of vibrations throughout the full range of normal running conditions of the Pump Station.
- 7.1.9 In no case shall temperature-rise above the ambient temperature reach or exceed 40°C for any mechanical components. For temperature-rise of bearings see Clause PA 5.7.7.
- 7.1.10 In the case of routine tests concerning standard equipment's or material quality control tests, not attended by Sedibeng Water or his Representative, tests reports or certificates in duplicate shall be submitted to Sedibeng Water.
- 7.1.11 The Contractor shall notify Sedibeng Water or his Representative in writing two weeks in advance, of the place and dates at which the equipment may be inspected and tested.
- 7.1.12 Sedibeng Water or his Representative will inform the Contractor of his intention to attend the test or the inspection and propose a date which suits him. If the date preferred by Sedibeng Water is later than ten days after the first possible date, the Contractor shall be entitled to perform the test or inspection without the presence of Sedibeng Water.
- 7.1.13 If at any agreed date the equipment to be inspected or tested is not ready and the test or inspection has to be postponed the Contractor shall be held responsible for the travelling and/or living expenses of Sedibeng Water's representative.
- 7.1.14 When tests and inspection have met the satisfaction of Sedibeng Water or his Representative a certificate of Workshop Acceptance will be issued. The contractor shall not pack or dispatch to Site any equipment before receiving the relevant "Certificate of Workshop Acceptance."
- 7.1.15 Sedibeng Water's acceptance shall not relieve the Contractor of any obligation with regards to specifications.

7.2 Tests

7.2.1 Performance tests

Each pump complete with its driving unit shall be tested at the Manufacturer's works, or other location approved by Sedibeng Water to "Class B" requirements of BS 5316 Part 2, and the efficiency carefully measured. Variations from the actual running conditions of the pumps are allowed as defined in the standard. Unless otherwise explicitly mentioned, cavitation tests are required at works.

- 7.2.2 The tests shall be witnessed by Sedibeng Water or his Representative and details of the tests and the results obtained, duly signed by the appointed Witness, shall be submitted to Sedibeng Water before despatch of, the pumping units for the Manufacturer's workshop.
- 7.2.3 The rotating element shall be dynamically balanced before pump assembly. The good balance of the whole pump set will be checked by measuring the absolute vibration of pump and motor bearing housings.
- 7.2.4 Tests shall be performed with the pump set on sound foundations, similar to those expected on site.
- 7.2.5 Measurements shall be taken in the three axes at each bearing, i.e. axial and two radial components at right angles to each other.

- 7.2.6 Performance and vibration tests as described above are to be performed before installation on Site for all pump sets more than 22 kW. If these tests are impractical or impossible at the pump manufacturer's works. Tenderers must state this in their Tender and explain the reasons why it is so. Sedibeng Water may be prepared to consider alternative proposals for testing provided these proposals are submitted with the Tender and are clearly described and defined. If this is not done, the Tenderer will be penalised for the cost necessary to have the tests performed in another workshop.
- 7.2.7 All pieces of equipment subject to water, oil or air pressure shall be tested at a pressure not less than one and a half times the design pressure.
- 7.2.8 Each piece shall withstand the hydrostatic test pressure without exhibiting signs of sweating, undue deformation and stressing, or defect of any kind.
- 7.2.9 Hydrostatic testing shall be done with blank flanges bolted on the flanges of the piece. The use of tie-bolts or other forms of restraint applied across the blank flanges to restrain the bodies from deflecting under the applied test pressure will not be permitted without Sedibeng Water's approval.
- 7.2.10 The hydrostatic test pressure shall be maintained for a period of at least 10 minutes.

7.3 Performance Test Results

7.3.1 At works

- a) Overall percentages of efficiency as calculated from the tests should not be less than the appropriate guaranteed figures at the duty points by more than 3%.
- b) The measured flow rates should not differ from the guaranteed deliveries at any point other than the duty points on the characteristic curves as supplied by the Tenderer by more than 5%.
- c) The NPSH requirement should be met for the required flow rate.
- d) The Contractor will be allowed a period of eight weeks to carry out any amendments to the plant, which he may consider necessary to meet the guaranteed figures. Any period granted for design amendments shall not extend the Contract Period.
- e) Further tests shall then be carried out at the Contractors expense and if the test results in question are still not within the limits specified, Sedibeng Water shall have the right to,
 - either rejects the entire plant and recovers all moneys already paid to the Contractor
 - or, let the Contractor continue with the installation of the pump sets, which may be subjected to penalties or rejection as defined hereinafter when the performances tests on site are performed.

7.3.2 On site

- a) Should the test results obtained for either efficiency, flow rate, NPSH or vibration still vary beyond the limits indicated in clause PA 7.3 above – the Contractor will again be allowed a further four weeks to make sure amendments as may be considered necessary and if after these amendments have been made the test results in question are still not within the figures, which have been guaranteed, Sedibeng Water reserves the right, according to circumstances, to reject the plant entirely.

- b) Any other discrepancies, abnormal wear or malfunctioning of plant which may be observed during the Acceptance Test shall be corrected by the Contractor without delay.
- c) The date of completion shall be the date on which the Acceptance Tests on site have been satisfactorily completed and the plant is in a fully operational state in accordance with the Specification.
- d) Any period granted for design amendments shall extend the Period of Maintenance by a corresponding amount.

7.4 **Commissioning**

7.4.1 **Initial Commissioning**

- a) On completion of mechanical and electrical erection and as soon as water is available and other circumstances permit, the Contractor shall arrange for the commissioning of one or more units of the pumping plant in the presence of Sedibeng Water. The Contractor shall ensure that his equipment is suitably prepared before giving Sedibeng Water fourteen days notice in writing of the date of commissioning.
- b) Before the Initial Commissioning, the Contractor shall satisfy himself and subsequently prove to Sedibeng Water that all monitoring and operating equipment are functioning correctly.
- c) The pump sets shall be run without interruptions separately for at least 4 hours or such further time as may be required to reach stable operating conditions (particularly, motor temperatures shall be stable).
- d) If the prescribed duration cannot be achieved, the Initial Commissioning shall take place at a date to be agreed upon by the Contractor and Sedibeng Water. It is to be born in mind that the penalties for delivery shall be linked with the Initial Commissioning.
- e) After the above commissioning, the plant shall be run under approved supervision for not less than two months before the Acceptance Tests are conducted. The Contractor must satisfy himself that the operators are in a position to operate the plant safely and correctly should he be absent from Site during this period.
- f) Commissioning shall not be considered to be complete until the plant is capable of continuous operation by fully trained operators of the Employer and until two months have elapsed and the plant has passed the Acceptance Tests as specified.
- g) The Acceptance Tests shall be performed only if and when every item of the whole Contract is fulfilled and if and when each piece of equipment, including the monitoring and control devices, is working properly. Sedibeng Water is entitled to postpone the Acceptance Tests if any part of the Contract is not to his satisfaction or if the plant has not been successfully operated for at least 200 hours.
- h) The Certificate of Commissioning for the equipment is used by Sedibeng Water only when the results of the Acceptance Tests, recorded in a report prepared and submitted by the Contractor, are found satisfactory.

A separate Certificate of Commissioning may be issued on request for a complete pump line only.

- i) Final Operation and Maintenance Manuals shall be made available before the Certificate

of Commissioning is issued.

- j) The Period of Maintenance (or Guarantee Period) commences at the date of the Certificate of Commissioning.
- k) During the first 14 days of operation of the scheme, the Contractor shall be on it to rectify any problems with the scheme within 24 hours of being telephonically notified. During the remainder of the maintenance period, the Contractor shall within 14 days of being notified, commence rectifying any possible problems that the Employer may encounter with the equipment supplied under this Contract.
- l) Should the Contractor fail to meet the above requirements, the Employer may appoint others to undertake the necessary repair work at the Contractor's cost.
- m) After the satisfactory conclusion of the Acceptance Tests on Site and the issue of the Certificate of Commissioning, the Contractor shall guarantee the satisfactory operation and functioning of the entire plant covered by the Certificate of Commissioning for a period of twelve months measured from the date of the Certificate of Commissioning.
- n) The Contractor shall make good, free of all charges, any defects arising during this Period of Maintenance including the replacement of all defective parts and their recommissioning. This guarantee shall apply to all defects arising during proper use of the plant, due to faulty design or maintenance instructions, inferior materials or poor workmanship.
- o) Maintenance by Sedibeng Water's personnel during the Period of Maintenance shall be limited to cleaning and lubrication only as instructed by the Contractor. All other maintenance or adjustments shall be carried out by the Contractor.
- p) The Final Certificate will be issued by Sedibeng Water when the Period of Maintenance has elapsed and all Contractual obligations have been met in accordance with the General Conditions of Contract.

8. MEASUREMENTS AND PAYMENT

Measurement and payment will be done in accordance with the methods stated below:

8.1 Supply and Delivery

Pump sets will be measured per unit including the following items as individually itemised.

- 8.1.1 Pumps, motors, geared couplings, coupling material, base plates and monitoring items as individually itemized.
- 8.1.2 Design, manufacture, purchase, protection, supply handling, transport and profit.
- 8.1.3 Fixing material required to secure monitoring equipment to pump.
- 8.1.4 Fixing material required to secure the pump and motor to the base-plate.
- 8.1.5 Temporary storage and maintenance during storage, should it be required.
- 8.1.6 The required tests and inspections at the manufacturer's works.

8.1.7 Operating and Maintenance Manuals as well as drawings in accordance with the specification.

8.1.8 Commissioning of each pump set as specified.

8.2 Individual Performance Checks

Pay-item	Unit
Performance testing of pumps by independent institutions (Provisional item)	No

Should Sedibeng Water require performance testing of the pumps or motors by independent institutions such as the South African Bureau of Standards, a separate pay-item will be provided in the Schedule of Quantities. The tendered rate shall include for the transporting to and from the institution, off loading, handling, etc., as well as all fees payable to the institution for each pump/motor unit tested.

9. PUMP AND MOTOR CLASSES AND THEIR APPLICABLE PROTECTION

TYPE OF EQUIPMENT	-11 kW	15-30 kW	37-250 kW	HT
1.1.1.1.1 PUMP STATUS MONITORING				
Pump casing Fenwall switch	O	O	X	X
Bearing temperature's	O	O	X	X
Suction pressure transmitter/Indicator	X	X	X	X
Delivery pressure transmitter/Indicator	X	X	X	X
Suction vale open limit switch	X	X	X	X
Delivery valve open limit switch	X	X	X	X
Delivery valve close limit switch	X	X	X	X
Delivery valve open/close control	X	X	X	X
X - YES O - NO				



ELECTRICAL MOTOR SPECIFICATIONS

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1. GENERAL

- 1.1 This specification covers low voltage (up to and including 1 000 V), 3-phase, slip ring and squirrel cage induction motors up to 450 kW and at a frequency of 50 Hertz.
- 1.2 Motors must be 4 pole 380V type and suitable for Star/Delta operation, unless approved otherwise by Sedibeng Water's Projects division.
- 1.3 Motors are to be supplied complete with a suitable cable box for feeder cables, terminal boxes, nuts, locknuts, intermediate disconnecting leads, cable lugs, etc.
- 1.4 Mounting bolts and geared half-couplings must be included in the motor's price.
- 1.5 Sedibeng Water prefer:
 - a. Siemens or GEC motors to be used throughout where possible, unless approved otherwise by Sedibeng Water's Projects division.
 - b. Motors in Pump stations to be horizontal mount, unless approved otherwise by Sedibeng Water's Projects division.
 - c. Motors at Boreholes to be vertical mount, unless approved otherwise by Sedibeng Water's Projects division.

2. QUALITY OF MATERIALS

- 2.1 The motor must be designed, manufactured, tested, delivered, erected and commissioned in accordance with:

SABS 948	:	Three	Phase	Induction	Motors
IEC-34(SABS IEC-34)	:	Rotating	Electrical	Machines,	Part 1 to 18
BS4999	:	Specifications for General Requirements for rotating electrical machines.			

Where reference is made to a code, specification or standard, the reference must be taken to be the latest edition, including addenda, amendments and revisions thereto.

- 2.2 All deviations from these specifications must be clearly pointed out at tender stage as deviations not indicated, will not be accepted
- 2.3 All materials must be new and of the quality class most suitable for the purpose specified. All parts must be capable of withstanding variations of temperature arising under working conditions without distortion, deterioration or setting up of undue strain in any part.
- 2.4 Quality control must be in accordance with **ISO 9001**.
- 2.5 Mild steel plate for fabricated parts must be of weldable quality in accordance with **BS 4360**. No welding, burning in, filling, plugging up or metal deposition to correct defects in any component will be permitted unless agreed to by Sedibeng Water in writing, following an inspection on the defect.

3. INTERCHANGEABILITY

- 3.1 Motors of the same rating must be identical, fully interchangeable and from the same motor manufacturer.
- 3.2 All similar parts are to be made accurately to dimensions and must be interchangeable with each other, so that a spare part or any part of another similar motor can be used satisfactorily in the relevant position on a motor without recourse to additional machining or filing.

4. MOTOR RATINGS

- 4.1 Motors must have continuous maximum ratings not less than the following:
- 50 kW or under, not less than 25 % in excess of the maximum likely to be drawn by the load within the operating range.
 - Over 50 kW and up to 100 kW, not less than 15 % in excess of the maximum likely to be drawn by the load within the operating range.
 - Over 100 kW, not less than 10 % in excess of the maximum likely to be drawn by the load within the operating range unless otherwise specified.
 - Where operating at other than continuous running duty is required, (i.e. short time or intermittent periods, as for valve actuators, hoists etc.), motors must have appropriate ratings in respect of output, duty and starting class.
- 4.2 All motors will be capable of continuous operation over the range of temperatures from - 10° C to + 40°C with a 24 hour continuous maximum ambient of 35° C at the specified altitude.
- 4.3 All motors will be suitable for operation at any voltage between ± 10 % of the nominal value and ± 2 % of nominal frequency at the altitude specified.

5. INSPECTION OF MANUFACTURED EQUIPMENT

- 5.1 Sedibeng Water or his appointed representative, reserves the right to inspect the motors or associated parts at any stage of manufacture.
- 5.2 The Contractor must ascertain when inspection is required and the contractor must then give Sedibeng Water not less than seven days notice of when such inspection may be undertaken.

6. GUARANTEE AND MAINTENANCE

- 6.1 The complete installation must be fully guaranteed for a period of twelve months from the date of commissioning. A complete full maintenance service must be provided during this period. The Tenderer must indicate with in tender what duties have been included and the time intervals between services. Should the Tenderer fail to provide this information; Sedibeng Water will lay down the duties as well as time intervals with which the contractor must comply.
- 6.2 Four copies of all test certificates, showing the results of all tests performed, will be supplied at a date not later than the delivery date of the motors.

7. TEMPERATURE RISES

- 7.1 All motors must be designed for a class B temperature rise, (80° C above ambient).
- 7.2 The temperature rise of the bearings must not exceed 50° C above ambient under continuous full load conditions.

8. BEARINGS

- 8.1 Bearing must be plain, ball or roller type, as appropriate unless otherwise specified. Vertical shafts, must have approved thrust and guide bearings. Grease-lubricated bearings must be provided.
- 8.2 The grease must be **ENGEN GENLEX 42 MT** and where applicable oil must be **ENGEN TURBINE 46**.
- 8.3 When the motor shaft is not located axially by its own bearings, it must be permanently marked to indicate its normal running position and the extent of float in either direction.
- 8.4 Ball, or roller bearings must be loaded conservatively, in order that the grease may be renewed at intervals of not less than one year, and they must be equipped with grease nipples or cups.
- 8.5 Care must be taken that bearings are sealed properly, in order to prevent ingress of bearing lubricant into windings and cores. For purpose of maintenance, end-shield bearings are preferred. A minimum bearing life of 40 000 hours is required. Unless otherwise approved in writing, motor bearings must be designed to allow the motor to run indefinitely, when uncoupled from the driven machine.
- 8.6 Where necessary, to prevent damage by any shaft currents, which may be produced, the bearings and their lubricating and cooling systems must be insulated from the bedplate or frame.

9. TERMINAL BOXES

- 9.1 The terminal box for the supply cables must be suitable for the cables specified and must be oversized. It must have a removable cover and gland plate. The degree of protection must not be less than IP 55.
- 9.2 Cable outlets must be capable of pointing to any of four directions at 90-degree intervals.
- 9.3 All terminals must be properly and permanently marked for easy identification.
- 9.4 Terminal boxes must be on the right hand side if viewed from the drive end unless otherwise specified.

10. NAME PLATES FOR MOTORS

10.1 In addition to the information required by SABS 948 the following must also be marked on the nameplates.

- 10.1.1 Year of manufacture.
- 10.1.2 The order number.
- 10.1.3 Total mass of motor in kg.
- 10.1.4 Diagram indicating the number, type and positions of temperature detectors.
- 10.1.5 Bearing types and sizes.
- 10.1.6 Bearing grease interval.

11. TEMPERATURE DETECTORS

11.1 Both bearing casings must be provided with 3/8" B.S.P. threaded holes suitable for the mounting of bearing temperature probes from the outside of the motor when required (refer item 21). These holes must be more or less in a horizontal position and on the same side as the terminal box.

12. MOUNTING

12.1 The motors must be mounted as required by the driven equipment supplied.

12.2 Each motor must be mounted on a common base-plate with the equipment driven. When uncoupled from the load, it must be possible to lift the motor clear without withdrawing the rotor and with the minimum amount of dismantling.

13. DRAWINGS AND INFORMATION FOR APPROVAL

The following drawings and information must be submitted for approval before manufacture commences:

13.1 Dimensioned outline and required foundation drawings of the motors. (Shaft diameter, shaft height and motor mass to be clearly shown).

13.2 Cross-sectional dimensioned drawings of the cable boxes.

13.3. Detailed drawings of the motor base plate showing full constructional details with dimensions.

14. WINDINGS

14.1 The stator windings must be star-connected for all motors of 3 kW and larger. Each end of each phase winding must be brought out to the stator terminal box. For single wound three phase motors, six stator-winding ends must be brought out to the stator terminal box. A cable lug must be supplied for each end of each phase winding.

14.2 All insulation material used must be Class F.

15. ROTATION

- 15.1 The normal rotation of the motors must be co-ordinated by the contractor with the supplier of the driven equipment.
- 15.2 All AC motors must be capable of having their direction of rotation reversed, merely by interchanging the supply leads. AC motors fitted with unidirectional fans, and therefore not capable of being easily reversed, must be supplied with a double-ended shaft and the holding-down boltholes must be symmetrical about both centre lines. This will permit the motor to be rotated through 180 degrees and coupled to the load, giving an opposite drive. A suitable cover must be provided for the unused bare shaft extension. The above arrangement also requires that two motor terminal boxes are provided diametrically opposite each other. The correct direction of rotation of a unidirectional motor must be indicated in a permanent manner on the frame.

16. BALANCE AND CRITICAL SPEED

- 16.1 Motors and couplings must be accurately and efficiently balanced statically, and dynamically, so that there will be no unbalanced end-thrust, when either new or worn, and to eliminate noise and vibration when running.
- 16.2 Where end-thrust arises, adequate longwearing thrust bearings must be provided. Dynamic balancing must be done by the removal of parent metal, in a manner, which does not affect the structural strength of the rotating element.
- 16.3 The use of solder, or similar deposits for balancing, will not be accepted. The operating speed of rotating elements must be below and as far removed as is possible from the critical resonant speeds thereof.
- 16.4 Vibration of all rotating equipment during operation must be to the satisfaction of Sedibeng Water. Strict attention must be paid to this aspect of the installation and certificates must be provided.
- 16.5 Notwithstanding the acceptance of the vibration limits during the works test, Sedibeng Water reserves the right to call for a vibration test on the installed equipment, if he considers it necessary and the contractor must be responsible for reducing the vibrations to within the specified peaks and provide certificates.

17. TYPE OF MOTOR

17.1 Squirrel-Cage Induction Motors

Squirrel-cage induction motors must be for direct on line starting at full voltage. The breakaway starting kVA of motors must be to Design letter D as specified in SABS 948.

All motors must be capable of starting against the associated load, with an acceleration torque of not less than 5 % of full load torque, when the voltage at the motor terminal during starting is reduced to 80 % of the nominal value.

18. TEST IN THE FACTORY

18.1 1.1.2 Type Tests

- 18.1.1 One motor of every type, 50 kW and larger, must be tested for temperature rise, efficiency and pullout torque. Type test certificates on identical motors will be acceptable in lieu of these tests for motors smaller than 50 kW. Should type test certificates for motors smaller than 50 kW not be available then the first motor of each size manufactured must be tested.
- 18.1.2 The measurement of the temperature rise of the stator windings of the motors must be by the increase in resistance method unless otherwise specified.
- 18.1.3 In addition to the type tests specified in SABS 948 the following must be done:
 - A Vibration Test : The amplitude of vibration (peak to peak) is to be measured in microns.
 - B Efficiency Test : The efficiency must be measured for full load and rated duty load.
 - C Temperature detector readings must be taken at intervals of the test.

18.2 Routine Tests

- 18.2.1 All the resistances of temperature detectors and heaters must be measured in addition to the routine tests specified in SABS 948.

18.3 Test Certificates

- 18.3.1 Four copies of all test certificates, showing the results of all tests performed, must be supplied at a date not later than the delivery date of the motors.

19. ERECTION AND COMMISSIONING

19.1 Erection

- 19.1.1 Where possible, motors must be erected by the motor supplier. Care must be taken to ensure that adequate tolerance margins are made available to ensure interchangeability with replacement motors. Tenderer must indicate with the tender who will erect the motors
- 19.1.2 A minimum of 10 mm of packers must be provided under the motor frame of motor bedplate to allow for adjustment in height.
- 19.1.3 Before holding-down bolts are grouted in, the motor must be lined up and the bolts must be properly centred in the hole of the bedplate.
- 19.1.4 The contractor must satisfy himself that the motors are properly installed, aligned and sufficiently protected and must check the settings of all motor protection gear before any motor is switched on.
- 19.1.5 Sedibeng Water must be notified at least 7 days in advance of any commissioning or testing to enable him to be present
- 19.1.6 The contractor who supply the motors must ensure that the overloads protecting the motors are suitable rated to protect the motor or that the protection relays, where applicable, are correctly set.

19.2 Bearing Inspection

- 19.2.1 Sedibeng Water must inspect motors with ball/roller bearings. The grease must be examined to ensure that it is not hard. No roughness must be felt when the shaft is rotated by hand and the motor must run without undue noise or vibration. A complete set of spare anti-friction bearings must be provided for each motor and delivered at the same time as the motor. Should the bearings fail or exhibit symptoms or brine ling during the guarantee period, the contractor, free of charge, without delay, must change them.

19.3 **Alignment**

- 19.3.1 After erection, the alignment of the geared half-coupling between the motor and the driven machine must be measured. In the case of a pedestal bearing motor, the air gap clearance between the rotor and the stator must also be measured. A record must be kept of these figures and they must be submitted to Sedibeng Water for approval.
- 19.3.2 A horizontal sleeve bearing or limited end-float roller bearing motor must be run uncoupled from its load to ensure that it rotates at the axial position indicated on the shaft and that the rotor is free to move to either side of this position. Particular attention must be paid to ensure that the free running position and the rotor end-float are in agreement with the axial movement of the geared coupling

19.4 **Insulation Resistance**

- 19.4.1 Before energising any of the motors, for the purpose of commissioning, the contractor must measure the insulation resistance of each motor between phases and casing with a 500 Volt "Megger" instrument, which values must be recorded and forwarded to Sedibeng Water for information. If any of the readings for a particular motor are lower than 1,5 megohms, that motor must not be energised until it has been dried out by the contractor by a method to Sedibeng Water's prior approval.
- 19.4.2 The method adopted for drying-out must be by applying heat, preferably by circulating current through the windings or, alternatively, by means of space heaters located in and around the machine.
- 19.4.3 Insulation resistance measurements and temperature readings must be taken regularly every hour until the motor attains an even temperature and thereafter every hour for the duration of the dry out period. The characteristic dry-out curve of insulation resistance versus temperature must be plotted. Dry-out will be considered complete four hours after the resistance readings have started to rise from the steady minimum value, provided that the winding temperatures remain steady during this period.
- 19.4.4 The contractor must provide all equipment and the personnel required for the drying-out operation. The onus remains on the contractor to satisfy him that a motor is dry before it is connected to the supply. Any motor, which fails as a result of being commissioned in a damp condition, must be repaired free of charge by the contractor.

20. STANDARD REQUIREMENTS

Supply	:	380 Volts : 3 Phase : 50 Hz
Output Rating	:	To suit pump requirements as per specification
Speed	:	1450 r.p.m. unless otherwise approved
Type of Motor	:	Squirrel cage (3 starts per hour)
Frame size	:	To suit pump
Enclosure	:	IP55 IC 0141 type to SABS 948
Mounting	:	Foot
Shaft Axis	:	According to application
Insulation	:	Class F
Harmonic Levels		Less than 5 %
Duty-Class	:	Continuous
Bearings	:	Ball
Cable Entry Location	:	Bottom
Cable and Gland	:	To be submitted to successful tenderer on request
Drive Details	:	Direct
Method of Starting	:	Direct on line
Load Details	:	Moment of inertia **kg m sq
Colour	:	Plascon broken white

21. MOTOR CLASSES AND THEIR APPLICABLE PROTECTION

TYPE OF EQUIPMENT	-11 kW	15-30 kW	37-250 KW	HT
1.1.2.1.1 STARTER COMPONENTS				
MCB with Thermal, Magnetic & E/leakage	X	X	X	O
Isolator	O	O	O	X
Main Contactor with aux. Contacts	X	X	X	X
Thermal overload relay	X	O	O	O
Multilin Protection	O	X	X	X
Protection CT's	O	X	X	X
Running hour meter	X	X	X	X
Auto/Man. Switch behind door	X	O	O	O
Start P/button behind door	X	O	O	O
Stop P/Button behind door	X	O	O	O
Reset P/Button behind door	X	O	O	O
Trip aux. Relay	X	O	O	O
VT for power measurement	O	X	X	X
1.1.2.1.2 MOTOR STATUS MONITORING				
Winding temperature's	O	O	O	X
Bearing temperature's	O	O	X	X
Local emergency stop	X	X	X	X
1.1.2.1.3 POWER FACTOR CORRECTION				
Capacitors in box next to motor or in MCC	O	X	X	X
X - YES O – NO				



ELECTRICAL SPECIFICATIONS

Rev. 0 M.J.JACOBS 23 July 2001

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1. GENERAL:

1.1 Abbreviations and definitions:

MCC	-	Motor Control Centre.
DB	-	Electrical distribution box.

1.2 Wiring of premises and installations to be done strictly in accordance with SABS 0142.

2. PANELS and BOXES:

2.1 All panels and boxes for outdoor use are made of 2 mm 3CR12 sheet metal and are epoxy coated.

2.2 All panels and boxes for indoor use are made of 2 mm mild steel and are epoxy coated.

2.3 All Pratley- or similar type of boxes used to interconnect wiring must be equipped with terminals and marked accordingly.

2.4 The colour coding for switchgear, cubicles and MCC panels are as follow:

High voltage (> 400 Volts)	Avocado Green powder coated
Low voltage (< 400 Volts)	Orange powder coated
Instrumentation	Tedelex Stone powder coated

2.5 All stands and supports to be painted Plascon Vadek Dark Brown.

3. NUMBERING:

3.1 Manufacturer's labels or logos are not allowed on panels or boxes.

3.2 All panels to be clearly marked according to Sedibeng Water's list of codes.

3.3 All equipment to be clearly marked with a unique number according to the Standard specifications.

3.4 The following colour coding must be used:

Panel Labels	White lettering (12mm) on black background (18mm).
Equipment Labels	White lettering (5mm) on black background (9mm).
Wire Numbers	Black lettering on yellow background.
Cable Numbers	Black lettering on yellow background.
Pump Numbers	Cream lettering (250mm) on brown background (300mm high x 300mm wide).

3.5 The main area codes are not used so as to keep the numbers as short as is possible.

3.6 Marking to be such that it is always read from left to right or from the bottom upwards.

- 3.7 Panels and equipment positions to be clearly and distinctly marked such that in the case of equipment replacement the number is not removed.
- 3.8 The numbers describe the route of the cable or wire between two items.
- 3.9 All terminals must be marked in numerical sequence. No other markings are allowed except in the MCC panels where the control supply from the bus bars are marked L and N.
- 3.10 Cables are marked with the same number at both ends.
- 3.11 Where two or more cables run between the same items they have the same number, however two digits are added to the cable numbers to distinguish between the cables, i.e. /01 for the first cable, /02 for the second cable, etc.
- 3.12 Electrical High Tension panels / cabinets must be numbered as follows:

AA **	BB **	89/	B ***
where			
	A	=	Denotes the Main Area.
	B	=	Denotes the Sub Area.
	89	=	Denotes High Tension equipment.
	B	=	Denotes a sequential number starting with 00.

The main Incomer panel must always be numbered AABB89/00.

- 3.13 Electrical Low Tension panels / cabinets must be numbered as follow:

AA **	BB **	90/	B ***
where			
	A	=	Denotes the Main Area.
	B	=	Denotes the Sub Area.
	90	=	Denotes Low Tension equipment.
	B	=	Denotes a sequential number starting with 00.

The main Incomer panel must always be numbered AABB90/00.

- 3.14 Compartments of electrical panels must be numbered in a matrix fashion where the vertical tiers (columns) are numbered alphabetically from left to

right and the horizontal tiers (columns) numerically from top to bottom.

- 3.15 Cable and wire ways must not be numbered, however terminals within these spaces must be associated with the compartment to which it belongs.
- 3.16 The back row of multiple rows of terminals to be marked from left to right followed by the front row from left to right etc.
- 3.17 All Pratley- or similar type of boxes used to interconnect wiring must be equipped with terminals. All wiring through the box must be connected and the box, terminals and wiring clearly marked.

- 3.18 Wires must be marked with the same number as the terminal that it is connected to.
- 3.19 The equipment number must precede the terminal number on all wiring.
- 3.20 The equipment number and the terminal number must always be separated with a / .
- 4. BUSBARS:**
- 4.1 All bus bars must be air insulated, electrolytic tough pitched copper, in accordance with SABS 1195.
- 4.2 The main bus bars must be continuously rated for the same current capacity as the incoming breaker. The cross sectional area of the bus bars must not be reduced by unnecessary holes. Tapering of bus bars will not be permitted.
- 4.3 The main bus bars must always be rated at a sufficient fault level rating in accordance with the supply.
- 4.4 Unless otherwise approved, the bus bars must be of the vertical type and clamped in such a manner as to withstand short circuit conditions without any damage to the bracings or distortion of bus bars or the frame of the assembly.
- 4.5 Rating of bus bars must be in accordance with SABS 1195 provided that the maximum designed current density must not exceed $1.5A / mm^2$. Bus bar sizing must take into account the expected temperature rise under normal full load and short circuit conditions.
- 4.6 The maximum temperature rise must not exceed $40^{\circ} C$.
- 4.7 For bus bars in parallel, the appropriate derating factor must also be taken in account.
- 4.8 The thickness of individual bus bars must not exceed 10 mm. Increase of bus bar rating must be achieved by sandwiching of separate bus bars. The spacing is achieved by copper spacers having the same thickness and width as the bus bars and spaced not more than 500 mm. apart.
- 4.9 Ends of bus bar runs must not be made closer than 25 mm. from earthed metal. Each bus bar end must be fitted with an insulated end cap.
- 4.10 Creepage distance must be 15 mm. for rated voltages up to and including 400V and 25 mm. for rated voltages above 400V when measured between:
- a) Phase conductors:
 - b) A Phase conductor and earth.
- 4.11 All bus bar ends must be suitably manufactured for possible extension to additional assemblies and must be predrilled or punched at both ends.
- 4.12 All joints and tees in bus bars and bus bar connections must be silver plated and be made with at least 4 cadmium plated high tensile steel class 8.8 bolts and nuts in accordance with SABS 136.

- 4.13 When bars are punched or drilled no deformation of the surface must be allowed. The size of bolts and nuts and the torque required on these must be in accordance with the following table:

Less than 1500 Amp - M10 bolt @ 40 Nm.

Between 1500 and 2500 Amp - M12 bolt @ 70 Nm.

Between 2500 and 5000 Amp - M16 bolt @ 150 Nm.

- 4.14 Bus bar droppers must be constructed from copper bar to the same standard as the main bus bars with a sufficient current rating.

5. EARTH BARS:

- 5.1 Earth bars must be constructed from copper and must have a cross section of not less than 120 mm².
- 5.2 The thickness of the bar must be maximum 10 mm. but not less than 6.3 mm. Sandwiching of earth bars will not be permitted.
- 5.3 The bar must be suitably drilled or punched to accommodate the earth conductors of each motor cable, as well as the connections to the substation earth ring at both ends of the assembly.
- 5.4 The bar must run at the front bottom throughout the full length of the panel.

6. WIRING:

- 6.1 All cables for high voltage applications must be SWA / PEX cable of suitable rating for the particular application.
- 6.2 All cables for low voltage applications must be SWA / PVC with a minimum voltage rating of 1000 V and the cores must be Red, Yellow, Blue and Black.
- 6.3 All non-insulated terminals on cables must only be applied with a hexagon bit crimper.
- 6.4 All wiring up to and including 6 mm² must be terminated with pre-insulated terminals.
- 6.5 Electrical distribution in all cabinets must be done with the respective phase colours and wiring must be sized according to the load.
- 6.6 Three phase supply wiring must follow the phase colours of red, yellow, blue, neutral and earth.
- 6.7 All feeders to equipment must be protected by suitable earth leakage units as

follow:

30 mA- All small power (240 Volt), lighting-, domestic- and instrument circuits.

300 mA - All motor and industrial equipment circuits.

- 6.8 All feeder cables must always be terminated direct onto contactors and breakers unless sizing and insufficient space necessitates the use of external terminals
- 6.9 Multi core cables must be terminated on a contiguous block of terminals, no open terminals must be allowed between individual cores.
- 6.10 Terminals with screw connections where the screw is in direct contact with the conductor is not acceptable; some form of protection must be afforded the conductor.

7. **EARTHING:**

- 7.1 Earthing and Earth Leakage Protection must be done according to NRS 016:1995 and NRS 042:1996
- 7.2 In DB's and MCC cabinets all electrical equipment must be earthed to the earth bar with minimum 2,5mm² Green / Yellow flexible multistrand panel wire.
- 7.3 All screen- and earth bars in Electrical cabinets must be connected to an appropriate earth mat with minimum 16mm² Green / Yellow wire in such a way as to avoid any closed earth loops.
- 7.4 All panels, cabinets and junction boxes must be cross-bonded with a 70 mm² bare stranded copper conductor.

2 8. **EQUIPMENT LABEL DEFINITIONS.**

<u>CODE.</u>	<u>DESCRIPTION.</u>
Axx	Small Fans and Air conditioners.
Bxx	Buzzers.
Cxx	Capasitors.
CTxx	Current Transformers.
Dxx	Diode Boards.
EBxx	Earth Bar.
Fxx	Fuses, Newelecs and Overloads.
Gxx	Gauges (Volt, Amp, Hour & Cos ϕ).
Hxx	Panel Lights.
Kxx	Contactors.

LCDxx	Analogue Indicators.
LTxx	Level Transmitter.
NLxx	Neutral Links.
NBxx	Neutral Bars.
Pxx	Plugs 15 amp.
PSxx	Power Supplies.
Qxx	Circuit Breakers.
Sxx	Switches and Push Buttons.
SBx	Screen bar.
Txx	Time Switches.
TRFxx	Transformers.
Wxx	Welding Plugs.
Xxx	Relays , Transducers and special equipment.

NB. xx start from 01 and increase according to amount of equipment.

3 9. EQUIPMENT SPECIFICATIONS.

9.1 Lightning Protection:

Power - Surgetech DehnGuard no.900 600

9.2 Enclosures:

Interconnection - CCG no. 1 Grey or Orange.

9.3 Terminals:

Standard sizes in use are as follow:
Phoenix Contact type
UK2.5N,
UK16N and
MBK 3/E-Z for CCG boxes.

9.4 Conduit:

Electrical - Only galvanized conduit and metal glands to be used for wiring.

Instrumentation - Kopex Liqueatite LT black 20mm
Kopex KF-F glands 20mm
(Smith Manufacture)

9.5

Area Lighting:

Fluorescent	-	Corolight C2-258SS (Herholdt's Lighting Bftn.)
Flood	-	LIGHTLINE L14ST-400 HPST / HAM (Herholdt's Lighting Bftn.)
Bulkhead	-	BRITELITE –B20-2D 16W (Herholdt's Lighting Bftn.)

9.6

Power Metering:

Enermax	-	E3M5 – 45451 – 4 (Strike Technologies)



INSTRUMENTATION SPECIFICATIONS

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1. GENERAL.

1.1 Abbreviations and definitions.

PLC	-	Programmable Logic Controller.
MCC	-	Motor Control Centre.
Marshalling	-	Main Instrument distribution cabinet.
JB	-	Instrumentation junction box.
DB	-	Electrical distribution box.

- 1.2 Wiring of premises and installations to be done strictly in accordance with SABS 0142.

2. PANELS and BOXES.

- 2.1 All Junction boxes and Marshalling Cubicles for outdoor use are made of 2 mm 3CR12 sheet metal and are epoxy coated in a Tedalex Stone colour. (SABS C37)
- 2.2 All Junction boxes and Marshalling Cubicles for indoor use are made of 2 mm mild steel and are epoxy coated in a Tedalex Stone colour. (SABS C37)
- 2.3 All Pratley- or similar type of boxes used to interconnect wiring must be equipped with specific terminals and marked accordingly.

3. MOUNTING.

- 3.1 All pressure gauges and transmitters to be mounted on a 50 mm diameter x 1500 mm high standpipe as close as possible to the measuring point.
- 3.2 All Actuators, standpipes and supports are painted according to Sedibeng Standard.
- 3.3 Level transmitter transducers to be mounted on reservoirs in a flanged standpipe 110 mm diameter and not longer than 300 mm. Standpipe must be mounted at least 15 % of reservoir depth away from sidewall and/or any obstacles.

4. NUMBERING.

- 4.1 Manufacturer's labels or logos are not allowed on panels or boxes.
- 4.2 All equipment to be clearly marked with a unique number according to the Standard specifications.
- 4.3 All panels to be clearly marked according to Sedibeng Water's list of codes.
- 4.4 Marking to be such that it is always read from left to right or from the bottom upwards if possible.
- 4.5 The following colour coding must be used:

Panel Labels	White lettering (12mm) on black background (18mm).
Equipment Labels	White lettering (5mm) on black background (9mm).
Wire Numbers	Black lettering on yellow background.
Cable Numbers	Black lettering on yellow background.
Pump Numbers	Cream lettering (250mm) on brown background (300mm high x 300mm wide).

- 4.6 All terminals to be marked in numerical sequence. No other markings are allowed except for the MCC panels where the control supply from the bus-bars are marked L and N.
- 4.7 The main area codes are not used so as to keep the numbers as short as possible.
- 4.8 Compartments of instrumentation panels must be numbered in a matrix fashion where the horizontal tiers (columns) are numbered alphabetically from left to right and the vertical tiers (columns) numerically from top to bottom. No physical numbers to be installed on panels itself.
- 4.9 Panels and equipment positions to be clearly and distinctly marked such that in the case of equipment replacement the number is not removed.
- 4.10 Cable and wire ways must not be numbered, however terminals within these spaces must be associated with the compartment to which it belongs.
- 4.11 The numbers describe the route of the cable or wires between two items.
- 4.12 All wiring must be marked according to the equipment they are connected to. This includes all screen wires.
- 4.13 The equipment number must precede the terminal number, for example in cubicle "C" terminal "12" the wire must be marked C/12.
- 4.14 Cables are marked with the same number at both ends.
- 4.15 Where two or more cables run between the same items they have the same number, however two digits are added to the cable numbers to distinguish between the cables, i.e. /01 for the first cable, /02 for the second cable, etc.
- 4.16 The wires of above-mentioned cables might be terminated on the same terminals or different terminals but they are marked according to the terminals that they are connected to.
- 4.17 Multiple layer terminals to be marked from the back row left to right followed by the front row from left to right etc.
- 4.18 Multiple layer terminals used for analogues to be marked from the front row left to the second row left incrementing to the right. This means that the front row will consist of all unequal numbers and the second row will consist of all the equal numbers.

4.19 Marhalling / Instrumentation cabinets must be numbered as follow:

AA BB 91/ B
**** ** *****

where

A	=	Denotes the Main Area.
B	=	Denotes the Sub Area.
91	=	Denotes instrumentation equipment.
B	=	Denotes a sequential number starting with 00.

The main marhalling panel must always be numbered AAB91/00.

5. INSTRUMENT LABEL DEFINITIONS.

CODE. DESCRIPTION.

Axx	Small Fans and Air conditioners.
Bxx	Buzzers.
Cxx	Capasitors.
CTxx	Current Transformers.
Dxx	Diode Boards.
EBxx	Earth Bar.
Fxx	Fuses, Newelecs and Overloads.
Gxx	Gauges (Volt, Amp, Hour & Cos □).
Hxx	Panel Lights.
Kxx	Contactors.
LBxx	Loop Controllers.
LCDxx	Analogue Indicators.
LTxx	Level Transmitter.
NLxx	Neutral Links.
NBxx	Neutral Bars.
Pxx	Plugs 15 amps.
PSxx	Power Supplies.
Qxx	Circuit Breakers.

Sxx	Switches, Push Buttons and Moscad PLC slots.
SBx	Screen bar.
Txx	Time Switches.
TRFxx	Transformers.
Wxx	Welding Plugs.
Xxx	Relays , Transducers and special equipment.

NB. xx start from 01 and increase according to amount of equipment.

6. WIRING.

6.1 All Instrument cables must be minimum 1mm diameter, non - armoured and wires of individual pairs to be colour coded black and white. Individual pairs to be numbered in such a way that the different cores are uniquely identified.

6.2 All single- and multipair cables must have individually screened twisted pairs with overall Mylar screen and drain wire.

Cables in use are:

16 Pairs
8 Pairs
4 Pairs

2 Pairs
1 Pair

6.3 All wiring up to and including 6 mm. square must be terminated with pre-insulated lugs and crimped with a hexagon bit crimper.

6.4 Multi pair cables must be terminated on a contiguous block of terminals, no open terminals must be allowed between individual pairs.

6.5 Terminals with screw connections where the screw is in direct contact with the conductor is not acceptable; some form of protection must be afforded the conductor.

6.6 The first 16 pair cable in a JB normally carries analogues. The second 16 pair carries discrete signals. When there is less than 16 analogues however the pairs from the last analogue up to pair no.16 on the first cable will have no inputs. The discrete inputs will start at pair no.1 of the second cable and will also have a few open pairs if the discrettes are less than 16. Where JB's are used for other purposes this might not be possible and can be altered.

6.7 Marshalling cabinets must be wired internally with 1mm. Grey flexible multistrand panel wire only.

6.8 Junction boxes must be wired internally with 1mm. White, 1mm Black

and 1mm Green / Yellow flexible multistrand panel wire only.

- 6.9 Electrical distribution in all cabinets must be done with the respective phase colours and wiring must be sized according to the load.
- 6.10 Connection of all electrical wiring must always be in the sequence Red, Yellow, Blue, Neutral and Earth or for instruments White, Black and Screen.
- 6.11 Screen wires are not to be connected in any instrument and the unconnected end must be insulated with any appropriate type of sleeving. The screens must however be continuous from instrument to marshalling cabinet.
- 6.12 All wiring through Pratley- or similar type of boxes must be connected to ensure continuity.
- 6.13 All feeders to equipment must be protected by suitable earth leakage units asfollow:
- | | | |
|--------|---|--|
| 30 mA | - | All small power (240 Volt), lighting-, domestic- and instrument circuits. |
| 300 mA | - | All motor and industrial equipment circuits. |
- 6.14 Conduit for wiring:
Electrical - Only galvanized conduit and metal glands.

Instrumentation - Kopex Liguatite LT black 20mm
Kopex KF-F glands 20mm
(Smith Manufacture)

7. EARTHING.

- 7.1 Earthing and Earth Leakage Protection must be done according to NRS 016:1995 and NRS 042:1996
- 7.2 In JB's and Marshalling cabinets all electrical equipment must be earthed to the earth bar with minimum 2,5mm. Green / Yellow flexible multistrand panel wire.
- 7.3 Screen wires in JB's must be through connected with 1mm. Green / Yellow flexible multistrand panel wire. In the Marshalling cabinets all screen wires must be connected to the screen bar with 1mm. Green / Yellow flexible multi-strand panel wire.
- 7.4 All screen- and earth bars in Marshalling cabinets must be connected to an appropriate earth mat with minimum 16mm. Green / Yellow wire in such a way as to avoid any closed earth loops.
- 7.5 All panels, cabinets and junction boxes, whether inside or outside, must be cross bonded with a 70 mm. square bare stranded copper conductor.

8. INSTRUMENTS SPECIFICATIONS.

8.1

External

8.2

Rotork electric actuators (Control voltage to be clarified)
Auma electric actuators
Fisher pneumatic actuators
Burkert electric actuators (Control voltage to be clarified)

8.3

Suction

Delivery

- 0 - 600 kPa
- 0 - 1600 kPa
- 0 - 2500 kPa
- 0 - 4000 kPa

8.4

Suction

Please confirm equipment if total static head on suction side is above 100 kPa.

Delivery

- Siemens Sitrans P 7MF4010-1DA10-1AB1-ZA02-ZB11
ZY20: 0 to 1600kPa
for ranges 600 - 1600 kPa.

- Siemens Sitrans P 7MF4010-1EA10-1AB1-ZA02-ZB11
ZY20: 0 to 4000kPa
for ranges above 1600 kPa.

8.5

Ball valves

Pipe work	-	12mm. Stainless steel
Snubbers	-	Vari-damp no. 150 SH 00 Snubbers are normally fit to delivery pressure side only. If the suction head exceeds 100 kPa then snubbers must be fitted on suction side also.
Sockets	-	2 x 1/2 " Stainless steel sockets to be welded on top of pipe on each side of pump. Position between pump and shut-off valve as close as possible to pump.

8.6 Temperature Switches.

Pump casing	-	Fenwall switch 17100-OMTG Style 3 mounted in Sarel enclosure into a Drywell.

8.7 Temperature Transmitters.

Motor windings	-	Thermistor for Multilin only in HT motors.
Bearings	-	Pyrotemp 2 wire Pt100 with head mount transmitter. Standard OD 6mm. x length as per application. (Pyrotemp RTX 0 - 150°C transmitter) Installation must be from outside.

8.8 Level Transmitters.

Ultrasonic	-	Milltronics Hydorranger with Echomax XPS-10 transducer and loop isolator LIS 1 for liquids.
Capacitance	-	E / H FTW 420 with probe holder 11463 for sumps levels. E / H Nivocompact FTC 230 for solids.
Pressure	-	E / H Borehole transmitter. Wika Borehole transmitter.

8.9 Flow Indicators.

Meinecke WPD meters
Honeywell – airflow switch

8.10 PLC Equipment.

Modicon
Motorola

8.11 SCADA Software.

Citect

8.12 Radio Equipment.

Motorola

8.13 **Controllers.**

Foxboro
Eurotherm

8.14 **Lightning Protection.**

- Power - Surgetech DehnGuard no.900 600
- 4-20 ma - Surgetech Blitzductor CT no.919 506
+ Insert 919 623
- Coax - Surgetech UGK / B no.929 010
- Antenna - Webb Polyphaser no. IS-50NX-C1

8.15 **Enclosures.**

- Sump level - Sarel no. 03763 + base plate 09172
- Interconnection - CCG no. 1 Grey or Orange.
- Fenwall - Sarel no. 02560

8.16 **Terminals.**

Standard sizes in use are as follow:
Phoenix Contact type
UK2.5N,
UK16N and
MBK 3/E-Z for CCG boxes.

8.17 **Lighting.**

- Fluorescent in- and outside - Corolight C2-258SS
(Herholdt's Lighting Bftn.)
- Floodlights in pump stations - LIGHTLINE L14ST-400 HPST / HAM
(Herholdt's Lighting Bftn.)
- Bulkhead in- and outside - BRITELITE –B20-2D 16W
(Herholdt's Lighting Bftn.)

8.18 **Power Supplies.**

- Instrumentation 24v - CM 62-PS-230-AC / 24 DC / 1
(Phoenix Contact)
- Radio 12v - Blue Ginger MB32ABS12V7A

(Blue Ginger)

8.19 **Motor Managers.**

Multilin MMII – PD – 1 – 2 – 240 Mod 601
with RS232/485 converter.

9. **SCADA LABEL DEFINITIONS.**

9.1 **Input labels.**

<u>Code.</u>	<u>Description.</u>
A	Suction Pressure Switch.
B	Suction Pressure Analogue.
C	Oil Pressure Switch.
D	Delivery Pressure Analogue.
E	Delivery Pressure Switch.
F	Non Drive End Pump Bearing Temperature Analogue.
G	Drive End Pump Bearing Temperature Analogue.
H	Drive End Motor Bearing Temperature Analogue.
I	Cooling or Flush Water Flow Switch.
J	Non Drive End Motor Bearing Temperature Analogue.
K	Fenwall Temperature Switch.
L	Motor Winding 1 Analogue.
M	Motor Winding 2 Analogue.
N	Motor Winding 3 Analogue.
O	Non Drive End Bearing Oil Flow Switch.
P	Motor Winding Thermistor Switch.
Q	Drive End Bearing Oil Flow Switch.
R	Regulator Winding Thermistor Switch.
S	Wear ring Limit Switch.
T	Delivery Valve Open Indication.
U	Delivery Valve Close Indication.

V	Suction Valve Open Indication.
W	Suction Valve Close Indication.
X	Motor speed Analogue.
Y	Motor speed Pulses.
Z	Power Factor.

<u>Code.</u>	<u>Description.</u>
AA	Running / Stopped Indication.
AB	CFS Open / Close Indication.
AC	Tripped / Ready Indication.
AD	Manual / Auto Indication.
AE	Emergency Stopped Indication.
AF	Exciter Panel Tripped / Ready Indication.
AG	Cascade Panel Tripped / Ready Indication.
AH	Water Flow Switch.
AI	Drive Alarm Indication.
AJ	Drive Fault Indication.
AK	Reset key switch.
AL	Chlorinator Empty Switch.
AM	Battery Voltage Indication.
AN	Extra Valve Open Indication.
AO	Extra Valve Close Indication.
AP	Needle Valve Close Indication.
AQ	Sump level low low Indication.
AR	Increment Speed Push Button.
AS	Decrement Speed Push Button.
AT	Local / Remote Indication.
AU	Sump Level High Indication.
AV	Sump Level High High Indication.

AW	Air Flow Indication.
AX	Security Alarm Indication.
AY	Chlorine Alarm Indication.
AZ	Power Fail Indication.

<u>Code.</u>	<u>Description.</u>
BA	Level Analogue.
BB	Flow Analogue.
BC	Dosing Analogue.
BD	Charger Fail Indication.
BE	Panic Situation Alarm.
BF	Motor Current Analogue.
BG	Security Lights.
BH	Regulator Winding 1 Analogue.
BI	Regulator Winding 2 Analogue.
BJ	Regulator Winding 3 Analogue.
BK	Pump Master Selection.
BL	Pump Follower Selection.
BM	Pump Standby Selection.
BO	Multilin Fail Indication.
BP	Run Time.
BQ	Switching Cycles.
BR	Block Interval.
BS	Gas Pressure Normal.
BU	Predicted Demand.
BV	KWH Total.
BW	KVARH.
BX	WATTS.

BY KVAR.
BZ KVA.

9.2 **Outputs Labels.**

<u>Code.</u>	<u>Description.</u>
CA	Open Suction Valve Command.
CB	Close Suction Valve Command.
CC	Open Delivery Valve Command.
CD	Close Delivery Valve Command.
CE	Start Motor Command.
CF	Emergency Stop Command.
CG	Increment Speed Control.
CH	Decrement Speed Control.
CI	Open Chlorine Bottle Actuator.
CJ	Target Demand Set.
CK	Spare.
CL	Extra Valve Open Control.
CM	Extra Valve Close Control.
CN	Motor Speed Analogue Output.
CO	Station Enable / Disable.
CP	Chlorine Dosing Set point.
CQ	Spare.
CR	Pump Duty Control.
CS	Stop Motor Command.
CU	Close Chlorine Bottle Actuator.
CV	Interrogation Command.

Alarm and Trip Definitions.

Pressure Switch - Alarm or Trip.

PS* * - (L -low, H - high, A - both).

Pressure Gauge - Alarm or Trip.

PIS* * - (L -low, H - high, A - both).

Pressure Transmitter - Alarm or Trip.

PT* * - (L - low, H - high, A - both).

Temperature Switch - Alarm or Trip.

TS* * - (L - low, H - high, A - both).

Temperature Gauge - Alarm or Trip.

TIS* * - (L -low, H - high, A - both).

Temperature Transmitter- Alarm or Trip.

TT* * - (L - low, H - high, A - both).

Level Switch - Alarm or Trip.

LS* * - (L - low, H - high, A - both).

Level Transmitter - Alarm or Trip.

LIT* * - (L - low, H - high, A - both).

Flow Switch - Alarm and Trip.

FS* * - (L - low, H - high, A - both).

Flow Transmitter - Alarm and Trip.

FIT* * - (L - low, H - high, A - both).

10. INSTRUMENT LABEL EXAMPLE DRAWINGS.

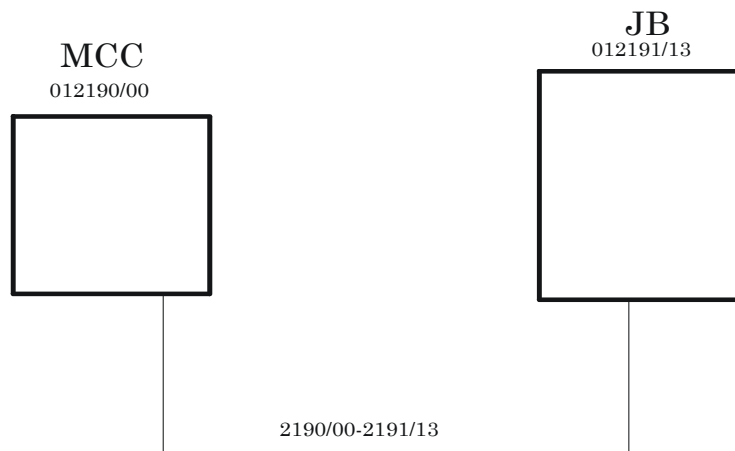


FIG. 1

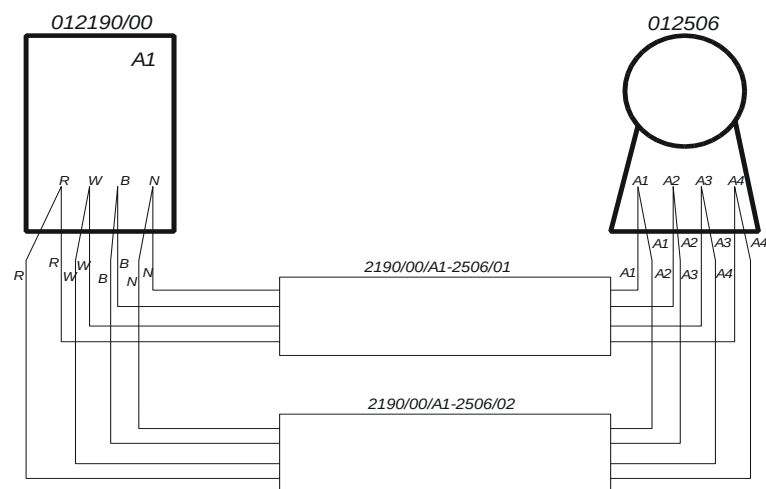


FIG. 2

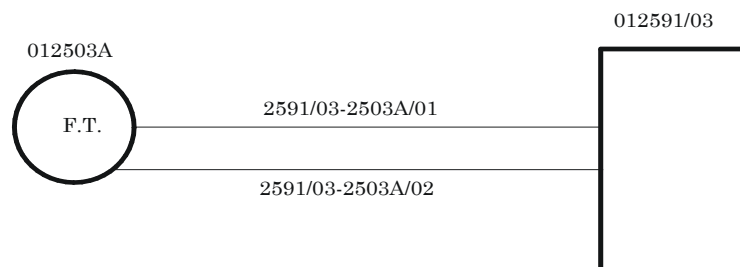


FIG. 3

PRATLEY BOX
011391/26

JUNCTION BOX 011391/02

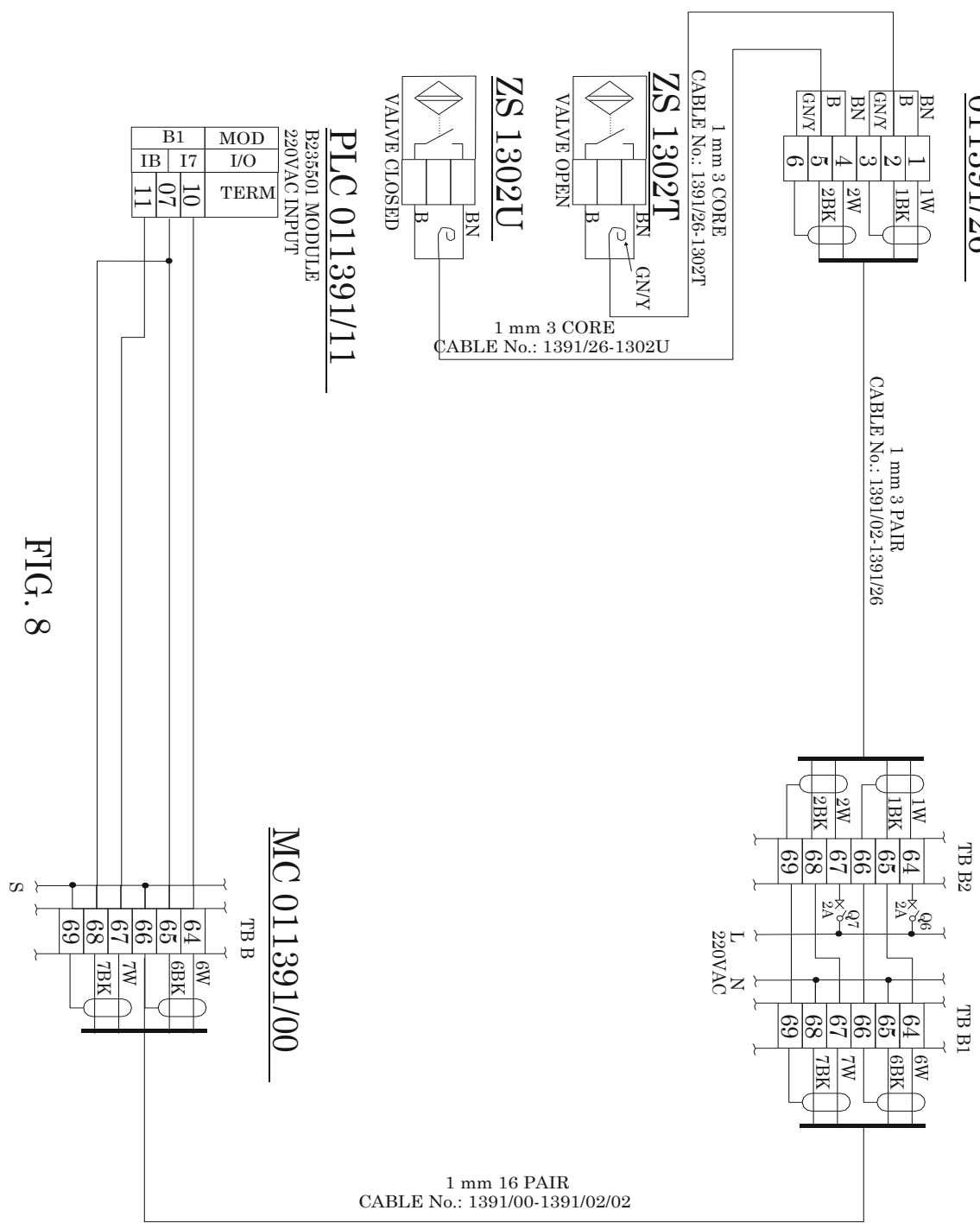
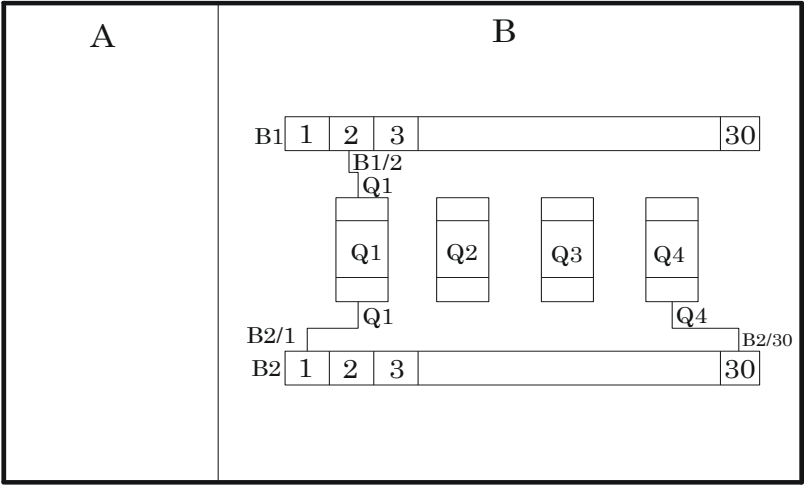


FIG. 8

JB 012591/01





VALVE SPECIFICATIONS

Rev. 0 M.J.JACOBS 23 July 2001

BUTTERFLY VALVES: (Must be used inside pump stations)

1. For waterworks purposes to S.A.B.S. 664.
2. Flanged type RAGMAX valves only unless otherwise approved by Sedibeng.
3. Metal-to-Metal seated – triple offset unless otherwise approved by Sedibeng.
4. Clockwise closing only.
5. Position of gearbox (L.H. or R.H.) to be specified. Drawing number G.W.V 1 hereby attached.
6. Gearbox must be fitted with a striker plate to accommodate sensors for open and close positions.
7. Valve must seal bi-directional.
8. Flange jointing material (bolts, nuts washers and gaskets). Not included.
9. Delivery period to be quoted and supplier must undertake to adhere to the quoted delivery date.
10. Sedibeng Water to be informed one week prior to pressure test date, so that a representative can attend testing.
11. Valves to be colour coded to Sedibeng Standard when used inside pump stations.

Material if applicable

Body & Disc : S.G. Iron.
Bushes : Glacier D.U.
Shaft : E N 57.
Seal : Stainless steel 316 L.
Clamp Ring : Stainless steel 304.

Castings

No welding repair of blowholes allowed.
Depth of blowhole must not be more than 10 % of wall thickness at specific point.
Diameter of blowhole must not be more than 20 % of wall thickness at specific point.

Corrosion Protection

Internal : Coupon K.S.I.R 88.
External : To be specified by Sedibeng Water

R.S.V. VALVES: (Preferred on pipe lines)

1. For waterworks purposes to S.A.B.S. 664.
2. Flanged type AVK valves only unless otherwise approved by Sedibeng.
3. Non-rising spindle.
4. Clockwise closing only.
5. Fully encapsulated gate in E.P.D.M. Rubber.
6. Valve to seal on both sides (bi-directional).
7. Flange jointing material (bolts, nuts, washers and gaskets), not included.
8. Delivery period to be quoted and supplier must undertake to adhere to the

- quoted delivery date.
9. Sedibeng Water to be informed one week prior to pressure test, so that representative can attend testing.
 10. Valves to be colour coded to Sedibeng Standard when used inside pump stations.

Material

Body - S.G. Iron
Spindle - Stainless steel 316L

Castings

No welding repair of blowholes allowed.
Depth of blowhole must not be more than 10 % of wall thickness at specific point.
Diameter of blowhole must not be more than 20 % of wall thickness at specific point.

Corrosion Protection

Internal and External : Fusion bonded epoxy powder coating to a dry film thickness of 250 µm.

AIR VALVES:

1. Ari D060 HFNS Non-slam Air Release and Vacuum Brake Valve complete with Rolling Seal, Small Orifice Mechanism and 1/4" Bleed Port on Main Valve Body.
2. Valves to be colour coded to Sedibeng Standard when used inside pump stations.

OR

1. Vent O Mat series R.B.X. Anti-Shock Air Release and Vacuum break valve, fitted with 1/4" bleed port on Main Valve Body.
2. Valves to be colour coded to Sedibeng Standard when used inside pump stations.

Corrosion Protection

Fusion bonded epoxy powder coating to a dry film thickness of 250 µm.

REFLUX VALVES:

1. Flanged type RAGMAX DUAL CHECK valves only unless otherwise approved by Sedibeng.
2. Valve must be slanted seat tilting disc.
3. Counterweight for valves bigger than 300 mm.
4. Position of Counterweight (L.H and R.H.) will be specified by Sedibeng Water.
5. Face to face dimensions must be specified in quotation.

6. Flange jointing material (bolts, nuts washers and gaskets), not included.
7. Delivery period to be quoted and supplier must undertake to adhere to the quoted delivery date.
8. Sedibeng Water to be informed one week prior to pressure test date, so that a representative can attend testing.
9. Valves to be colour coded to Sedibeng Standard when used inside pump stations.

Castings

No welding repair of blowholes allowed.

Depth of blowhole must not be more than 10 % of wall thickness at specific point.

Diameter of blowhole must not be more than 20 % of wall thickness at specific point.

Corrosion Protection

Internal : Coupon K.S.I.R. 88

External : To be specified by Sedibeng Water.



APPROVED COLOUR CODING

Colour coding to be applied to all Equipment, Structures and Buildings.

Office walls		
Inside	Plascon	Broken White – G376
Outside	Plascon	Kalahari - BBO805
“Plant” walls		
Inside	Plascon	White – EPL30
Outside	Plascon	Kalahari - BBO805
“Plant” Floors		
Workspace	Neutron	Yellow Epoxy floor coat
Walk ways	Plascon	Grey - DWY5
Storage area	Plascon	Calypso Stripe - G127
Refuge bin area	Plascon	Light Blue Stripe - G16
Door frames	Plascon	PWD Brown – G18
Window frames	Plascon	Broken White – G376
Ceilings	Plascon	White – MDH1
Handrails		
Horizontal	Plascon	Broken White – G376
Vertical	Plascon	PWD Brown – G18
Galvanized or S/Steel	Do not paint.	
Water pipes	Plascon	Calypso Orange – G127
Air pipes	Plascon	White – MDH1
Lime pipes	Plascon	Tapioca - G377
Ferri pipes	Plascon	Medium Yellow - G6
Chlorine pipes	Plascon	Sunshine Yellow – SGE10
Poli pipes	Plascon	Mushroom - G375
Oil pipes	Plascon	Windsor Green – G33
Sewerage pipes	Plascon	Black – SGE2
Valves (In Plants)	Plascon	PWD Brown – G18
Bermad Valves	Leave in Factory colour.	
Actuators	Plascon	PWD Brown – G18

Motors	Plascon	Broken White – G376
Pumps	Plascon	Broken White – G376
Pumps (Dosing Units)	Leave in Factory colour.	
Pump base	Plascon	PWD Brown - G18
Concrete Supports	Plascon	PWD Brown - G18
Steel columns	Plascon	PWD Brown - G18
Support pipes	Plascon	PWD Dark Brown – G18
Crane hooks	Plascon	Medium Yellow – G6 Black – SGE2
Crane beams	Plascon	Tapioca – G377
Electrical panels HT	Powder Lak	Olive Green Texture 36-0551
Electrical panels LT	Powder Lak	B26 Orange Texture 62-0122
Instrument panels	Powder Lak	Tedelex Stone Texture 61-1146

DR RUTH S MOMPATI DISTRICT MUNICIPALITY

**UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS;
ELECTRICAL WORKS**

BDM 2007-027C2

C4 Site Information

C4.1 ENVIRONMENTAL MANAGEMENT PLAN

C4.2 TENDER DRAWINGS

C 4 SITE INFORMATION

C4.1: Environmental Management Specification and Plan

C4.1.1 General

In order to ensure that the construction works is carried out in an environmentally sensitive matter, strict compliance to the Environmental Management Plan and specifications is required. The purpose of the EMS&P is to:

- Encourage good management practices through planning and commitment to environmental issues,
- Provide rational and practical environmental guidelines to:
 - Minimise disturbance of the natural environment,
 - Prevent pollution of land, air and water,
 - Prevent soil erosion and facilitate re-vegetation.
- Adopt the best practicable means available to prevent or minimise adverse environmental impact,
- Develop waste management practices based on prevention, minimisation, recycling, treatment or disposal of wastes,
- Train employees and contractors with regard to environmental obligations.

C4.1.2 Training and Induction of Employees

The Contractor has a responsibility to ensure that all those people involved in the project are aware of and familiar with the environmental requirements for the project (this includes sub-contractors, casual labour, etc.). The CMP shall be part of the terms of reference for all contractors, sub-contractors and suppliers.

C4.1.3 Complaints Register and Environmental Incident Book

Any complaints received by the project team from the public will be recorded. The complaint should be brought to the attention of the site manager, who will respond.

The following information must be recorded:

- Time, date and nature of the complaint,
- Type of communication (telephone, letter etc),
- Name, contact address and telephone number of the complainant,
- Response and investigation undertaken and
- Actions taken and by whom.

All complaints received will be investigated and a response given to the complainant within 28 days.

All environmental incidents occurring on the site will be recorded. The following information will be provided:

- Time, date, location and nature of the incident,
- Actions taken and by whom.

C4.1.4 Site Cleanliness and Neatness

- Location of a construction camp is to be approved by the Engineer and is to be restored to its previous condition after completion of construction.
- The construction camp may not be site in close proximity to steep areas or within 32m from the edge of any watercourse.
- The construction camp should preferably be fenced with a 1.8m bonnox fence or similar approved.
- All materials, equipment, plant and vehicles must be stored within the construction camp.

- A dedicated area must be made available for construction staff to change and store their personal belongings.
- Ablution facilities must be provided on site at a ratio of 1:10 for construction staff, but may not be located within 32m from any watercourse or wetland, and may not cause pollution. Chemical toilets must be maintained and cleaned regularly and effluent must be disposed of off-site into an approved municipal sewerage system.
- Painting or permanent marking of natural features is prohibited.

C4.1.5 Access

- Access to existing roads, schools, buildings, shops and residential properties must not be impeded during construction.
- Access roads utilised by the Contractor must be maintained in good condition.
- Construction of roads within or through wetlands or watercourses is prohibited.

C4.1.6 Borrow Pits

- Mining authorisations (permits) for borrow pits must be obtained from the Department of Minerals and Energy (DME) in consultation with the Department of Water Affairs and Forestry (DWAF).
- Spoil dumps resulting from borrow pits must not interfere with any natural surface drainage.
- Borrow pits must be rehabilitated after use in accordance with the requirements of DME and DWAF.

C4.1.7 Dust Control / Air Quality.

- Dust suppression measures must be implemented during construction by ensuring that all surfaces prone to dust generation are kept damp (e.g. use of water tanker).
- Ensure that vehicles and equipment are in good working conditions and that emissions are not excessive.
- Special care must be taken in areas where the route passes close to schools and residential areas.
- The speed of construction vehicles must be reduced.

C4.1.8 Fauna

Contractor staff may not chase, catch or kill animals encountered during construction. Construction activities may not harm or disturb the breeding activities of any animal.

C4.1.9 Fire Prevention and Control

- Smoking is prohibited in the vicinity of flammable substances.
- The contractor must ensure that fire-fighting equipment is available on site, particularly where flammable substances are being stored or used, and that construction staff are aware of where it is kept and how it is operated.
- Fires started for comfort (warmth) are prohibited, due to the risk of veld fires and risk to adjacent property owner's lands.

C4.1.10 Grave Sites

Gravesites in close proximity to the road must not be disturbed during construction.

C4.1.11 Materials Handling and Spills Management

- Any hazardous materials to be used during construction (e.g. lime, fuel, paint, etc) are to be stored in a designated area at the campsite.
- The storage and handling of fuel, lubricants, paint, tar, bitumen binders and other chemicals must be in especially demarcated impervious and bunded areas.
- The storage containers/facilities (including any diesel/petrol tanks) must be placed on an impermeable surface and surrounded by a bund wall, in order to ensure that accidental spillage does not pollute the environment.
- Workers must at all times be made aware of the health and safety risks associated with any hazardous substances used (e.g. smoking near fuel tanks), and must be provided with appropriate protective clothing/equipment in case of spillages or accidents.
- Ensure all staff and contractors undergo relevant training in the maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants and other chemicals.
- Any spill of potentially hazardous materials must be cleaned up immediately (Potentially hazardous materials on site include paint, oil, grease, fuel, turpentine, etc).
- The area of contaminated soil or spill must be deposited into the hazardous waste container(s).
- The contractor should keep Peat Sorb or a similar absorbent on site to clean up any spills. The absorbent must be stored in a designated area and be available for inspection.
- All spills are to be recorded in the environmental incident book.

C4.1.12 Noise

- Noise generating activities must be restricted to between 07h00 and 17h00 Monday to Saturday, unless otherwise approved by the appropriate competent person in consultation with adjacent landowners/affected persons.
- All equipment, vehicles and machinery must be in good working condition and be equipped with sound mufflers if necessary.
- Construction staff must be trained and made aware of not creating unnecessary noise such as hooting and shouting.

C4.1.13 Pollution Control

- The pollution of adjacent areas due to improper storage of construction materials or any hazardous substances is prohibited.
- Soil and water pollution through usage of fuel, oil, paint, bitumen or other hazardous substances must be avoided.
- All construction vehicles are to be maintained in good working order so as to prevent soil or water pollution from oil, fuel or other leaks, and to reduce noise pollution.
- The Contractor is responsible to rectify any source of pollution from their undertakings and to take appropriate measures to prevent any pollution of surface or ground water.

C4.1.14 Rivers and Streams

- During construction there must be no obstruction of the water flow of rivers and streams.
- Excavated material must not be stockpiled on or near riverbanks, in order to prevent sedimentation occurring.
- Erosion control measures must be employed both during and after construction.
- No impediments to natural surface water flow, other than approved erosion control measures, must occur.
- The removal of vegetation or any material may not destabilize watercourse banks.
- Construction activities may not result in damming of flow upstream.

- Lowering the base level and increasing the gradient in any watercourse is prohibited.
- The construction of the pipeline across a watercourse may only take place during low flow periods.
- Waterflow may only be diverted or impeded temporally and partially during construction and natural flow must continue.
- The quality of water downstream may not deteriorate as a result of the construction of the pipeline.
- The profile of the watercourses must be returned to one similar to pre-construction.
- Beds and embankments must be protected and restored to original conditions at completion.
- Rehabilitation of in-stream vegetation must be undertaken immediately after the pipeline has been constructed.

C4.1.15 Safety

- Safety measures, such as detour signs, must be implemented during construction to ensure the safety of workers, pedestrians and drivers/passengers in vehicles in the vicinity of construction work.
- Special care must be taken in the vicinity of schools to ensure the safety of children wishing to cross the road under construction.
- The relevant signage (e.g. speed control signs) must be erected alongside the road during the operation phase in order to control traffic.
- Accommodation must be made for pedestrian pathways alongside the road during the construction and operation phases.

C4.1.16 Soil Management

- Topsoil must be stockpiled at a height not exceeding 1,5m at a pre-designated location for use during rehabilitation. Stockpiles may not have slopes steeper than 1 (V) in 2,5 (H), may not be compacted in any way or stockpiled for a period longer than 6 months.
- Clean water runoff must be diverted away from the construction site, and all necessary drainage works must be installed at the inception of the construction phase.
- Erosion should be minimised by the construction of meadow drains and the planting of indigenous vegetation on the side slopes and drains to reduce flow velocity of stormwater.
- Spoil from cuts may be used in existing erosion galleys.
- Stone pitching and gabions should be constructed at pipe outlets prone to erosion.
- Servicing and re-fuelling of vehicles must only be carried out at construction camp.

C4.1.17 Worker Conduct

- Code of Conduct for Construction Personnel:
- Do not leave the construction site untidy and strewn with rubbish which will attract animal pests.
- Do not set fires.
- Do not cause any unnecessary, disturbing noise at the construction camp/site or at any designated worker collection/drop off points.
- Do not drive a construction-related vehicle under the influence of alcohol.
- Do not exceed the national speed limits on public roads or exceed the recommended speed limits on the site.
- Do not drive a vehicle which is generating excessive noise or gaseous pollution (noisy vehicles must be reported and repaired as soon as possible).
- Do not litter along the roadsides, including both the public and private roads.
- Do not pollute any water bodies (whether flowing or not).
- No member of the construction team is allowed to enter the areas outside the construction site.

C4.1.18 Traffic Disturbances and Diversions

- Any traffic diversions must be undertaken with the approval of all relevant authorities and in accordance with all relevant legislation.
- Wherever possible, traffic diversion must only take place on existing disturbed areas and remain within the existing road reserve.
- Traffic diversion routes must be rehabilitated after use.

C4.1.19 Vegetation

- Protected species may not be removed without the necessary permit.
- Only vegetation falling directly on the route must be removed where necessary.
- Alien vegetation within the road reserve must be eradicated, and management measures must be implemented for future control of these species.
- Vegetation that has been removed from large areas (e.g. on traffic diversion routes) during construction must be replaced with indigenous vegetation after construction has been completed.
- Soils that become compacted through the construction activities must be loosened to an appropriate depth to allow seed germination.
- Top-soiling and re-vegetation must commence immediately after completion of an activity and at least 100m from the work front. All disturbed areas must be ripped and seeded with a suitable mix of indigenous, locally occurring grasses to prevent soil erosion. Hand weeding of the site must be undertaken to remove alien species on a regular basis until the grasses are well established and are able to out compete weeds.
- Only vegetation indigenous to the area may be used for rehabilitation.

C4.1.20 Waste Management

- All general, non-hazardous waste must be placed in a skip container and disposed of at a registered waste disposal site.
- The contractor is to ensure that the portable toilet facilities at the campsite are properly maintained and in working order.
- No disposal, or leakage, of sewage must occur on or near the site.
- All hazardous waste (e.g. oil, paint, empty lime bags, contaminated wash water, etc) must be stored in leakproof containers and disposed of at a registered hazardous waste disposal site.
- The contents of waste storage containers must, under no circumstances, be emptied to the surrounding area. In general, littering, discarding or burying of any materials is not allowed on site or along the route.
- Adequate waste receptacles must be available at strategic points around the construction camp and site for all domestic refuse and to minimise the occurrence of littering.
- Concrete rubble must be collected and disposed of as directed by the Engineer.
- Each working area must be cleared of litter and building waste (e.g. rubble, wood, concrete packets etc) on completion of the day's work.
- All hazardous waste must be disposed of at an official registered site, or removed by registered hazardous waste contractors.

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT PLANT (ELECTRICAL)

TENDER NO: BDM 2007-027 C2

PORTION 1: TENDER

PART T2: RETURNABLE DOCUMENTS

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT PLANT (ELECTRICAL)

TENDER NO: BDM 2007-027 C2

T2.1 LIST OF RETURNABLE DOCUMENTS

T2.1 LIST OF RETURNABLE DOCUMENTS

Returnable Schedules required for Tender Evaluation purposes:

The following schedules **must be completed** in BLACK ink in full during tendering. Incomplete forms may lead to disqualification of a tender:

Forms

Returnable Schedules as listed on page T2.2.1.

Other Documents required for Tender Evaluation purposes:

- Proof of Tender Document Purchase
- Original valid Tax Clearance Certificate. Should the Tenderer submit the TCC via eFiling, please ensure the Tax Compliance Status letter with the PIN is included. Failure to provide the PIN will result in the tender being declared non-responsive.
- Valid B-BBEE Certificate
- CIDB Registration Certificate
- Preliminary Health and Safety Plan
- Documentation supporting the preference points claimed in terms of the Municipality's Supply Chain Management Policy Manual
- Letter of Good Standing with Compensation Fund

Returnable Schedules that will be incorporated into the Contract:

As bound in this Tender Document - refer to the Tables of Contents

Other Documents (Schedules and Affidavits) that will be incorporated into the Contract:

- C1.1 Offer and Acceptance
- C1.2 Contract Data
- C2.2 Bill of Quantities and Summary

UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT PLANT (ELECTRICAL)

TENDER NO: BDM 2007-027 C2

T2.2 RETURNABLE SCHEDULES

RETURNABLE SCHEDULES

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FORM B	RECORD OF ADDENDA TO TENDER DOCUMENTS	4
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T2.2 RETURNABLE SCHEDULES

FORM A CERTIFICATE OF SITE VISIT/BRIEFING SESSION

Attach receipt as proof of Tender Document purchase

I hereby certify that I:

Representative of (Tenderer):

Of address:

.....

Visited the Site of works / attended the Compulsory Briefing Session on (date)

And have ascertained all aspects which may influence the work on the costs thereof. I have also studied the tender documents before visiting the Site of Works.

I certify that I am satisfied with the description of the Works and the explanations (if any) given to me by the Engineer. I am also familiar with the manner in which the Works is set out and specified, as well as the way the Works must be carried out under the Tender.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

SIGNATURE BY ENGINEER OR ATTENDING
MW REPRESENTATIVE

T2.2.3

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

FORM B RECORD OF ADDENDA TO TENDER DOCUMENTS

We confirm that the following communications received from the Employer before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer (attach to this page):

Item	Date	Title of Details
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM C ALTERATIONS AND ALTERNATIVE OFFERS BY TENDERER

Should the Tenderer desire to have any departures from, alternative offers or modifications to the General Conditions of Contract, Specifications, Bill of Quantities or Drawings considered, or to qualify his tender in any way, he shall set out his proposals clearly hereunder or alternatively state them in a covering letter attached to his tender and referred to hereunder.

Page	Description

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM D AUTHORITY OF SIGNATORY

Indicate the status of the tenderer by ticking the appropriate box hereunder. The tenderer must complete the certificate set out below for the relevant category. Delete whichever is inapplicable.

A. Company ☐	B. Partnership ☐	C. Joint Venture ☐	D. Sole Proprietor ☐	E. Close Corporation ☐

The following documentation must be provided in all categories:

Certified Copy of Extract from Minutes / Company Documentation

A. Certificate for Company

I, ...,
 Chairperson of the Board of Directors of,
 hereby confirm that by Resolution of the Board taken on 20.....,
 Mr/Ms,
 acting in the capacity of,
 was authorised to sign all documents in connection with this tender and any contract resulting from it on behalf of the company.

As witnesses:

1. ....	.....
WITNESS	CHAIRMAN
2. ....	.....
WITNESS	DATE

B. Certificate for Partnership

We, the undersigned, being the key partners in the business trading as
 hereby authorize
 Mr/Ms,
 acting in the capacity of,
 was authorised to sign all documents in connection with this tender and any contract resulting from it on behalf of the company.

Name	Address	Signature	Date

T2.2.6

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

NOTE: This certificate is to be completed and signed by all of the key partners upon whom rests the direction of the affairs of the Partnership as a whole.

C. Certificate for Joint Venture

We, the undersigned, are submitting this tender offer in Joint Venture and hereby authorize

Mr/Ms,

authorized signatory of the Company,

acting in the capacity of Lead Partner, to sign all documents in connection with the tender offer for Contract

.....

and any contract resulting from it on our behalf.

This authorization is evidenced by the attached power of attorney signed by legally authorized signatories of all the Partners of the Joint Venture.

Name of Firm	Address	Authorizing Signature, Name and Capacity
Lead Partner (Partner 1):		
CIDB Reg No: _____ CIDB Grading: _____		Signature: _____ Name: _____ Position: _____
Partner 2:		
CIDB Reg No: _____ CIDB Grading: _____		Signature: _____ Name: _____ Position: _____
Partner 3:		
CIDB Reg No: _____ CIDB Grading: _____		Signature: _____ Name: _____ Position: _____
Partner 4:		
CIDB Reg No: _____ CIDB Grading: _____		Signature: _____ Name: _____ Position: _____

D. Certificate for Sole Proprietor

I, ...

hereby confirm that I am the sole owner of the business trading as:

As witnesses:

1.

WITNESS

CHAIRMAN

2.

WITNESS

DATE

E. Certificate for Close Corporation

We, the undersigned, being the key members in the business trading as

hereby authorize Mr/Ms,

acting in the capacity of,

to sign all documents in connection with this tender and any contract resulting from it on our behalf.

Name	Address	Signature	Date

NOTE: This certificate is to be completed and signed by all of the key members upon whom rests the direction of the affairs of the Close Corporation as a whole.

FORM E COMPULSORY ENTERPRISE QUESTIONNAIRE

The validity of the information supplied in this document will be verified before the contract is awarded to the selected Contractor

The Contractor **must** supply the following information:

The following particulars must be furnished. In the case of a Joint Venture, **separate** enterprise questionnaires in respect of each partner

Section 1: Name of enterprise:

Section 2: VAT registration number, if any:

Section 3: CIDB registration number, if any:

Section 4: Particulars of sole proprietors and partners in partnerships

Name*	Identity number*	Personal income tax number*	% Shareholding

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

Section 5: Particulars of Companies and Close Corporations

Company registration number:

Close corporation number:

Tax reference number:

Section 6: Turnover – Approximate turnover for each of the past three years

Year 2011 R

Year 2012 R

Year 2013 R

Anticipated turnover for 2014 R

Section 7: Management and Manpower Resources

Number of Supervisors

Number of Labourers

Number of Operators

Other Personnel (Specify)

Total number permanent employees

Total number contract employees

Section 8: Record of Service of the State

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

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

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

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

* Insert separate page if necessary

Section 9 Record of spouses, children and parents in the service of the state

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

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

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

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

* Insert separate page if necessary

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

- (a) authorizes the Employer to obtain a tax clearance certificate from the South African Revenue Services that my/our tax matters are in order;
- (b) confirms that neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act of 2004;
- (c) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption;
- (d) confirms that I/we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the tenderers or those responsible for compiling the scope of work that could cause or be interpreted as a conflict of interest;
- (e) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM F VALID TAX CLEARANCE CERTIFICATE

It is a condition of Tender that:

1. The taxes of the successful tenderer must be in order, or that satisfactory arrangements have been made with the Receiver of Revenue to meet his / her tax obligations.
2. The attached form "Application for Tax Clearance Certificate (in respect of tenders)", must be completed in all respects and submitted to the Receiver of Revenue where the tenderer is registered for tax purposes. The Receiver of Revenue will then furnish the tenderer with a Tax Clearance Certificate that will be valid for a period of twelve (12) months from date of issue. This Tax Clearance Certificate must be submitted in the original together with the tender. Failure to submit the original and valid Tax Clearance Certificate may invalidate the tender.

Should the Tenderer submit the TCC via eFiling, please ensure the Tax Compliance Status letter with the PIN is included.

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

Original Valid Tax Clearance Certificate to be attached to this page

DECLARATION OF GOOD STANDING REGARDING INCOME TAX

The validity of this document will be verified with the relevant office of the South African Revenue Service before the contract is awarded to the selected Contractor

SOUTH AFRICAN REVENUE SERVICE

PARTICULARS																	
Tender No:																	
Closing Date:																	
Name of Tax Payer/Contractor:																	
Trade Name:																	
ID Number	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td> </tr> </table>																
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DECLARATION																	
It is hereby declared that the Income Tax and VAT obligations of the abovementioned, which includes the rendition of returns and payment of the relevant taxes: - have been satisfied in terms of the relevant Acts; or - that suitable arrangements have been made with the South African Revenue Services in this regard																	
Signature Capacity	SARS Date Stamp																

FORM G VALID B-BBEE CERTIFICATION REGISTRATION

Tenderers Company Name (1)	
B-BBEE Level	
Accredited Verification Agency	
Expiry Date	
Work distribution based on value of work (%)	

Tenderers Company Name (2)	
B-BBEE Level	
Accredited Verification Agency	
Expiry Date	
Work distribution based on value of work (%)	

Copy of Valid B-BBEE Certification of each Partner to be attached to this page

FORM H REGISTRATION OF WORKMAN'S COMPENSATION

Tenderers Company Name	
WCC Registration Number	
Expiry Date	

Copy of Letter of Good Standing of each Partner to be attached to this page

FORM I CIDB REGISTRATION

Tenderer's Company Name	
CIDB Registration Number	
Contractor Grading	

Copy of CIDB Registration to be attached to this page

FORM J COMPULSORY BANKING DETAILS

THE FOLLOWING FORM MUST BE COMPLETED BY THE TENDERER'S BANK AND AN ORIGINAL BANK STAMP MUST BE AFFIXED TO THIS PAGE. NON-COMPLIANCE WILL DISQUALIFY THE TENDER

Confidential

(Note: Each member of a Joint Venture (JV) must complete a Bank Detail form)

TENDER NO. _____

PROJECT _____

BANK DETAILS

I/we hereby request and authorize my/our Banker as detailed below to verify and supply a Bank Code for my/our account. A Bank Rating certificate is required to evaluate the Tenderer's financial stability.

I/we also hereby acknowledge that the bank details, as given, can be verified independently by the Employer's appointed Consultant on the Project.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

Account Holder _____

Bank _____

Branch _____

Branch Code _____

Account Number _____

Type of Account Cheque ☐ / Transmission ☐ / Savings ☐ / Other ☐ _____

Tender Amount (R) _____

(Words) _____

TO BE COMPLETED BY THE BANK

.....
Initials & Surname (Bank Official) Date Signature (Bank official)

Telephone Number (Bank Official)

Bank Code based on Tender Amount and Construction Period		Bank Stamp of Bank Certified as Correct

T2.2.17

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

FORM K TENDERS GREATER THAN R10 MILLION

1. The Tenderer is required by law to prepare annual financial statements for auditing their audited annual financial statements:

- For the past three years; or
- Since their establishment or established during the past three years.

2. Does the Tenderer have any undisputed commitments for Municipal services towards a Municipality or other service provider in respect of which payment is overdue for more than 30 days?

Yes ☐ // No ☐

If so, state particulars:

.....

3. Has any contracts been awarded to the Tenderer by an Organ of State during the past five years?

Yes ☐ // No ☐

If so, state particulars:

.....

4. Has there been any material non-compliance or dispute concerning the execution of such contract?

Yes ☐ // No ☐

If so, state particulars:

.....

5. Is any portion of the goods or services expected to be sourced out from outside the Republic?

Yes ☐ // No ☐

If so, state what portion and whether any portion of payment from the Municipality is expected to be transferred out of the Republic.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM L SCHEDULE: SIMILAR WORK COMPLETED

The Tenderer must insert in the space provided below, a list of projects completed in the past ten (10) years by his firm. Should no details be entered it will be assumed that the Tender has been submitted by an inexperienced Tenderer and cannot be rated as competent. *Contact details for referrals to be correct. Please describe work done in detail. Additional pages may be used with Completion Certificates.*

Client	Contact Person & Telephone Number	Detail Scope of Work	Value of Contract (R)	Year Completed	Completion Certificate Attached

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM M SCHEDULE OF CURRENT PROJECTS

Client	Detail Scope of Work	Value of Contract (R)	Expected Completion Date

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM N KEY PERSONNEL, SUPERVISORY & MANAGEMENT STAFF AND NON-LOCAL WORKERS TO BE EMPLOYED

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

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

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

The Tenderer shall attach hereto the *curricula vitae* of at least the project director, manager and site agent and the qualified health and safety officer. The information is necessary for evaluation of the tender.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM O SCHEDULE OF PROPOSED SUB-CONTRACTORS

This schedule is to notify the Client that it is the intention of the Tenderer to employ the following Sub-contractors for work on this contract.

Name and address of proposed Sub-contractor		Nature and extent of work	Previous experience with Sub-contractor
1.			
2.			
3.			
4.			
5.			

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM P SCHEDULE OF PLANT AND EQUIPMENT

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

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

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

- (b) Details of major equipment that will be hired, or acquired for this contract if my/our tender is acceptable (letter of intent to be provided).

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM Q DAYWORK SCHEDULE

The Tenderer must enter a rate which will be applicable to all daywork executed by him. This rate must cover all overheads, profit, administration, insurance, supervision, etc, as well as any equipment which may be required.

Daywork may only be done after the written approval has been obtained from the Engineer as no payment will be considered should the approval not be obtained. (Refer to Schedule of Quantities).

Worker	Rate per hour (R)
Labour:	
Foreman	
Charge Hand	
Skilled Artesian	
Unskilled Artesian	
Semi-skilled Worker	
Worker	
Plant (Tenderer to specify):	
..... Model	
..... Model	
..... Model	
..... Model	
..... Model	
..... Model	
..... Model	

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM R PRELIMINARY PROGRAMME, METHOD STATEMENT, QUALITY MANAGEMENT PLAN AND LOCAL PROCUREMENT (DTI)

The Bidder shall attach a preliminary programme reflecting the proposed sequence, duration and milestones of execution of the various activities comprising the work for this Contract. The programme shall be in accordance with the information supplied in the Contract, requirements of the Project Specification and with all other aspects of his/her Tender.

Note: The programme must be based on the completion time as specified in the Contract Data. No other completion time that may be indicated on this programme will be regarded as an alternative offer, unless it is listed in Form C and supported by a detailed statement to that effect, all as specified in the Tender Data.

The Bidder shall attach a Method Statement that adequately details all activities, durations and any associated risks in terms of operations envisaged on this Contract.

The Bidder shall also attach his Quality Management Plan showing clearly how quality assurance and process control will be managed both at the Plant and on Site. The plan will be used to evaluate the tenders as the quality of workmanship is of highest priority in this Contract. Any quality certification by recognized international body must be stated.

NB : The tenderer is to note that at least 25% of the Contract Amount (excluding Contingencies, Contract Price Adjustment and VAT) is to be procured and spent on companies which is regarded as local (local meaning any entity which is registered on the Central Supplier Database – the CSD of South Africa). The Contractor is to indicate in the table below the amount which will be spent on local Contractors (also expressed as a percentage of the Contract Amount).

Description	Amount to be spent Locally * (R)	Amount not spent Locally (R)
General		
Supply and Deliver		
Install and Commission		
Sub Total		
Total Contract Amount	R	
Percentage split	%	%

*Where the Contractor indicated the amount to be spent locally, it is required to set out this amount in detail in the attached DTI forms below (Annexures C, D & E):

DECLARATION CERTIFICATE FOR LOCAL PRODUCTION AND CONTENT FOR DESIGNATED SECTORS

This Standard Bidding Document (SBD) must form part of all bids invited. It contains general information and serves as a declaration form for local content (local production and local content are used interchangeably).

Before completing this declaration, bidders must study the General Conditions, Definitions, Directives applicable in respect of Local Content as prescribed in the Preferential Procurement Regulations, 2011, the South African Bureau of Standards (SABS) approved technical specification number SATS 1286:2011 (Edition 1) and the Guidance on the Calculation of Local Content together with the Local Content Declaration Templates [Annex C (Local Content Declaration: Summary Schedule), D (Imported Content Declaration: Supporting Schedule to Annex C) and E (Local Content Declaration: Supporting Schedule to Annex C)].

1. General Conditions

- 1.1. Preferential Procurement Regulations, 2011 (Regulation 9) makes provision for the promotion of local production and content.
- 1.2. Regulation 9.(1) prescribes that in the case of designated sectors, where in the award of bids local production and content is of critical importance, such bids must be advertised with the specific bidding condition that only locally produced goods, services or works or locally manufactured goods, with a stipulated minimum threshold for local production and content will be considered.
- 1.3. Where necessary, for bids referred to in paragraph 1.2 above, a two stage bidding process may be followed, where the first stage involves a minimum threshold for local production and content and the second stage price and B-BBEE.
- 1.4. A person awarded a contract in relation to a designated sector, may not sub-contract in such a manner that the local production and content of the overall value of the contract is reduced to below the stipulated minimum threshold.
- 1.5. The local content (LC) expressed as a percentage of the bid price must be calculated in accordance with the SABS approved technical specification number SATS 1286: 2011 as follows:

$$LC = [1 - x / y] * 100$$

Where:

x is the imported content in Rand

y is the bid price in Rand excluding value added tax (VAT)

Prices referred to in the determination of x must be converted to Rand (ZAR) by using the exchange rate published by South African Reserve Bank (SARB) at 12:00 on the date of advertisement of the bid as indicated in paragraph 4.1 below.

The SABS approved technical specification number SATS 1286:2011 is accessible on http://www.thedti.gov.za/industrial_development/ip.jsp at no cost.

- 1.6 A bid may be disqualified if –
 - (a) this Declaration Certificate and the Annex C (Local Content Declaration: Summary Schedule) are not submitted as part of the bid documentation; and
 - (b) the bidder fails to declare that the Local Content Declaration Templates (Annex C, D and E) have been audited and certified as correct.

2. Definitions

- 2.1. **“bid”** includes written price quotations, advertised competitive bids or proposals;
 - 2.2. **“bid price”** price offered by the bidder, excluding value added tax (VAT);
 - 2.3. **“contract”** means the agreement that results from the acceptance of a bid by an organ of state;
 - 2.4. **“designated sector”** means a sector, sub-sector or industry that has been designated by the Department of Trade and Industry in line with national development and industrial policies for local production, where only locally produced services, works or goods or locally manufactured goods meet the stipulated minimum threshold for local production and content;
 - 2.5. **“duly sign”** means a Declaration Certificate for Local Content that has been signed by the Chief Financial Officer or other legally responsible person nominated in writing by the Chief Executive, or senior member / person with management responsibility(close corporation, partnership or individual).
 - 2.6. **“imported content”** means that portion of the bid price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the Contractor or its subcontractors) and which costs are inclusive of the costs abroad (this includes labour or intellectual property costs), plus freight and other direct importation costs, such as landing costs, dock duties, import duty, sales duty or other similar tax or duty at the South African port of entry;
 - 2.7. **“local content”** means that portion of the bid price which is not included in the imported content, provided that local manufacture does take place;
 - 2.8. **“stipulated minimum threshold”** means that portion of local production and content as determined by the Department of Trade and Industry; and
 - 2.9. **“sub-contract”** means the primary contractor’s assigning, leasing, 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.
3. **The stipulated minimum threshold(s) for local production and content (refer to Annex A of SATS 1286:2011) for this bid is/are as follows:**

TENDERERS MUST COMPLETE A SEPARATE ANNEXURE C BELOW FOR EACH DESIGNATED SECTOR. COMPLETED ANNEXURES MUST BE APPENDED TO THIS PAGE.

Industry/sector/sub-sector	Minimum threshold for local content
Valves	Local Content %
25mm Pressure Reducing Valve, Class 16, Dial Type 0-6 bar (Cla-Val Aqua 80-451)	70%
25mm Threaded Ball Valve, Class 16, Full Bore	70%
50mm Air Valve, Class 16 RBX Double Orifice AV with Anti Shock Mechanism	70%
50mm Air Valve, Class 25 RBX Double Orifice AV with Anti Shock Mechanism	70%
50mm Ball Valve, Class 16, Threaded to BSP/NPT Female	70%
50mm Ball Valve, Class 25, Threaded to BSP/NPT Female	70%
50mm Flanged Gate Valve, Class 16, (SANS 664)	70%
50mm Pressure Reducing Valve, Class 16 (Pilot Controlled)	70%
80mm Wedge Gate Valve, Class 16, with Hand wheel (SANS 664)	70%

T2.2.27

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Industry/sector/sub-sector	Minimum threshold for local content
Valves	Local Content %
80mm Wedge Gate Valve, Class 25, with Hand wheel (SANS 664)	70%
150mm Resilient Seal Gate Valve, Class 16 (SANS 664)	70%
200mm Butterfly Valve, Class 16, Wafer Type, Gear Operated	70%
200mm Gate Valve, Class 16, (SANS 664)	70%
200mm Hydraulic Control Valve, Class 16, Pressure Reducing and Sustaining	70%
200mm Hydraulic Control Valve, Class 16, with Pressure Reducing Function	70%
300mm Gate Valve, Class 16 (SANS 664)	70%
300mm Gate Valve, Class 25 (SANS 664)	70%
300mm RSV Gate Valve, Class 16 (SANS 664)	70%
300mm RSV Gate Valve, Class 25 (SANS 664)	70%
350mm Gate Valve, Class 16 (SANS 664)	70%
350mm Resilient Seal Gate Valve, Class 16 (SANS 664)	70%
600mm Gate Valve With Bypass, Class 16 (SANS 664)	70%
700mm Gate Valve With Bypass, Class 16 (SANS 664)	70%
Steel Pipes	Local Content %
25mm Steel Pipe (SANS 62 Heavy Duty)	80%
50mm Steel Pipe (SANS 62 Heavy Duty)	80%
300mm Steel Pipe (SANS 719)	80%
350mm Steel Pipe (SANS 719)	80%
500mm Steel Pipe (SANS 719)	80%
600mm Steel Pipe (SANS 719)	80%
700mm Steel Pipe (SANS 719)	80%

4. **Does any portion of the services, works or goods offered have any imported content? (Tick applicable box)**

YES		NO	

- 4.1 If yes, the rate(s) of exchange to be used in this bid to calculate the local content as prescribed in paragraph 1.5 of the general conditions must be the rate(s) published by SARB for the specific currency at 12:00 on the date of advertisement of the bid.

The relevant rates of exchange information is accessible on www.resbank.co.za.

Indicate the rate(s) of exchange against the appropriate currency in the table below (refer to Annex A of SATS 1286:2011):

Currency	Rates of exchange
US Dollar	
Pound Sterling	
Euro	
Yen	
Other	

NB: Bidders must submit proof of the SARB rate(s) of exchange used.

5. Were the Local Content Declaration Templates (Annex C, D and E) audited and certified as correct?
(Tick applicable box)

YES		NO	

- 5.1. If yes, provide the following particulars:

- (a) Full name of auditor
- (b) Practice number
- (c) Telephone and cell number
- (d) Email address

(Documentary proof regarding the declaration will, when required, be submitted to the satisfaction of the Accounting Officer / Accounting Authority).

6. Where, after the award of a bid, challenges are experienced in meeting the stipulated minimum threshold for local content the DTI must be informed accordingly in order for the DTI to verify and in consultation with the AO/AA provide directives in this regard.

LOCAL CONTENT DECLARATION (REFER TO ANNEX B OF SATS 1286:2011)

LOCAL CONTENT DECLARATION BY CHIEF FINANCIAL OFFICER OR OTHER LEGALLY RESPONSIBLE PERSON NOMINATED IN WRITING BY THE CHIEF EXECUTIVE OR SENIOR MEMBER/PERSON WITH MANAGEMENT RESPONSIBILITY (CLOSE CORPORATION, PARTNERSHIP OR INDIVIDUAL)

IN RESPECT OF BID NO.

ISSUED BY: (Procurement Authority / Name of Institution):

NB!

- 1 The obligation to complete, duly sign and submit this declaration cannot be transferred to an external authorized representative, auditor or any other third party acting on behalf of the bidder.
- 2 Guidance on the Calculation of Local Content together with Local Content Declaration Templates (Annex C, D and E) is accessible on http://www.thedti.gov.za/industrial_development/ip.jsp. Bidders should first complete Declaration D. After completing Declaration D, bidders should complete Declaration E and then consolidate the information on Declaration C. **Declaration C should be submitted with the bid documentation at the closing date and time of the bid in order to substantiate the declaration made in paragraph (c) below.** Declarations D and E should be kept by the bidders for verification purposes for a period of at least 5 years. The successful bidder is required to continuously update Declarations C, D and E with the actual values for the duration of the contract.

I, the undersigned, ... (full names),

do hereby declare, in my capacity as

of (name of bidder entity), the following

- (a) The facts contained herein are within my own personal knowledge.
- (b) I have satisfied myself that:
 - (i) the goods/services/works to be delivered in terms of the above-specified bid comply with the minimum local content requirements as specified in the bid, and as measured in terms of SATS 1286:2011; and
 - (ii) the declaration templates have been audited and certified to be correct.
- (c) The local content percentage (%) indicated below has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 4.1 above and the information contained in Declaration D and E which has been consolidated in Declaration C:

Bid price, excluding VAT (y)	R
Imported content (x), as calculated in terms of SATS 1286:2011	R
Stipulated minimum threshold for local content (paragraph 3 above)	
Local content %, as calculated in terms of SATS 1286:2011	

If the bid is for more than one product, the local content percentages for each product contained in Declaration C shall be used instead of the table above. The local content percentages for each product has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 4.1 above and the information contained in Declaration D and E.

- (d) I accept that the Procurement Authority / Institution have the right to request that the local content be verified in terms of the requirements of SATS 1286:2011.

(e) I understand that the awarding of the bid is dependent on the accuracy of the information furnished in this application. I also understand that the submission of incorrect data, or data that are not verifiable as described in SATS 1286:2011, may result in the Procurement Authority / Institution imposing any or all of the remedies as provided for in Regulation 13 of the Preferential Procurement Regulations, 2011 promulgated under the Preferential Policy Framework Act (PPPFA), 2000 (Act No. 5 of 2000).

SIGNATURE.....

DATE

WITNESS 1

DATE

WITNESS 2

DATE

SATS 1286.2011

Annex C

Local Content Declaration - Summary Schedule

(C1)	Tender No.		
(C2)	Tender description:		
(C3)	Designated product(s)		
(C4)	Tender Authority:		
(C5)	Tendering Entity name:		
(C6)	Tender Exchange Rate:	Pula	EU
(C7)	Specified local content %		

Note: VAT to be excluded from all calculations

GBP

Calculation of local content							
Tender item no's	List of items	Tender price - each (excl VAT)	Exempted imported value	Tender value net of exempted imported content	Imported value	Local value	Local content % (per item)
(C8)	(C9)	(C10)	(C11)	(C12)	(C13)	(C14)	(C15)

Tender summary			
Tender Qty	Total tender value	Total exempted imported content	Total Imported content
(C16)	(C17)	(C18)	(C19)

Signature of tenderer from Annex B

Date:

(C20) Total tender value

(C21) Total Exempt imported content

(C22) Total Tender value net of exempt imported content

(C23) Total Imported content

(C24) Total local content

(C25) Average local content % of tender

T2.2.32

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

Annex D

Imported Content Declaration - Supporting Schedule to Annex C

(D1) Tender No. _____
(D2) Tender description: _____
(D3) Designated Products: _____
(D4) Tender Authority: _____
(D5) Tendering Entity name: _____
(D6) Tender Exchange Rate: _____ Pula _____

Note: VAT to be excluded from all calculations

EU R 9.00 GBP R 12.00

A. Exempted imported content

		Calculation of imported content							
Tender item no's	Description of imported content	Local supplier	Overseas Supplier	Foreign currency value as per Commercial Invoice	Tender Exchange Rate	Local value of imports	Freight costs to port of entry	All locally incurred landing costs & duties	Total landed cost excl VAT
(D7)	(D8)	(D9)	(D10)	(D11)	(D12)	(D13)	(D14)	(D15)	(D16)

Summary	
Tender Qty	Exempted imported value
(D17)	(D18)

(D19) Total exempt imported value

This total must correspond with Annex C - C 21

B. Imported directly by the Tenderer

		Calculation of imported content							
Tender item no's	Description of imported content	Unit of measure	Overseas Supplier	Foreign currency value as per Commercial Invoice	Tender Rate of Exchange	Local value of imports	Freight costs to port of entry	All locally incurred landing costs & duties	Total landed cost excl VAT
(D20)	(D21)	(D22)	(D23)	(D24)	(D25)	(D26)	(D27)	(D28)	(D29)

Summary	
Tender Qty	Total imported value
(D30)	(D31)

(D32) Total imported value by tenderer

C. Imported by a 3rd party and supplied to the Tenderer

		Calculation of imported content							
Description of imported content	Unit of measure	Local supplier	Overseas Supplier	Foreign currency value as per Commercial Invoice	Tender Rate of Exchange	Local value of imports	Freight costs to port of entry	All locally incurred landing costs & duties	Total landed cost excl VAT
(D33)	(D34)	(D35)	(D36)	(D37)	(D38)	(D39)	(D40)	(D41)	(D42)

Summary	
Quantity imported	Total imported value
(D43)	(D44)

(D45) Total imported value by 3rd party

D. Other foreign currency payments

		Calculation of foreign currency payments		
Type of payment	Local supplier making the payment	Overseas beneficiary	Foreign currency value paid	Tender Rate of Exchange
(D46)	(D47)	(D48)	(D49)	(D50)

Summary of payments	
Local value of payments	
(D51)	

(D52) Total of foreign currency payments declared by tenderer and/or 3rd party

(D53) Total of imported content & foreign currency payments - (D32), (D45) & (D52) above

This total must correspond with Annex C - C 23

Signature of tenderer from Annex B

Date: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

Local Content Declaration - Supporting Schedule to Annex C

Note: VAT to be excluded from all calculations

(E9) Total local products (Goods, Services and Works)

(E12)	Administration overheads and mark-up	(Marketing, insurance, financing, interest etc.)	

This total must correspond with Annex C - C24

Date: _____

FORM T DECLARATION OF INTEREST (SBD 4)

1. Any legal person, including persons employed by the state¹, or persons having a kinship with persons employed by the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid (includes an advertised competitive bid, a limited bid, a proposal or written price quotation). In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons employed by the state, or to persons connected with or related to them, it is required that the bidder or his/her authorized representative declare his/her position in relation to the evaluating/adjudicating authority where:

- the bidder is employed by the state; and/or
- the legal person on whose behalf the bidding document is signed, has a relationship with persons/a person who are/is involved in the evaluation and or adjudication of the bid(s), or where it is known that such a relationship exists between the person or persons for or on whose behalf the declarant acts and persons who are involved with the evaluation and or adjudication of the bid.

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

2.1 Full Name of bidder or his or her representative:

2.2 Identity Number:

2.3 Position occupied in the Company (director, trustee, shareholder², member):

.....

2.4 Registration number of company, enterprise, close corporation, partnership agreement or trust:

.....

2.5 Tax Reference Number:

2.6 VAT Registration Number:

- 2.6.1 The names of all directors / trustees / shareholders / members, their individual identity numbers, tax reference numbers and, if applicable, employee / PERSAL numbers must be indicated in paragraph 3 below.

¹ "State" means-

- (a) any national or provincial department, national or provincial public entity or constitution within the meaning of the Public Finance Management Act, 1999 (Act No. 1 of 1999);
- (b) any municipality or municipal entity;
- (c) provincial legislature;
- (d) national Assembly or the national Council of provinces; or
- (e) Parliament

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

2.7 Are you or any person connected with the bidder presently employed by the state? Yes / No

If so, furnish the following particulars:

Name of person / director / trustee / shareholder / member:

Name of state institution at which you or the person connected to the bidder is employed:

Position occupied in the state institution

Any other particular:

If you are presently employed by the state, did you obtain the appropriate authority to undertake remunerative work outside employment in the public sector: Yes / No

If yes, did you attach proof of such authority to the bid document: Yes / No

(Note: failure to submit proof of such authority, where applicable, may result in the disqualification of the bid)

If no, furnish reasons for non-submission of such proof:

2.8 Did you or your spouse, or any of the company's directors / trustees / shareholders / members or their spouses conduct business with the state in the previous twelve months?: Yes / No

If so, furnish particulars:

2.9 Do you or any person connected with the bidder, have any relationship (family, friend, other) with a person employed by the state and who may be involved with the evaluation and or adjudication of this bid?: Yes / No

If so, furnish particulars:

2.10 Are you, or any person connected with the bidder, aware of any relationship (family, friend, other) between any other bidder and any person employed by the state who may be involved with the evaluation and or adjudication of this bid?: Yes / No

If so, furnish particulars:

2.11 Do you or any of the directors / trustees / shareholders / members of the company have any interest in any other related companies whether or not they are bidding for this contract: Yes / No

If so, furnish particulars:

3. Full details of directors / trustees members / shareholders:

Full Name	Identity Number	Personal Income Tax Reference Number	State Employee Number / Persal Number

4. DECLARATION

I, THE UNDERSTAND (FULL NAME)

CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 2 AND 3 ABOVE IS CORRECT. I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

NAME OF BIDDER

FORM U DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES (SBD 8)

1. This tender document must form part of all tenders invited.
2. It serves as a declaration to be used by entities in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.
3. The tender of any Bidder may be rejected if that Bidder, or any of its directors have:
 - abused the institution's supply chain management system;
 - committed fraud or any other improper conduct in relation to such system; or;
 - 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. Failure to comply will result in the tender being disqualified.

Item	Question	Response	
4.1	Is the Bidder, any of its directors listed on the National Treasurer's database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector? (Companies for 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) The Database of Restricted Suppliers now resides on the National Treasury's website (www.treasury.gov.za) and can be accessed by clicking on its link at the bottom of the home page. If so, furnish particulars: 	Yes ☐	No ☐
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, 2004 (Act 12 of 2004)? The register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page. If so, furnish particulars: 	Yes ☐	No ☐
4.3	Was the Bidder or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years? If so, furnish particulars: 	Yes ☐	No ☐

Item	Question	Response	
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 ☐	No ☐
	If so, furnish particulars:		

CERTIFICATION

I, THE UNDERSTAND (FULL NAME)

CERTIFY THAT THE INFORMATION FURNISHES IN THIS DECLARATION FORM IS TRUE AND CORRECT.

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

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

NAME OF BIDDER

FORM V CERTIFICATE OF INDEPENDENT BID DETERMINATION (SBD 9)

1. This Standard Bidding Document (SBD) must form part of all bids¹ invited.
2. Section 4(1)(b)(iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).² Collusive bidding is a *pre se* prohibition meaning that it cannot be justified under any grounds.
3. Treasury Regulation 16A9 prescribed that accounting offers and accounting authorities must take all reasonable steps to prevent abuse of the supply chain management system and authorized accounting offers and accounting authorities to:
 - a. disregard the bid of any bidder if that bidder, or any of its directors have abused the institution's supply chain management system and or committed fraud or any other improper conduct in relation to such system.
 - b. cancel a contract awarded to a supplier of goods and services if the supplier committed any corrupt or fraudulent act during the bidding process or the execution of that contract.
4. This SBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.
5. In order to give effect to the above, the attached Certificate of Bid Determination (SBD 9) must be completed and submitted with the bid:

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

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

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

(Bid Number and Description)

in response to the invitation for the bid made by:

(Name of Institution)

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

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 aspect;
3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;
4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign the bid, on behalf of the bidder;
5. For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:
 - (a) has been requested to submit a bid in response to this bid invitation;
 - (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and
 - (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder.
6. The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or 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);

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

- (c) methods, factors or formulas used to calculate prices;
 - (d) the intention or decision to submit or not to submit, a bi;
 - (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 then (10) years in terms of the Prevention and Combating of Corrupt Activities Act No. 12 of 2004 or any other applicable legislation.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

NAME OF BIDDER

FORM W PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2011

(80/20 Version)

Purchases

This preference form must form part of all bids invited. It contains general information and services as a claim form for preference points for Broad-Based Black Economic Empowerment (B-BBEE) Status Level of Contribution.

NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF B-BBEE, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT REGULATIONS, 2011

1. GENERAL CONDITIONS

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

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

1.2 The value of this bid is estimated to exceed R1,000,000 (all applicable taxes included) and therefore the 90/10 system shall be applicable.

1.3 Preference points for this bid shall be awarded for:

- (a) Price; and
- (b) B-BBEE Status Level of Contribution

The maximum points for this bid are allocated as follows:

	<u>Points</u>
Price	80
B-BBEE Status Level of Contribution	20
Total Points for Price and B-BBEE must not exceed	100

1.4 Failure on the part of a bidder to fill in and/or to sign this form and submit a B-BBEE Verification Certificate from a Verification Agency accredited by the South African Accreditation System (SANAS) or a Registered Auditor approved by the Independent Regulatory Board of Auditors (IRBA) or an Accounting Officer as contemplated in the Close Corporation Act (CCA) together with the bid, will be interpreted to mean that preference points for B-BBEE status level of contribution are not claimed.

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

2. DEFINITIONS

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

- 2.2 **“B-BBEE”** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;
- 2.3 **“B-BBEE status level of contributor”** means the B-BBEE status received by a measured entity based on its overall performance using the relevant scorecard contained in the Codes of Good Practice on Black Economic Empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;
- 2.4 **“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 services, works or goods, through price quotations, advertised competitive bidding processes or proposals;
- 2.5 **“Broad-Based Black Economic Empowerment Act”** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- 2.6 **“comparative price”** means the price after the factors of a non-firm price and all unconditional discounts that can be utilized have been taken into consideration;
- 2.7 **“consortium or joint venture”** 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;
- 2.8 **“contract”** means the agreement that results from the acceptance of a bid by an organ of state;
- 2.9 **“EME”** means any enterprise with an annual total revenue of R5 million or less;
- 2.10 **“Firm price”** means the price that is only subject to adjustments in accordance with the actual increase or decrease resulting from the change, imposition, or abolition of customs or excise duty and any other duty, levy, or tax, which, in terms of the law or regulation, is binding on the contractor and demonstrably has an influence on the price of any supplies, or the rendering costs of any service, for the execution of the contract;
- 2.11 **“functionality”** means the measurement according to predetermined norms, as set out in the bid documents, of a service or commodity that is designed to be practical and useful, working or operating, taking into account, among other factors, the quality, reliability, viability and durability of a service and the technical capacity and ability of a bidder;
- 2.12 **“non-firm prices”** means all prices other than “firm” prices;
- 2.13 **“person”** includes a juristic person;
- 2.14 **“rand value”** means the total estimated value of a contract in South African currency, calculated at the time of bid invitations, and includes all applicable taxes and excise duties;
- 2.15 **“sub-contract”** means the primary contractor’s assigning, leasing, 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;
- 2.16 **“total revenue”** bears the same meaning assigned to this expression in the Codes of Good Practice on Black Economic Empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act and promulgated in the *Government Gazette* on 9 February 2007;
- 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; and
- 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. ADJUDICATION USING A POINT SYSTEM

- 3.1 The bidder obtaining the highest number of total points will be awarded the contract.
- 3.2 Preference points shall be calculated after prices have been brought to a comparative basis taking into account all factors of non-firm prices and all unconditional discounts;.
- 3.3 Points scored must be rounded off to the nearest 2 decimal places.
- 3.4 In the event that two or more bids have scored equal total points, the successful bid must be the one scoring the highest number of preference points for B-BBEE.
- 3.5 However, when functionality is part of the evaluation process and two or more bids have scored equal points including equal preference points for B-BBEE, the successful bid must be the one scoring the highest score for functionality.
- 3.6 Should two or more bids be equal in all respects, the award shall be decided by the drawing of lots.

4. POINTS AWARDED FOR PRICE

4.1 The 80/20 OR 90/10 Preference Point Systems

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

$$P_s = 80 \left(1 - \frac{P_t - P_{\min}}{P_{\min}} \right) \quad \text{OR} \quad P_s = 90 \left(1 - \frac{P_t - P_{\min}}{P_{\min}} \right)$$

80/20 **90/10**

Where:

P_s = Points scored for comparative price of bid under consideration

P_t = Comparative price of bid under consideration

$P_{\min}$ = Comparative price of lowest acceptable bid

5. POINTS AWARDED FOR B-BBEE STATUS LEVEL OF CONTRIBUTION

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

B-BBEE Status Level of Contributor	Number of points (90/10 system)	Number of points (80/20 system)
1	10	20
2	9	18
3	8	16
4	5	12
5	4	8
6	3	6
7	2	4
8	1	2
Non-compliant contributor	0	0

- 5.2 Bidders who qualify as EMEs in terms of the B-BBEE Act must submit a certificate issued by an Accounting Officer as contemplated in the CCA or a Verification Agency accredited by SANAS or a Registered Auditor. Registered auditors do not need to meet the prerequisite for IRBA's approval for the purpose of conducting verification and issuing EMEs with B-BBEE Status Level Certificates.
- 5.3 Bidders other than EMEs must submit their original and valid B-BBEE status level verification certificate or a certified copy thereof, substantiating their B-BBEE rating issued by a Registered Auditor approved by IRBA or a Verification Agency accredited by SANAS.
- 5.4 A trust, consortium or joint venture, will qualify for points for their B-BBEE status level as a legal entity, provided that the entity submits their B-BBEE status level certificate.
- 5.5 A trust, consortium or joint venture will qualify for points for their B-BBEE status level as an unincorporated entity, provided that the entity submits their consolidated B-BBEE scorecard as if they were a group structure and that such a consolidated B-BBEE scorecard is prepared for every separate bid.
- 5.6 Tertiary institutions and public entities will be required to submit their B-BBEE status level certificates in terms of the specialized scorecard contained in the B-BBEE Codes of Good Practice.
- 5.7 A person will not be awarded points for B-BBEE status level if it is indicated in the bid documents that such a bidder intends sub-contracting more than 25% of the value of the contract to any other enterprise that does not qualify for at least the points that such a bidder qualifies for, unless the intended sub-contractor is an EME that has the capability and ability to execute the sub-contract.
- 5.8 A person awarded a contract may not sub-contract more than 25% of the value of the contract to any other enterprise that does not have an equal or higher B-BBEE status level than the person concerned, unless the contract is sub-contracted to an EME that has the capability and ability to execute the sub-contract.

6. BID DECLARATION

- 6.1 Bidders who claim points in respect of B-BBEE Status Level of Contribution must complete the following:

7. B-BBEE STATUS LEVEL OF CONTRIBUTION CLAIMED

- 7.1 B-BBEE Status Level of Contribution:

..... = ...(maximum of 10 or 20 points)

(Points claimed in respect of paragraph 7.1 must be in accordance with the table reflected in paragraph 5.1 and must be substantiated by means of a B-BBEE certificate issued by a Verification Agency accredited by SANAS or a Registered Auditor approved by IRBA or an Accounting Officer as contemplated in the CCA).

8. SUB-CONTRACTING

- 8.1 Will any portion of the contract be sub-contracted? **YES / NO** (delete which is not applicable)

If yes, indicate:

- (i) what percentage of the contract will be subcontracted? %
- (ii) the name of the sub-contractor?
- (iii) the B-BBEE status level of the sub-contractor?
- (iv) whether the sub-contractor is an EME?..... **YES / NO** (delete which is not applicable)

9. DECLARATION WITH REGARD TO COMPANY/FIRM

9.1 Name of company/firm

9.2 VAT registration number

9.3 Company registration number

9.4 TYPE OF COMPANY/ FIRM (Tick Applicable Box)

☐ Partnership/Joint Venture / Consortium

☐ One person business / sole propriety

☐ Close corporation

☐ Company

☐ (Pty) Limited

9.5 Describe Principal Business Activities

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

9.6 Company Classification (Tick Applicable Box)

☐ Manufacturer

☐ Supplier

☐ Professional Service Provider

☐ Other Service Providers, e.g. transporter, etc.

9.7 Municipal Information

Municipality where business is situated

Registered Account Number

Stand Number

9.8 Total number of years the company/firm has been in business?

9.9 **Declaration:**

I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the B-BBE status level of contribution indicated in paragraph 7 of the foregoing certificate, qualifies the company/ firm for the preference(s) shown and I / we acknowledge that:

(i) The information furnished is true and correct;

- (ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- (iii) In the event of a contract being awarded as a result of points claimed as shown in paragraph 7, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct; and
- (iv) If the B-BBEE status level of contribution has been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have:
 - (a) disqualify the person from the bidding process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - (d) restrict the bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, from obtaining business from any organ of state for a period not exceeding 10 years, after the audi alteram partem (hear the other side) rule has been applied; and
 - (e) forward the matter for criminal prosecution.

WITNESSES:

1.
 SIGNATURE(S) OF BIDDER(S)

2.

 DATE ADDRESS

FORM X COMPLIANCE WITH OHSA (ACT 85 OF 1993)

Tenderers are required to satisfy the Employer and the Engineer as to their ability and available resources to comply with the above by answering the following questions and providing the relevant information required below.

1.	Is your company familiar with the OHSA (ACT 85 of 1993) and its Regulations <u>and</u> do you have a copy available?	YES / NO
2.	Who will prepare the Contractor's Health and Safety Plan? (Provide a copy of the person/s curriculum vitae/s or company profile).	
3.	Does your company have a health and safety policy? (If yes, provide a copy). How is this policy communicated to all employees? (Provide supporting documentation to proof such communication)	YES / NO
4.	Does your company keep records of safety aspects of each construction site? If yes, what records are kept?	YES / NO
5.	Does your company conduct monthly safety meetings? If yes, provide copies of the Minutes of the last two meetings held	YES / NO
6.	Does your company have a safety officer in his employment, responsible for the overall safety of your company? If yes, please explain his duties and provide a copy of his CV (only if not the same person as in question 2 above). If No, indicate who will be appointed as safety officer for this project and provide a copy of his/her CV	YES / NO
7.	Indicate the total number of employees in the Company	
8.	Does your company have trained first aid employees? If yes, indicate, who.	YES / NO
9.	Does your company have a safety induction training programme in place? (If yes, provide a summary of topics covered in such induction training programme)	YES / NO

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM Y STATUS OF CONCERN SUBMITTING TENDER

1. GENERAL

State whether the Tenderer is a company, a closed corporation, a partnership or a one-man concern. (Make an X in the appropriate space below):

Company ☐	Closed Corporation ☐	Partnership ☐
One-man Concern ☐	Joint Venture ☐	

2. INFORMATION TO BE PROVIDED

If the Tenderer Entity is a:		Documentation to be submitted with the Tender:
1	<u>Close Corporation</u> , incorporated under the Close Corporation Act, 1984, Act 69 of 1984	CIPRO CK1 or CK2 (copies of the founding statement) and list of members.
2	<u>Private Company</u> , incorporated with share capital, under the companies Act, 1973, Act 61 of 1973 (including Companies incorporated under Art 53 (b))	Copies of: • CIPRO CM1 - Certificate of Incorporation • CIPRO CM22 & CM29 - Contents of Register of Directors, Auditors and Officers • Shareholders Certificates of all Members of the Company
3	<u>Private Company</u> , incorporated with share capital, under the companies Act, 1973, Act 61 of 1973 in which any, or all, <u>shares are held by another</u> Close Corporation or company with, or without, share capital	Copies of documents referred to in 1 and/or 2 above in respect of all such Close Corporations and/or Companies.
4	<u>Public Company</u> incorporated with share capital, under the companies Act, 1973, Act 61 of 1973 (including Companies incorporated under Art 21)	A signed statement of the Company's Secretary confirming that the Company is a public Company. Copy of CM29
5	Sole Proprietary or a Partnership	Copy of the Identity Document of: • such Sole Proprietary, or • each of the Partners in the Partnership Copy of the Partnership Agreement.
6	Co-operative	CIPRO CR2 - Copies of the Company registration document. (The percentage of work to be done by each partner must clearly be indicated on <u>Form V</u> : Preference Points Claim Form in terms of the Preferential Procurement Regulations 2001) of the tender document.
7	Joint Venture	All the documents (as described above) as applicable to each partner in the JV as well as a copy of the Joint Venture Agreement. (The percentage of work to be done by each partner of the Joint Venture must clearly be indicated in the Joint Venture Agreement).

NOTE:

- (a) If the shares are held in trust provide a copy of the Deed of Trust (only the front page and pages listing the trustees and beneficiaries are required) as well as the Letter of Authority as issued by the Master of the Supreme Court, wherein trustees have been duly appointed and authorised, must be provided.
- (b) Include a copy of the Certificate of Change of Name (CM9) if applicable.

3. REGISTERED FOR VAT PURPOSES IN TERMS OF THE VALUE-ADDED TAX ACT, (Act Nr. 89 of 1991)

(Make an X in the appropriate space below) (include information for each partner in the Joint Venture)

No ☐ Yes ☐ VAT Registration No.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORM Z CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

(Bid Number and Description)

in response to the invitation for the bid made by:

(Name of Municipality / Municipal Entity)

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

I certify, on behalf of _____ that:

(Name of Bidder)

1. I have read and I understand the contents of this Certificate;
2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;
4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign, the bid, on behalf of the bidder;
5. For the purposes of this Certificate and the accompanying bid, I understand that the word competitor¹ shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:
 - (a) has been requested to submit a bid in response to this bid invitation;
 - (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and
 - (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder.
6. The bidder has arrived at the accompanying bid independently from, and without consultation communication, agreement or arrangement with any competitor. However communication between partners in a joint venture or consortium¹ 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:

1 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.

- (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.

The undersigned, who warrants that he/she is duly authorised to do so on behalf of the enterprise, confirms that the contents of this schedule are within my personal knowledge and are to the best of my belief both true and correct.

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

FORWARD EXCHANGE COVER

IMPORTED CONTENT SHEET: FORWARD EXCHANGE COVER FOR IMPORTED GOODS

The Tenderer shall, in the attached schedule, for each item which a price is tendered, state the item number as it appears in the Schedule of Quantities, a brief description of the item, the country of origin, the value of the imported content of all goods comprising that item, the number of items for which he requires forward exchange cover, and the total amount for which forward exchange cover will be required.

Each Part of the Schedule of Quantities must be dealt with separately.

In the event of components being imported from more than one country, a separate entry shall be made for each country.

The Tenderer shall state the applicable rate(s) for the relevant country(ies) as at the date seven days prior to the closing date for the receipt of tenders.

Exchange rate(s) as at (insert date)

Country	Exchange Rate

SIGNATURE OF PERSON AUTHORISED TO SIGN THE TENDER

NAME

DATE

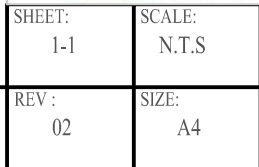
Equipment Schedule:

[illegible]

- Final design space factors to match MCC Certification requirements to SABS.
- If natural ventilation of the MCC bucket is not adequate,forced ventilation should be used as required.

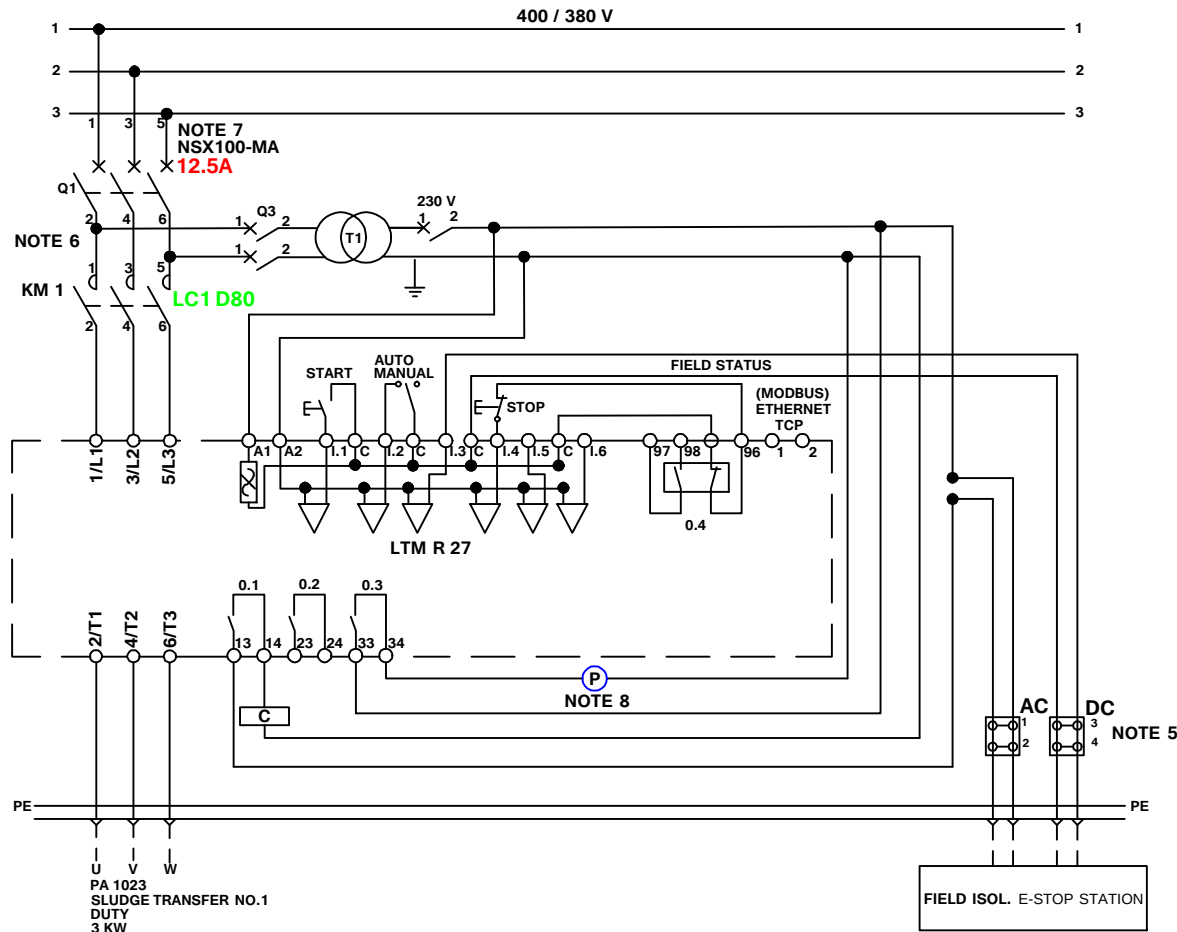


1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - SLUDGE TRANSFER NO.1

DRW. NO:
14004-E-MC2-004

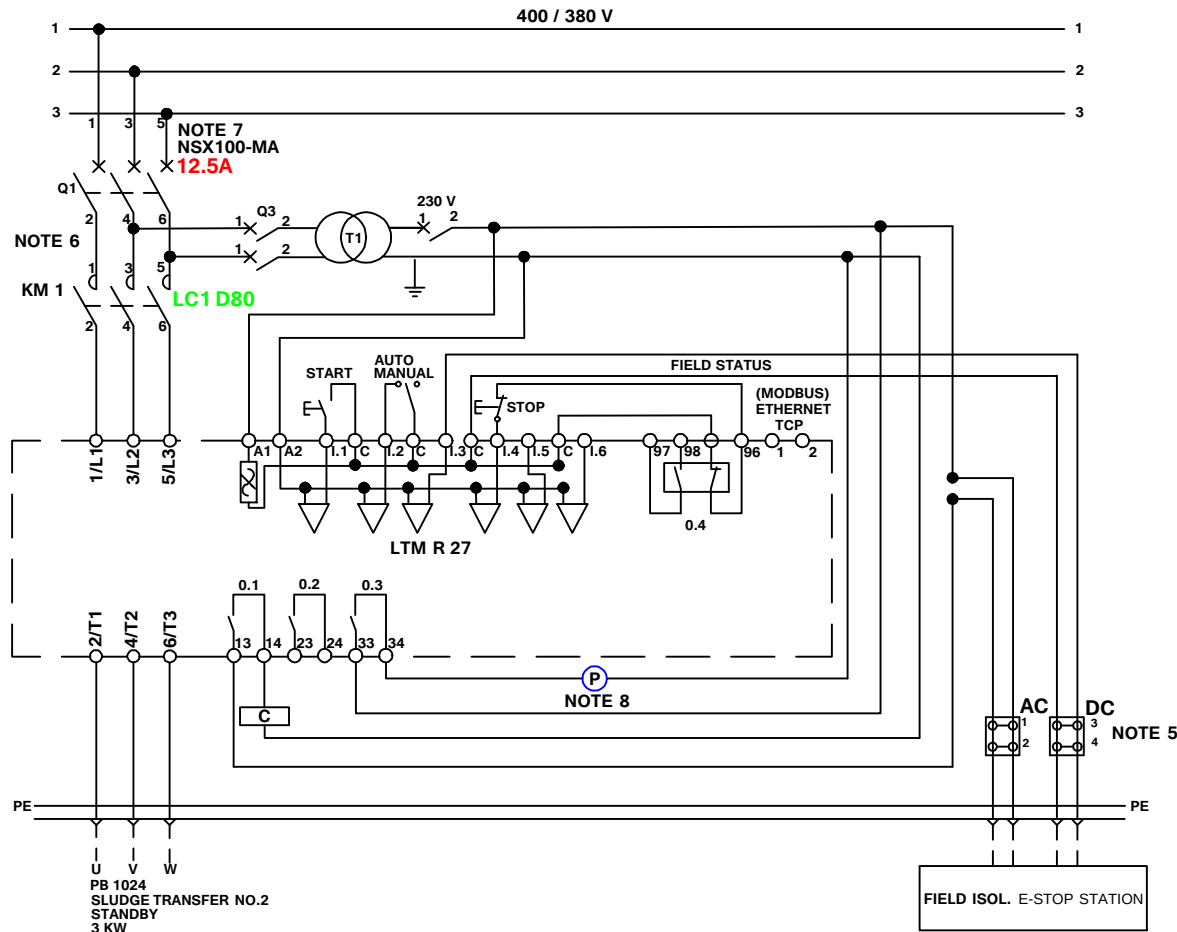
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

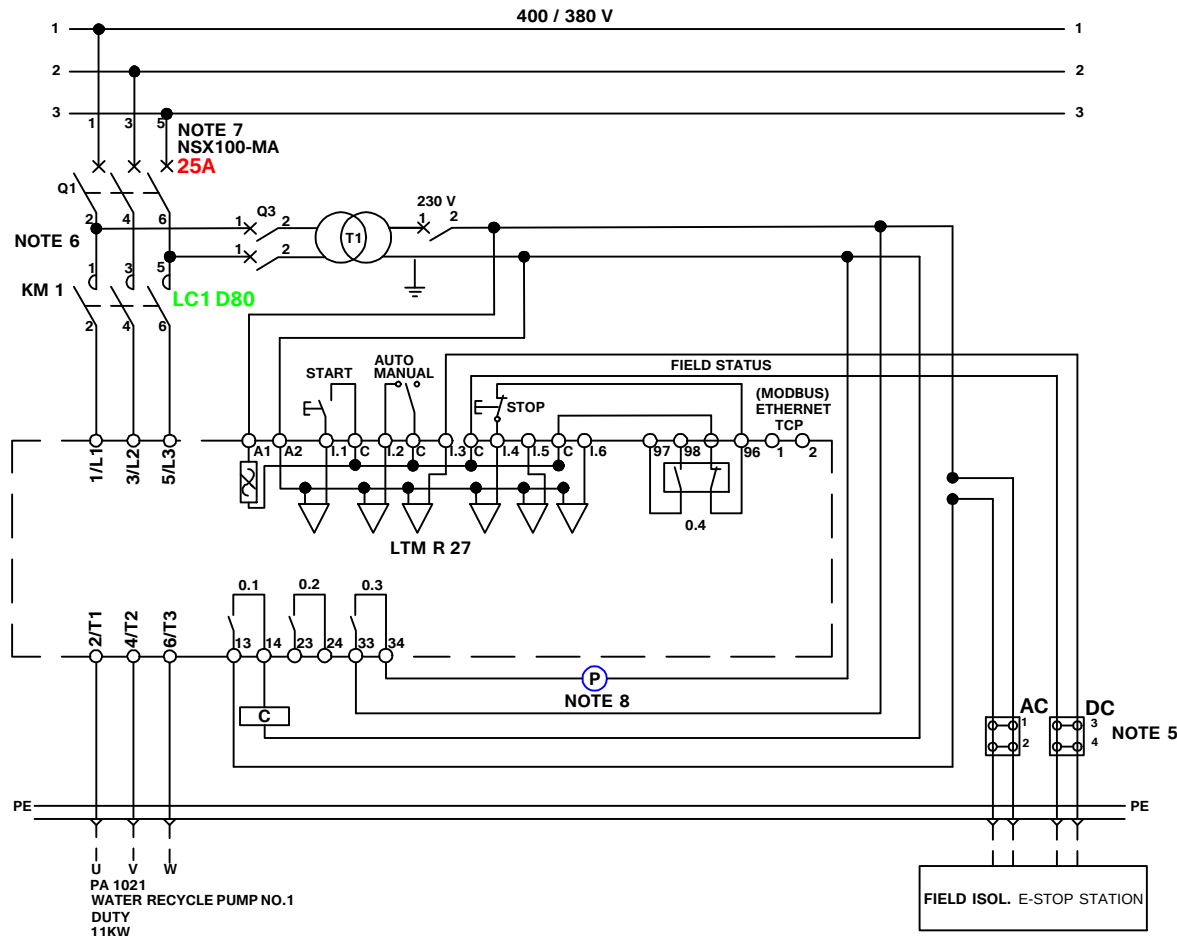
GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



GENERAL NOTES:

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2. Start/Stop switch mounted on door.
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5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - WATER RECYCLE PUMP NO.1

DRW. NO:
14004-E-MC2-006

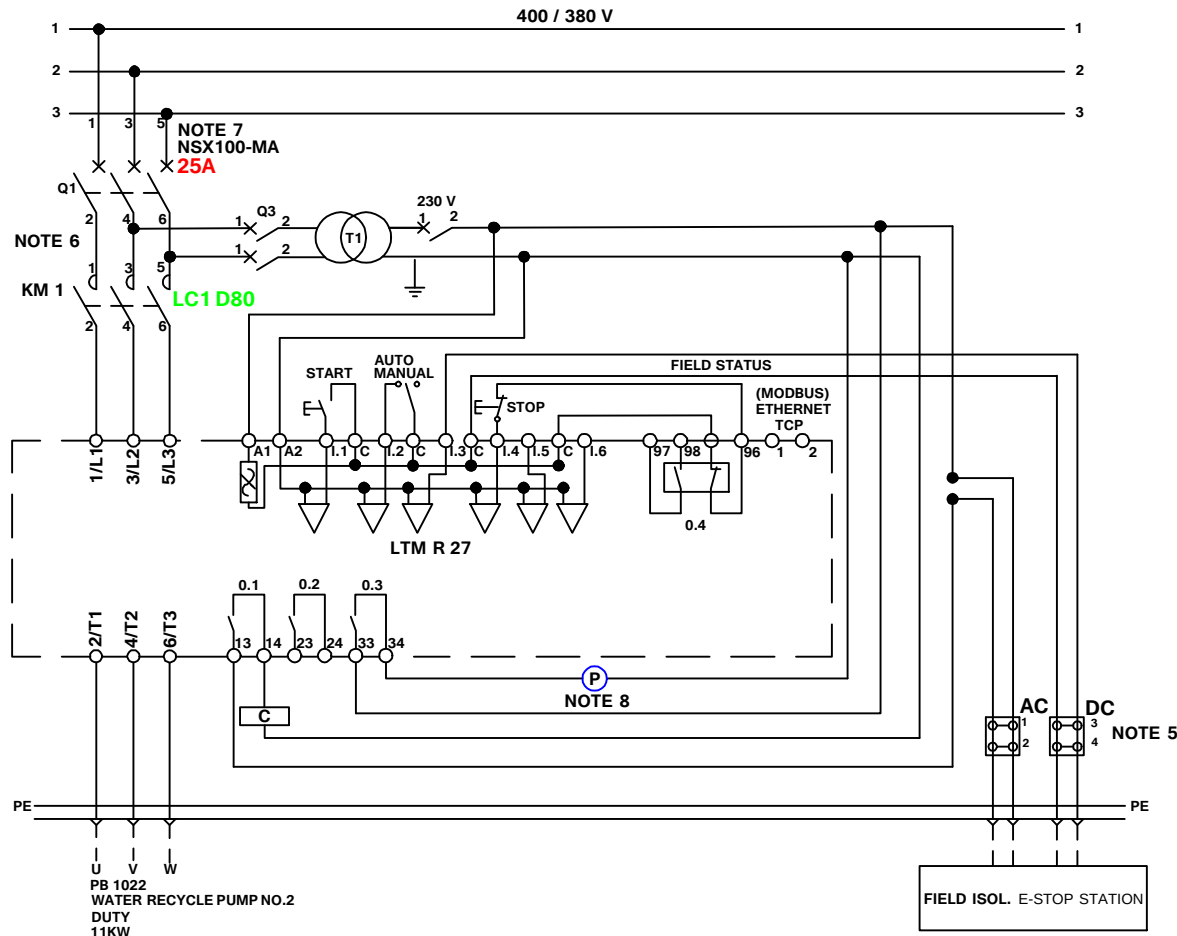
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - WATER RECYCLE PUMP NO.2

DRW. NO:
14004-E-MC2-007

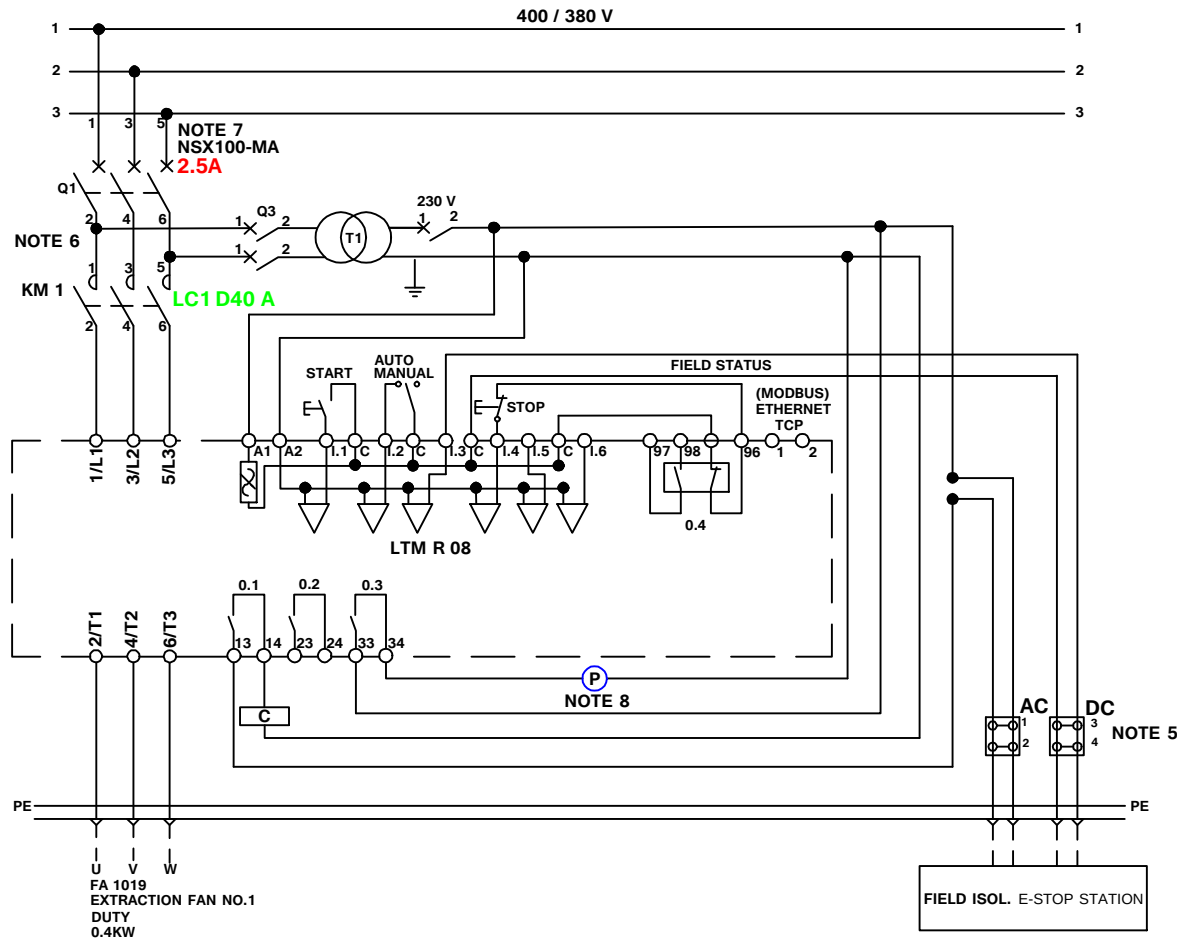
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - EXTRACTION FAN NO.1

DRW. NO:
14004-E-MC2-008

REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

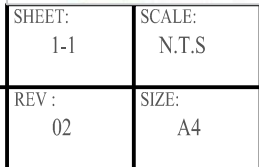
DATE:
19-07-2016

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



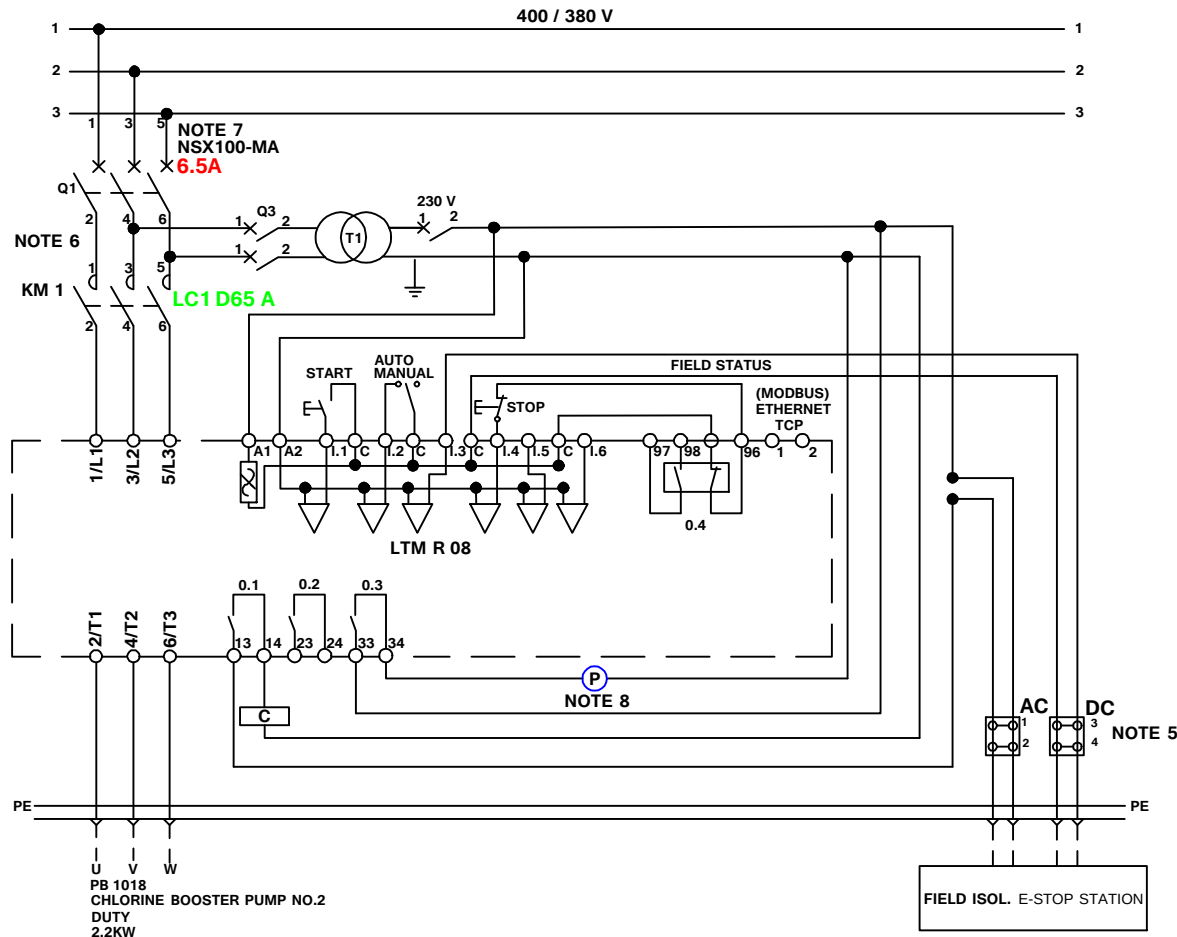
SIZE:
A4

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2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

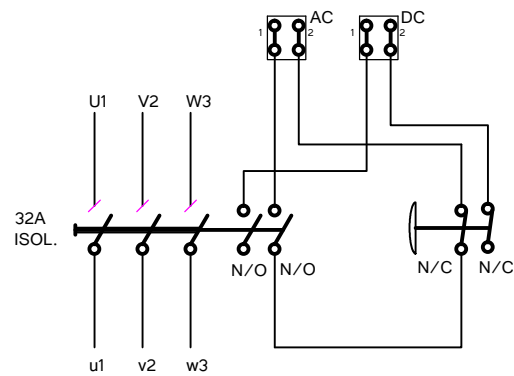
DRAWING TITLE
EXPANSION WORKS - CHLORINE BOOSTER PUMP NO.2

DRW. NO:
14004-E-MC2-011

REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016



FIELD ISOLATOR E-STOP STATION

GENERAL NOTES:

- E-Stop must to comply to SANS with a latching contact when operated.
- Isolator must have a handle operated mechanism with a lock out function.
- Isolator E-station is valid for operation for up to 37 kW.
- Terminal block must be mounted on a DIN rail.
- Cable gland should be brass with nickel plating complete with accessories.
- Enclosure must have an IP rating of 65 .
- There must be an Earth brass stud in the E-stop Isolator Station.
- All components must be mounted on a galvanised mild steel plate.
- E-Stop must be MildSteel Powder Coated.
- E-Stop Station must be fitted with a integrated drip cover.

ISSUED FOR TENDER



SHEET:	SCALE:
1-1	N.T.S

REV :	SIZE:
02	A4

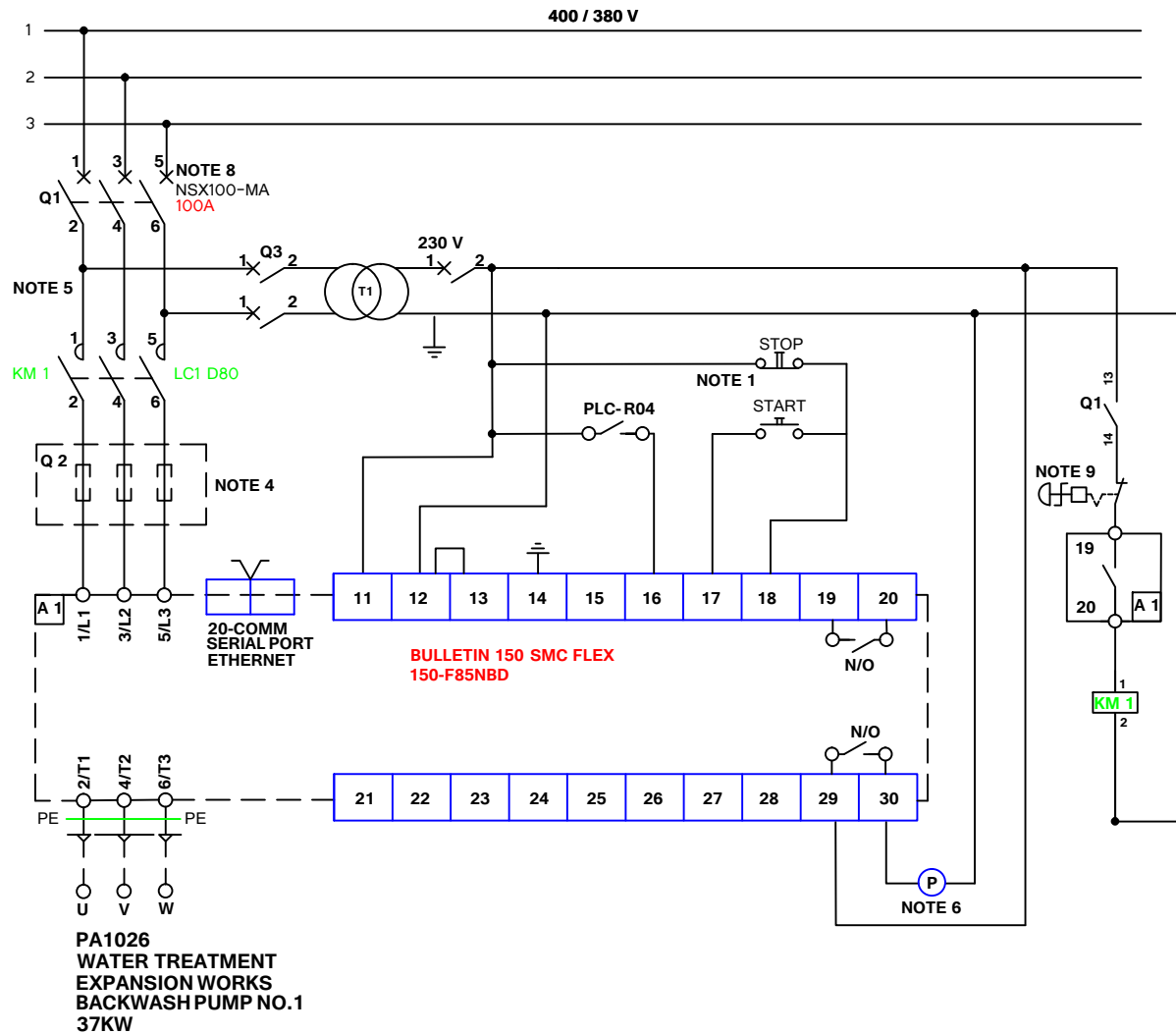
DRAWING TITLE
EXPANSION WORKS - FIELD ISOLATOR E-STOP STATION

DRW. NO :
14004-E-MC2-012

REVISED BY :
J.MOLEFE

CHECKED :
T.CHAUKE

DATE :
19-07-2016



GENERAL NOTES:

1. Start Stop mounted on door panel .
2. 40 kw Submersible pump
KSB151/401/460UG-S type
to deliver 400 m / hr at a head of 22.5m .
3. Class 30 Starting duty .
4. Fast acting Fuses to achieve type 2
co-ordination as per relevant table.
5. Line to Line connection for control transformers
must be balanced.
6. Pilot light is a 230V LED cluster indicating motor
running mounted on the door panel.
7. PLC interface wired to a terminal block in each
MCC bucket.
8. The NSX100-MA breaker fitted with a Vigi MH
earth leakage unit.
9. IP 68 enclosure E-stop station in the field wired via
terminal block in bucket with latching contact.

ISSUED FOR TENDER



SHEET:
1-1

SCALE:
N.T.S

DRAWING TITLE
EXPANSION WORKS - BACKWASH PUMP NO.1

DRW. NO :
14004-E-MC2-013

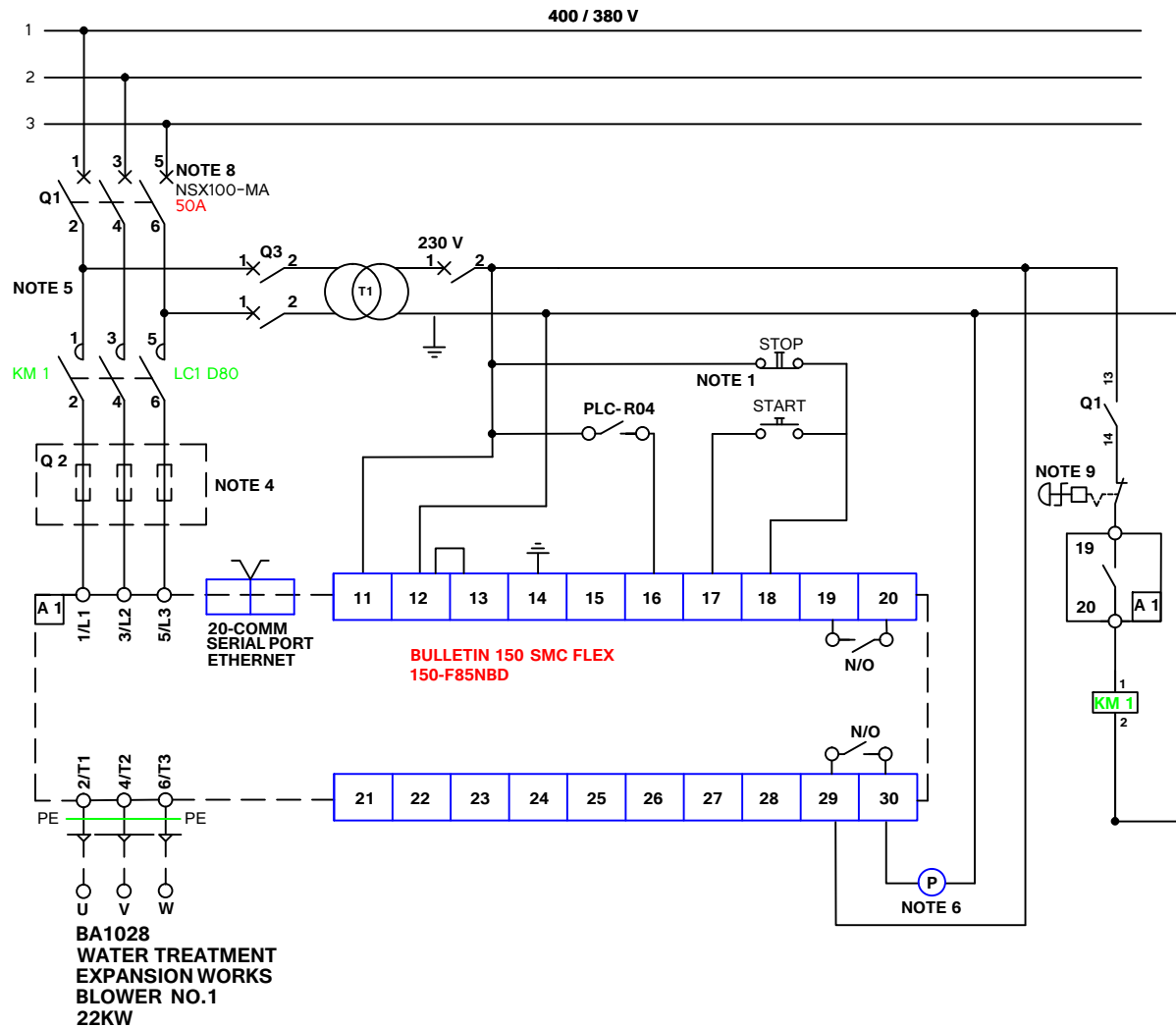
DRAWN & CHECKED BY :
J.MOLEFE

CHECKED :
T.CHAUKE

DATE :
07-09-2016

REV :
03

SIZE:
A4



GENERAL NOTES:

1. Start Stop mounted on door panel .
2. 40 kw Submersible pump
KSB151/401/460UG-S type
to deliver 400 m / hr at a head of 22.5m .
3. Class 30 Starting duty .
4. Fast acting Fuses to achieve type 2
co-ordination as per relevant table.
5. Line to Line connection for control transformers
must be balanced.
6. Pilot light is a 230V LED cluster indicating motor
running mounted on the door panel.
7. PLC interface wired to a terminal block in each
MCC bucket.
8. The NSX100-MA breaker fitted with a Vigi MH
earth leakage unit.
9. IP 68 enclosure E-stop station in the field wired via
terminal block in bucket with latching contact.

ISSUED FOR TENDER



SHEET:
1-1

SCALE:
N.T.S

DRAWING TITLE
EXPANSION WORKS - BLOWER NO.1

DRW. NO :
14004-E-MC2-015

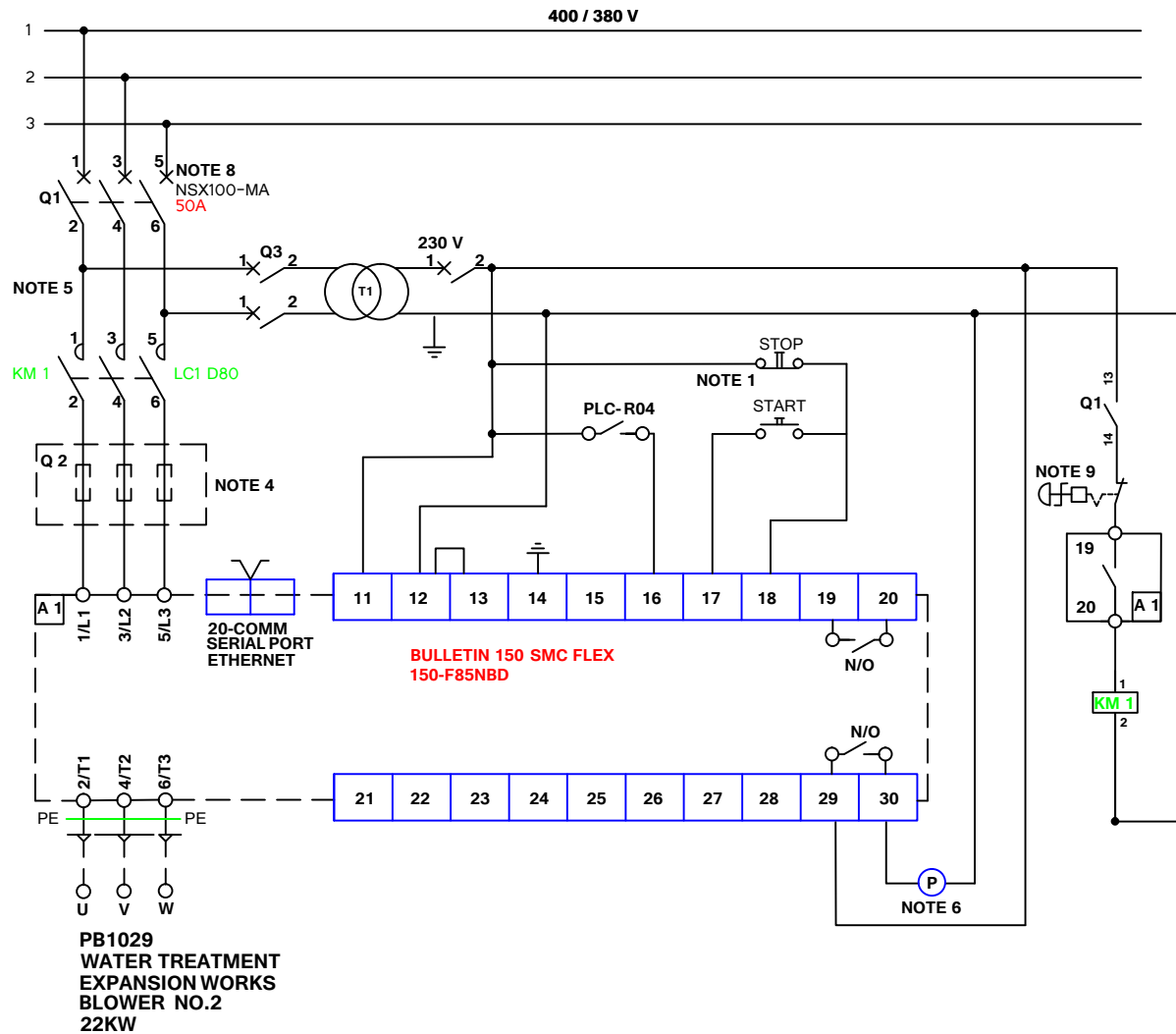
DRAWN & CHECKED BY :
J.MOLEFE

CHECKED :
T.CHAUKE

DATE :
07-09-2016

REV :
03

SIZE:
A4



GENERAL NOTES:

1. Start Stop mounted on door panel .
2. 40 kw Submersible pump KSB151/401/460UG-S type to deliver 400 m / hr at a head of 22.5m .
3. Class 30 Starting duty .
4. Fast acting Fuses to achieve type 2 co-ordination as per relevant table.
5. Line to Line connection for control transformers must be balanced.
6. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.
7. PLC interface wired to a terminal block in each MCC bucket.
8. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
9. IP 68 enclosure E-stop station in the field wired via terminal block in bucket with latching contact.

ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

DRAWING TITLE
EXPANSION WORKS - BLOWER NO.2

DRW. NO :
14004-E-MC2-016

DRAWN & CHECKED BY :
J.MOLEFE

CHECKED :
T.CHAUKE

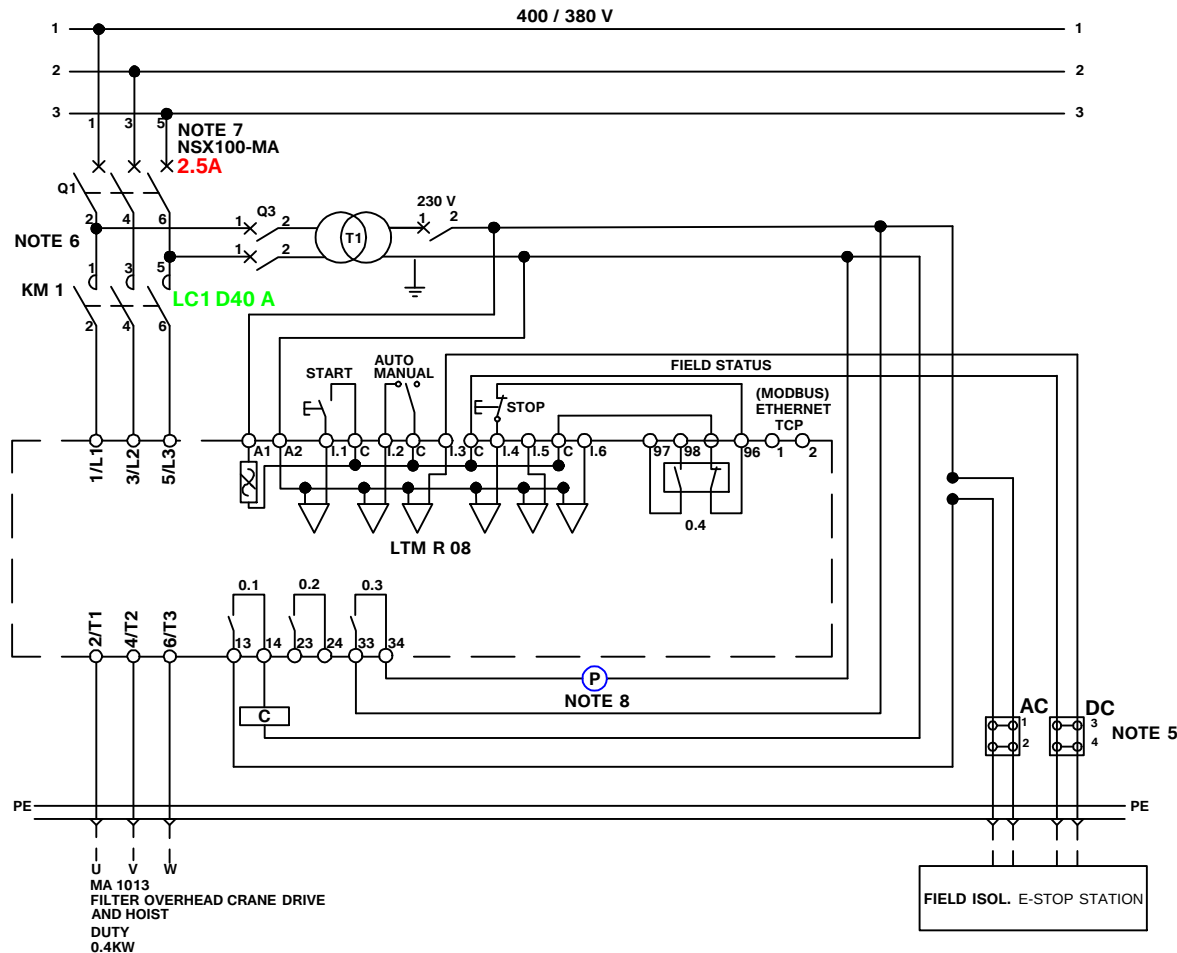
DATE :
07-09-2016

REV :
03

SIZE:
A4

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - FILTER OVERHEAD CRANE DRIVE AND HOIST

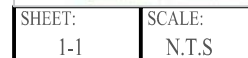
DRW. NO:
14004-E-MC2-017

REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



SIZE:	A4

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



SIZE:
A4

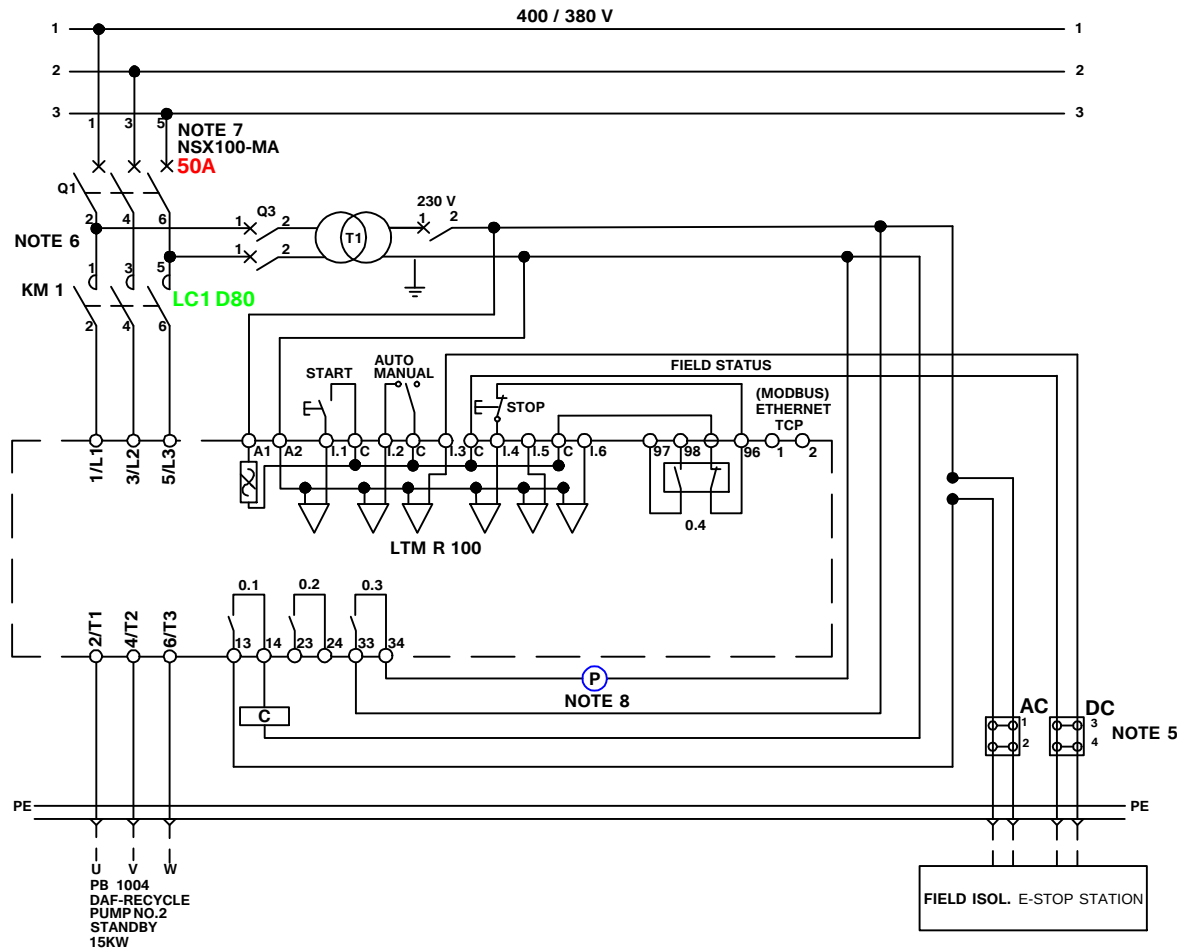
1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



SIZE:
A4

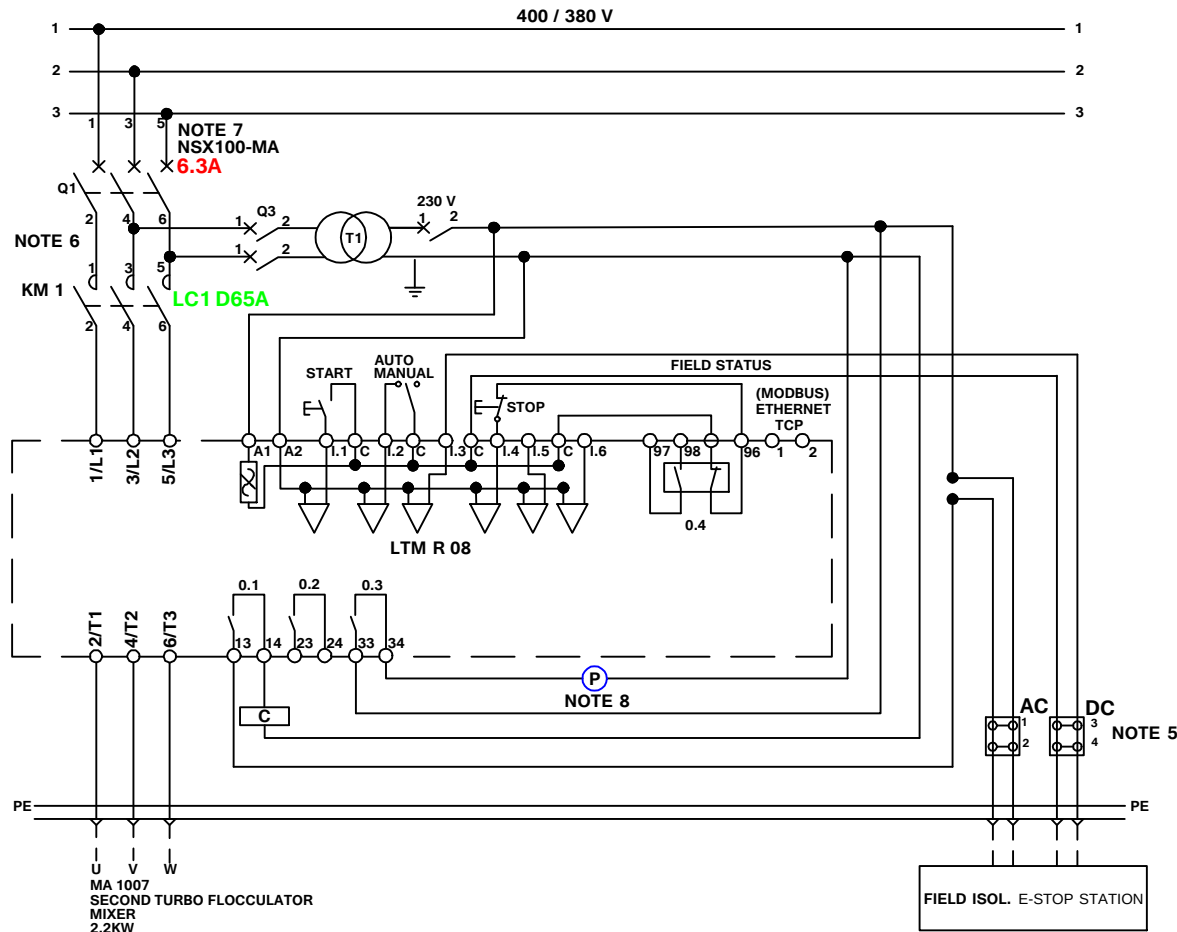
GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - SECOND TURBO FLOCCULATOR MIXER

DRW. NO:
14004-E-MC2-022

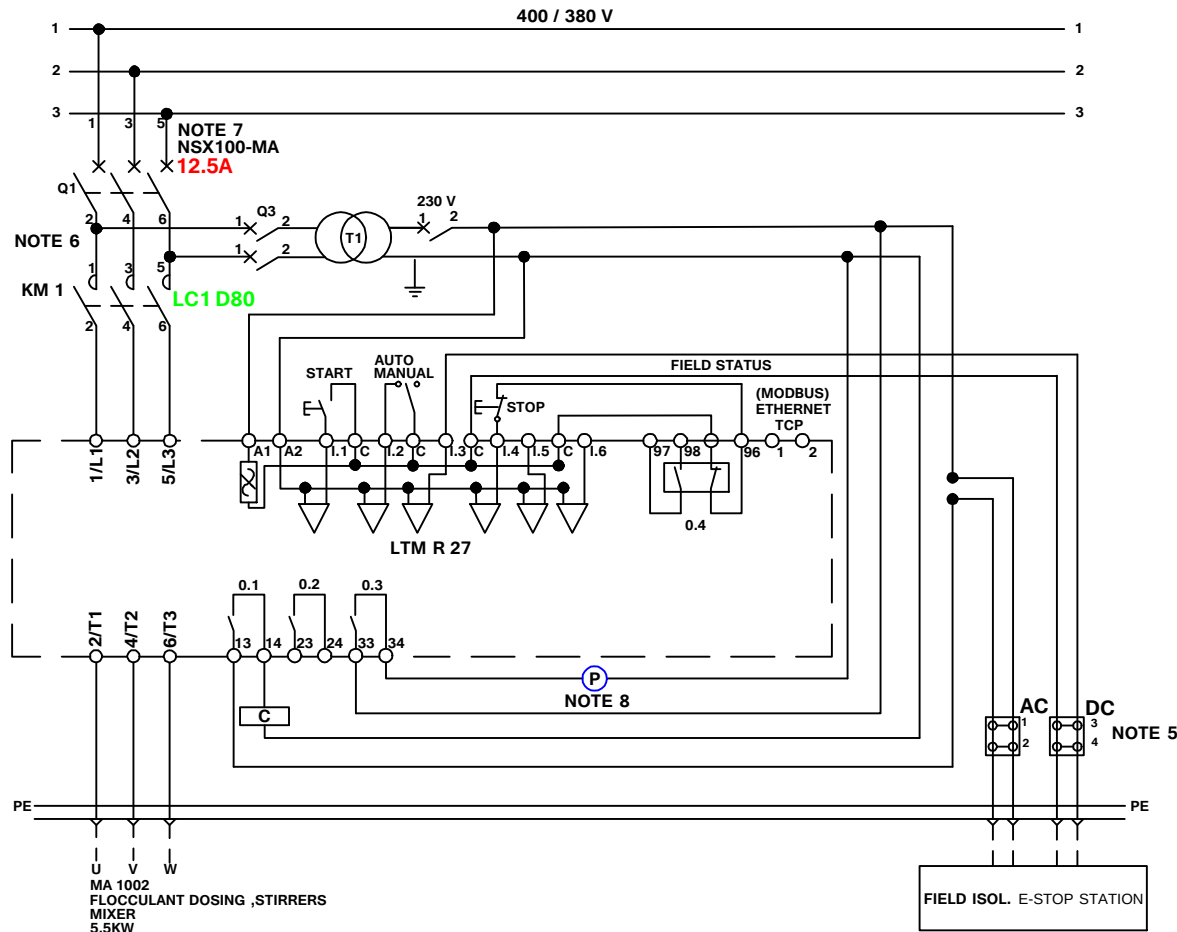
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - FLOCCULANT DOSING, STIRRERS MIXER

DRW. NO:
14004-E-MC2-023

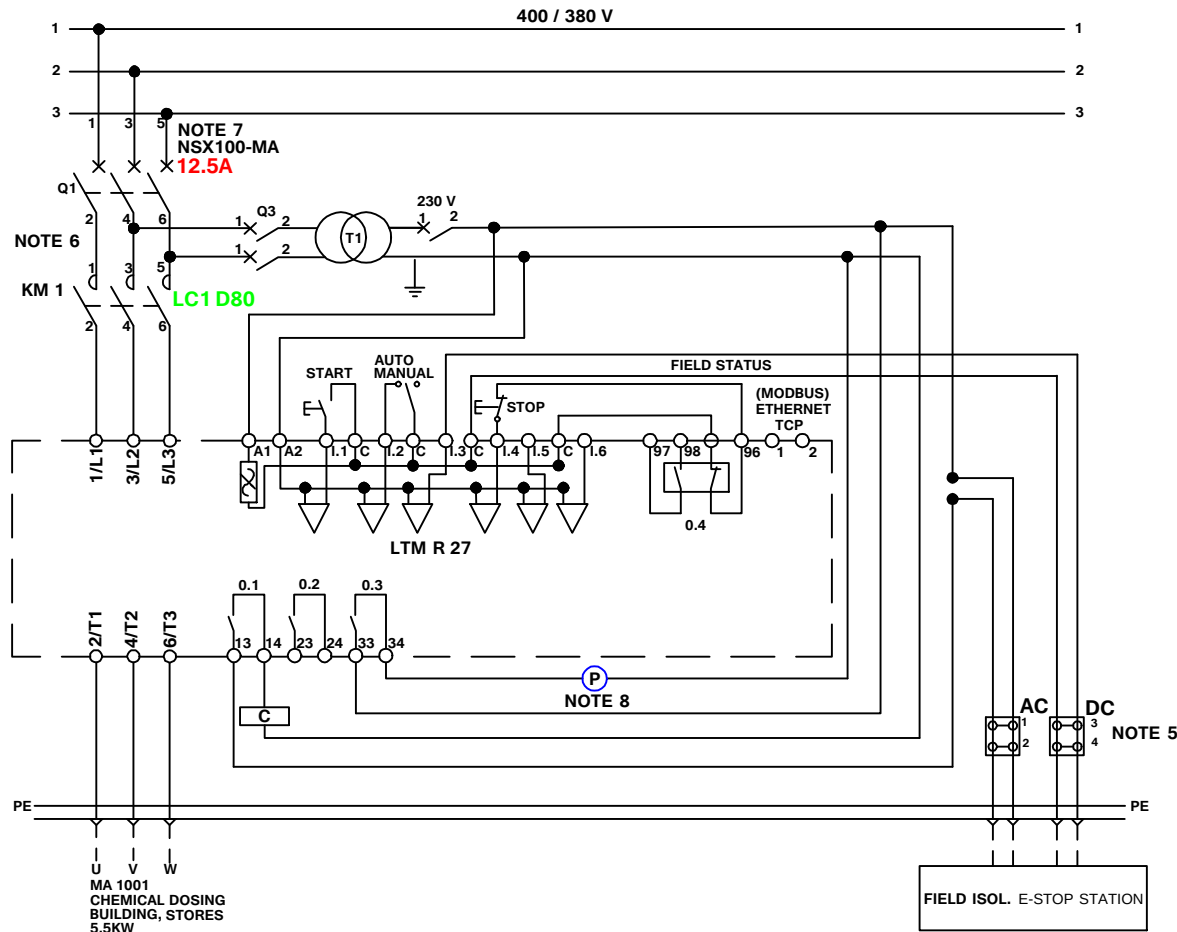
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - CHEMICAL DOSING BUILDING, STORES AND INLET WORKS

DRW. NO:
14004-E-MC2-024

REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

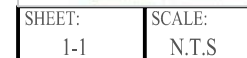
DATE:
19-07-2016

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



SIZE:
A4

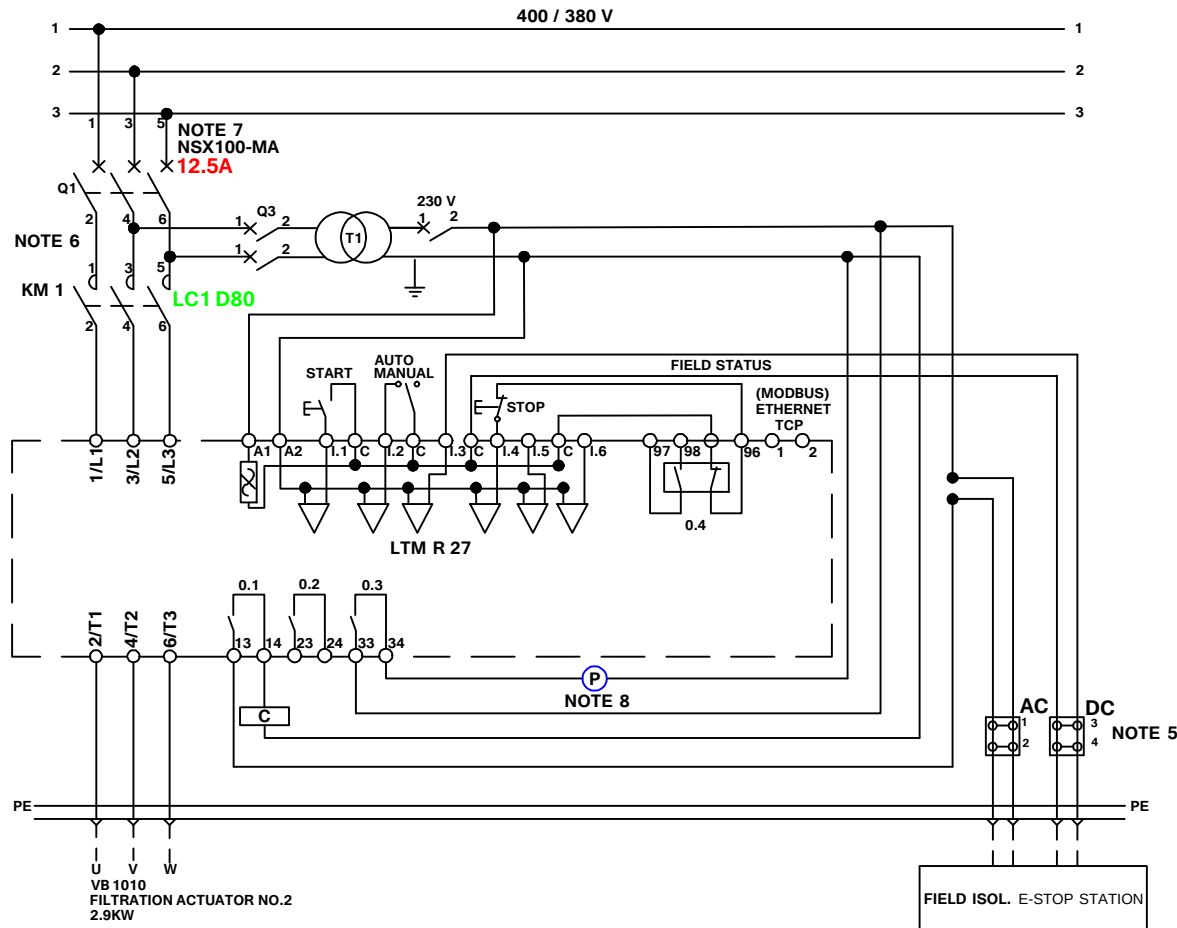
1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



SIZE:	A4

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - FILTRATION ACTUATOR NO.2

DRW. NO:
14004-E-MC2-027

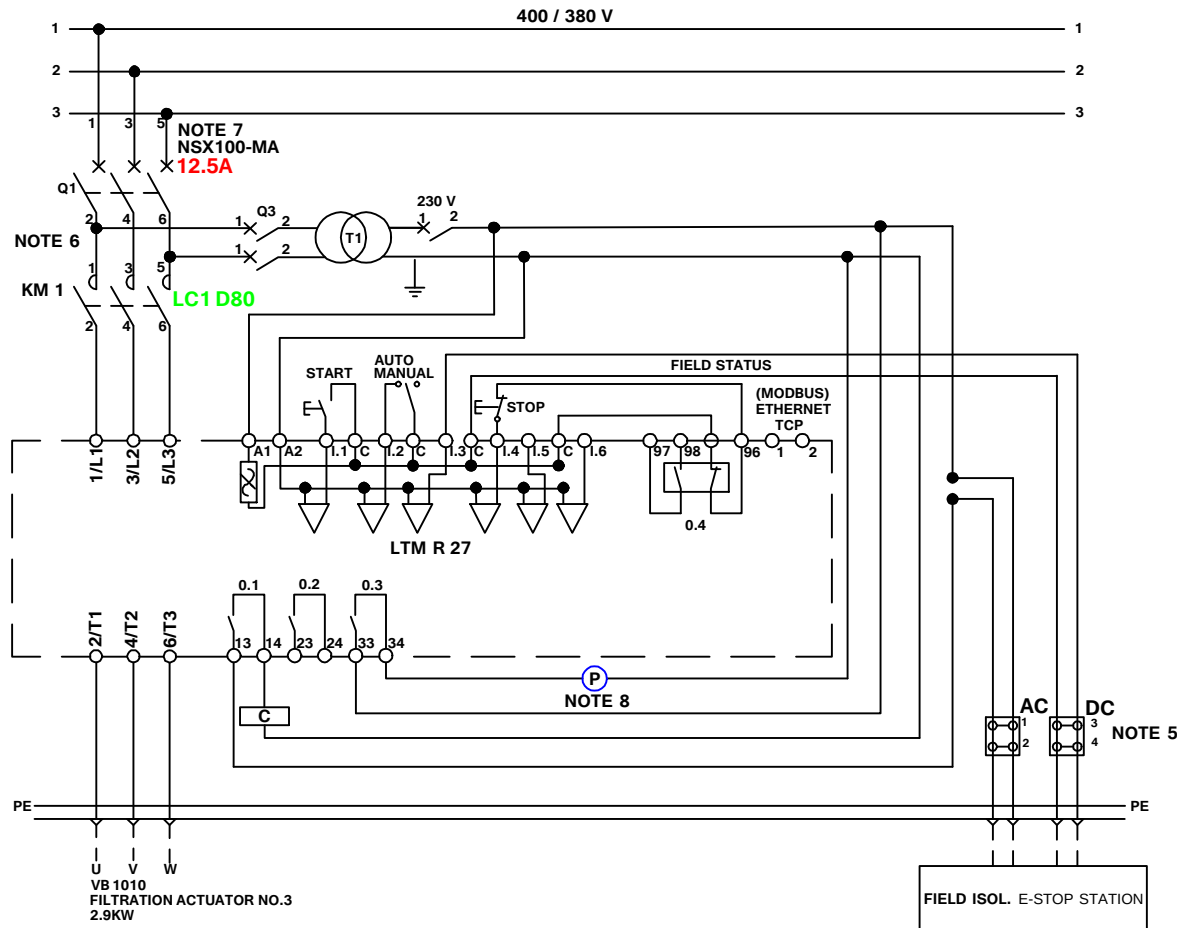
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - FILTRATION ACTUATOR NO.3

DRW. NO:
14004-E-MC2-028

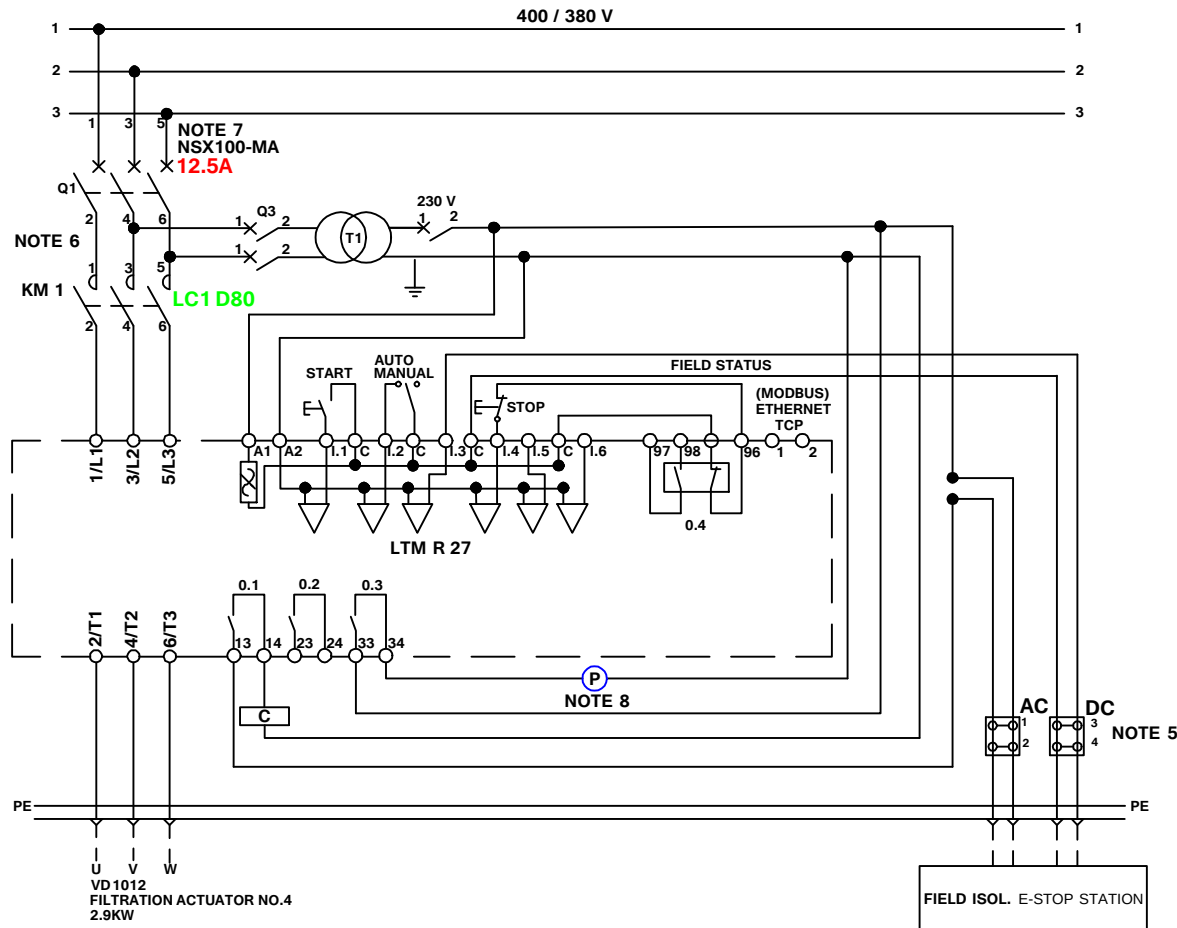
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - FILTRATION ACTUATOR NO.4

DRW. NO:
14004-E-MC2-029

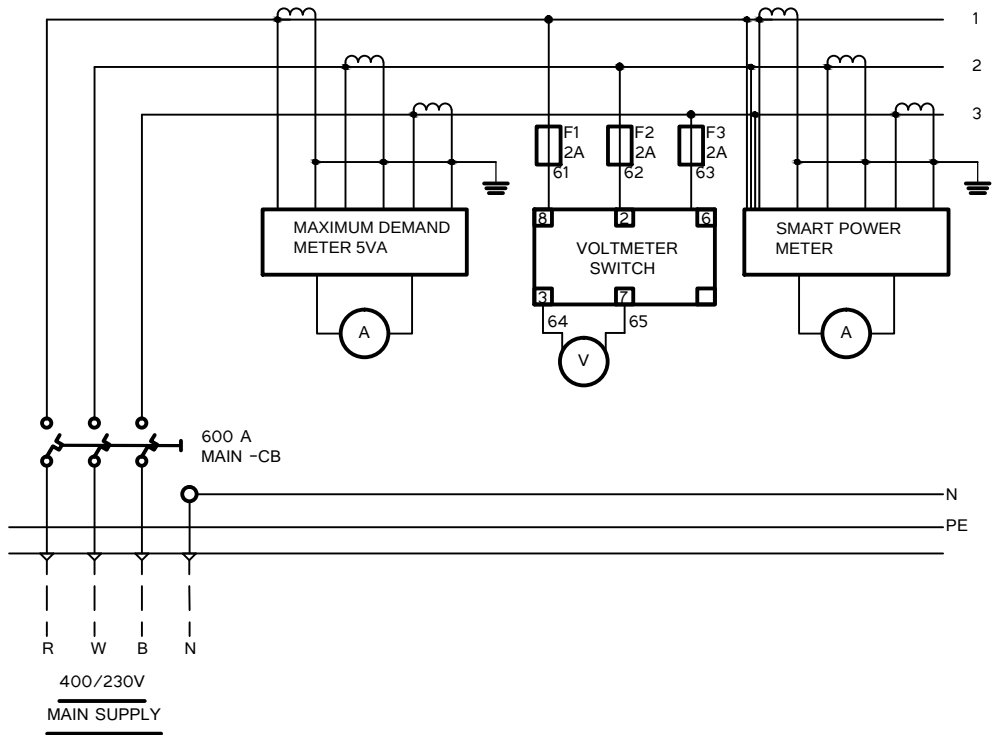
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

-The Smart Power meter must be modbus ethernet enabled.



ISSUED FOR TENDER



SHEET: 1-1	SCALE: AS SHOWN
REV : 02	SIZE: A4

DRAWING TITLE
EXPANSION WORKS -MCC 2 INCOMER SCHEMATIC

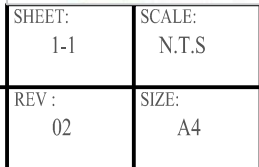
DRW. NO :
14004-E-MC3-030

DRAWN & CHECKED BY :
J.MOLEFE

CHECKED :
T.CHAUKE

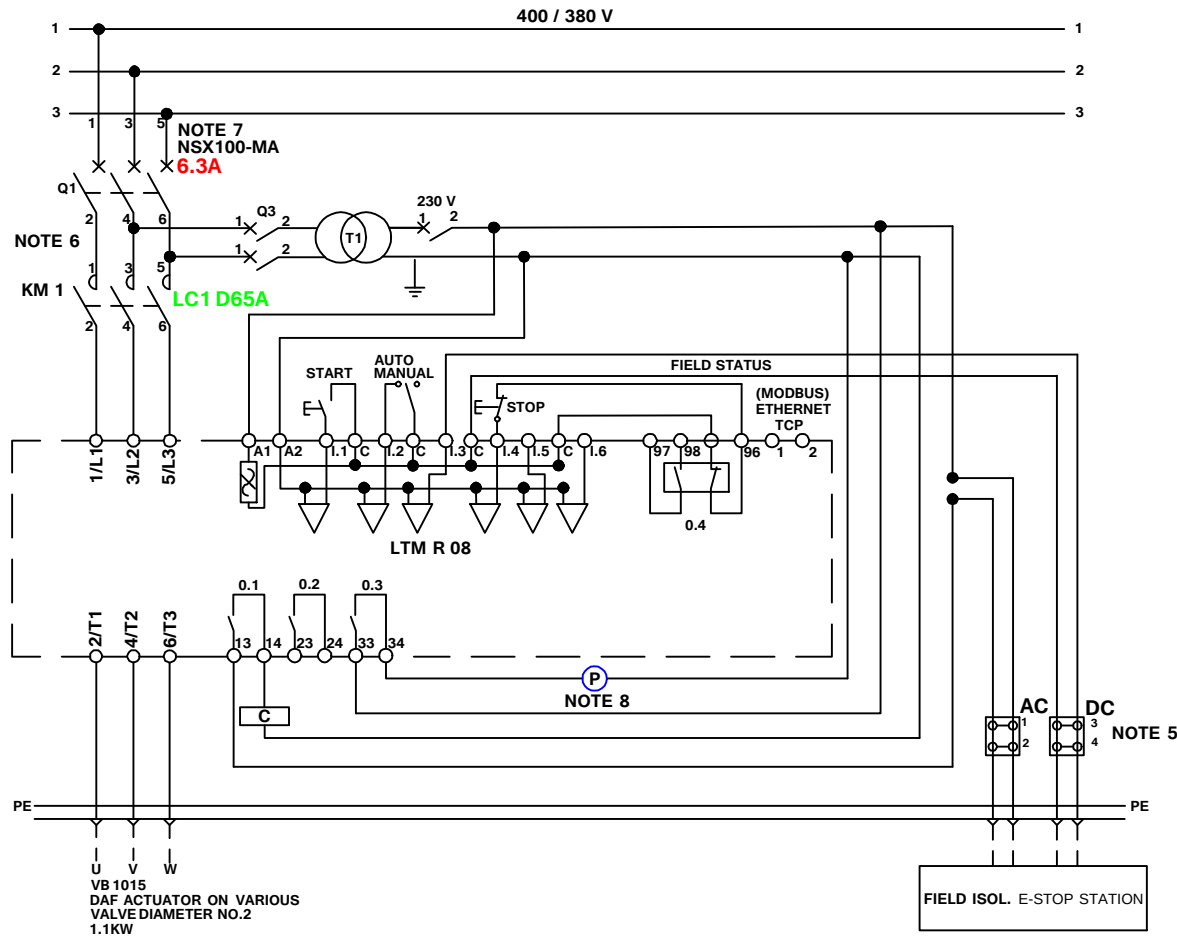
DATE :
16-02-2016

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - DAF ACTUATOR ON VARIOUS VALVE DIAMETERS NO.2

DRW. NO:
14004-E-MC2-032

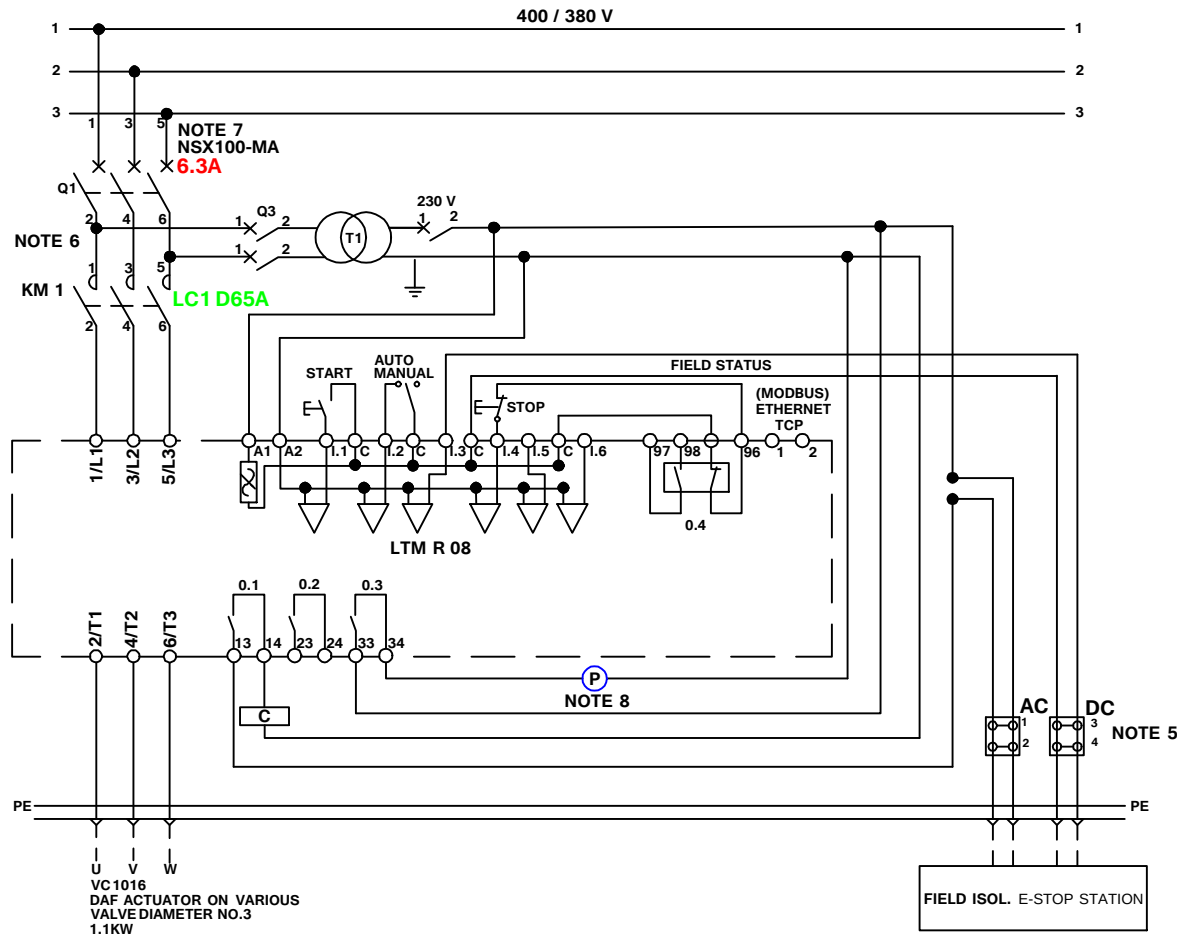
REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

GENERAL NOTES:

1. Auto Manual switch mounted on door.
2. Start/Stop switch mounted on door.
3. On manual Start/Stop are Active.
4. On Auto mode door mounted Start/Stop buttons are not active.
5. The AC & DC must run on separate 3 core 2.5mm cables.
6. Line to Line connection for control transformers must be balanced.
7. The NSX100-MA breaker fitted with a Vigi MH earth leakage unit.
8. Pilot light is a 230V LED cluster indicating motor running mounted on the door panel.



ISSUED FOR TENDER



SHEET: 1-1 SCALE: N.T.S

REV: 02 SIZE: A4

DRAWING TITLE
EXPANSION WORKS - DAF ACTUATOR ON VARIOUS VALVE DIAMETERS NO.3

DRW. NO:
14004-E-MC2-033

REVISED BY:
J.MOLEFE

CHECKED:
T.CHAUKE

DATE:
19-07-2016

PROJECT: BLOEMHOF WATER TREATMENT WORKS SCHEME				WTW EXPANSION			PROJECT NO. : 6452						14004-K-E-T								
CLIENT: Dr Ruth Mpati Municipality							LOCATION: LEKWA TEEMANE MUNICIPALITY SOUTH AFRICA														
ISSUED FOR: APPROVAL							DETAILED DESIGN - WTW EXPANSION														
							DESIGNED BY: KIEREET CHOTU														
ISSUE DATE: 12 February 2016							CHECKED BY: KIEREET CHOTU														
REVISION: 00							APPROVED BY: TERENCE CHAUKE														
DRAWING No. 14004-E-CS-004							TITLE: CABLE SCHEDULE (INSTRUMENT LIST)														
Rec No	Dev No	Tag	Process Area	Equipment	Measurement	INTSR	TYPE	IJB	Volts	Cable	Type	Length (m)	Notes	Position	IO Card	IO No.	PB Address	Inp1 Add	Inp2 Add	Out1 Add	Out2 Add
1	1	INL-FM-001-PV	Pump Station Inlet	Raw Water Pump Station Inlet Flow	Flow Transmitter	FIT	AI	IJB-001	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened								
2	2	INL-BV-001-XY-OPN	Pump Station Inlet	Raw Water Pump Station Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-001	24	12c x 1.0mm²	OAM PVC	30	12 core								
3	3	INL-BV-001-XY-CLS	Pump Station Inlet	Raw Water Pump Station Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-001	24												
4	4	INL-BV-001-ZS-OPN	Pump Station Inlet	Raw Water Pump Station Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-001	24												
5	5	INL-BV-001-ZS-CLS	Pump Station Inlet	Raw Water Pump Station Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-001	24												
6	6	INL-BV-002-XY-OPN	Pump Station Inlet	Flocculation Valve Open Output	Solenoid	VLVx	DQ	IJB-001	24	12c x 1.0mm²	OAM PVC	30	12 core								
7	7	INL-BV-002-XY-CLS	Pump Station Inlet	Flocculation Valve Close Output	Solenoid	VLV	DQ	IJB-001	24												
8	8	INL-BV-002-ZS-OPN	Pump Station Inlet	Flocculation Valve Open Feedback	Limit Switch	VLV	DI	IJB-001	24												
9	9	INL-BV-002-ZS-CLS	Pump Station Inlet	Flocculation Valve Close Feedback	Limit Switch	VLV	DI	IJB-001	24												
10	10	POLY-TK1-V-01-XY-OPN	Polymer Dosing	Polymer Tank 1 Drain Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
11	11	POLY-TK1-V-01-XY-CLS	Polymer Dosing	Polymer Tank 1 Drain Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
12	12	POLY-TK1-V-01-ZS-OPN	Polymer Dosing	Polymer Tank 1 Drain Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
13	13	POLY-TK1-V-01-ZS-CLS	Polymer Dosing	Polymer Tank 1 Drain Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
14	14	POLY-TK1-V-02-XY-OPN	Polymer Dosing	Polymer Tank 1 Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
15	15	POLY-TK1-V-02-XY-CLS	Polymer Dosing	Polymer Tank 1 Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
16	16	POLY-TK1-V-02-ZS-OPN	Polymer Dosing	Polymer Tank 1 Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
17	17	POLY-TK1-V-02-ZS-CLS	Polymer Dosing	Polymer Tank 1 Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
18	18	POLY-TK1-V-03-XY-OPN	Polymer Dosing	Polymer Tank 1 Measuring Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
19	19	POLY-TK1-V-03-XY-CLS	Polymer Dosing	Polymer Tank 1 Measuring Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
20	20	POLY-TK1-V-03-ZS-OPN	Polymer Dosing	Polymer Tank 1 Measuring Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
21	21	POLY-TK1-V-03-ZS-CLS	Polymer Dosing	Polymer Tank 1 Measuring Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
22	22	POLY-TK1-V-04-XY-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
23	23	POLY-TK1-V-04-XY-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
24	24	POLY-TK1-V-04-ZS-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
25	25	POLY-TK1-V-04-ZS-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
26	26	POLY-TK1-RV-01-XY-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
27	27	POLY-TK1-RV-01-XY-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
28	28	POLY-TK1-RV-01-ZS-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
29	29	POLY-TK1-RV-01-ZS-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
30	30	POLY-TK1-V-05-XY-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
31	31	POLY-TK1-V-05-XY-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
32	32	POLY-TK1-V-05-ZS-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
33	33	POLY-TK1-V-05-ZS-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
34	34	POLY-TK1-RV-02-XY-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
35	35	POLY-TK1-RV-02-XY-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
36	36	POLY-TK1-RV-02-ZS-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
37	37	POLY-TK1-RV-02-ZS-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
38	38	POLY-TK2-V-01-XY-OPN	Polymer Dosing	Polymer Tank 2 Drain Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
39	39	POLY-TK2-V-01-XY-CLS	Polymer Dosing	Polymer Tank 2 Drain Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
40	40	POLY-TK2-V-01-ZS-OPN	Polymer Dosing	Polymer Tank 2 Drain Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
41	41	POLY-TK2-V-01-ZS-CLS	Polymer Dosing	Polymer Tank 2 Drain Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
42	42	POLY-TK2-V-02-XY-OPN	Polymer Dosing	Polymer Tank 2 Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
43	43	POLY-TK2-V-02-XY-CLS	Polymer Dosing	Polymer Tank 2 Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
44	44	POLY-TK2-V-02-ZS-OPN	Polymer Dosing	Polymer Tank 2 Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
45	45	POLY-TK2-V-02-ZS-CLS	Polymer Dosing	Polymer Tank 2 Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
46	46	POLY-TK2-V-03-XY-OPN	Polymer Dosing	Polymer Tank 2 Measuring Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
47	47	POLY-TK2-V-03-XY-CLS	Polymer Dosing	Polymer Tank 2 Measuring Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
48	48	POLY-TK2-V-03-ZS-OPN	Polymer Dosing	Polymer Tank 2 Measuring Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
49	49	POLY-TK2-V-03-ZS-CLS	Polymer Dosing	Polymer Tank 2 Measuring Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
50	50	POLY-TK2-V-04-XY-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
51	51	POLY-TK2-V-04-XY-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
52	52	POLY-TK2-V-04-ZS-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
53	53	POLY-TK2-V-04-ZS-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
54	54	POLY-TK2-RV-01-XY-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
55	55	POLY-TK2-RV-01-XY-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
56	56	POLY-TK2-RV-01-ZS-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
57	57	POLY-TK2-RV-01-ZS-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												

[illegible]

142	142	FIL-TK2-VA-1011-OPN	Filters	Filter Tank 2 Filter Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-012	24	7c x 1.0mm²	OAM PVC	30	7 core										
143	143	FIL-TK2-VA-1011-CLS	Filters	Filter Tank 2 Filter Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-012	24														
144	144	FIL-TK2-VA-1012-OPN	Filters	Filter Tank 2 Sludge Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-012	24	7c x 1.0mm²	OAM PVC	30	7 core										
145	145	FIL-TK2-VA-1012-CLS	Filters	Filter Tank 2 Sludge Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-012	24														
146	146	FIL-TK2-MV-04	Filters	Filter Tank 2 Filter Inlet Motorised Control Valve Output	Control Valve	CVLVx	AQ	IJB-012	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
147	147	FIL-TK2-LI-001-PV	Filters	Filter Tank 2 Level	Level Transmitter	LIT	AI	IJB-012	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
148	148	FIL-TK3-VA-1009-OPN	Filters	Filter Tank 3 DAF Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
149	149	FIL-TK3-VA-1009-CLS	Filters	Filter Tank 3 DAF Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
150	150	FIL-TK3-VA-1010-OPN	Filters	Filter Tank 3 Disinfection Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
151	151	FIL-TK3-VA-1010-CLS	Filters	Filter Tank 3 Disinfection Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
152	152	FIL-TK3-VA-1011-OPN	Filters	Filter Tank 3 Filter Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
153	153	FIL-TK3-VA-1011-CLS	Filters	Filter Tank 3 Filter Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
154	154	FIL-TK3-VA-1012-OPN	Filters	Filter Tank 3 Sludge Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
155	155	FIL-TK3-VA-1012-CLS	Filters	Filter Tank 3 Sludge Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
156	156	FIL-TK3-MV-04	Filters	Filter Tank 3 Filter Inlet Motorised Control Valve Output	Control Valve	CVLVx	AQ	IJB-013	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
157	157	FIL-TK3-LI-001-PV	Filters	Filter Tank 3 Level	Level Transmitter	LIT	AI	IJB-013	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
158	158	FIL-TK4-VA-1009-OPN	Filters	Filter Tank 4 DAF Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
159	159	FIL-TK4-VA-1009-CLS	Filters	Filter Tank 4 DAF Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
160	160	FIL-TK4-VA-1010-OPN	Filters	Filter Tank 4 Disinfection Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
161	161	FIL-TK4-VA-1010-CLS	Filters	Filter Tank 4 Disinfection Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
162	162	FIL-TK4-VA-1011-OPN	Filters	Filter Tank 4 Filter Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
163	163	FIL-TK4-VA-1011-CLS	Filters	Filter Tank 4 Filter Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
164	164	FIL-TK4-VA-1012-OPN	Filters	Filter Tank 4 Sludge Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
165	165	FIL-TK4-VA-1012-CLS	Filters	Filter Tank 4 Sludge Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
166	166	FIL-TK4-MV-04	Filters	Filter Tank 4 Filter Inlet Motorised Control Valve Output	Control Valve	CVLVx	AQ	IJB-014	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
167	167	FIL-TK4-LI-001-PV	Filters	Filter Tank 4 Level	Level Transmitter	LIT	AI	IJB-014	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
							167					1920											
		SUMMARY	COUNTS	UNIT																			
		Digital Inputs	100	ea		TYPE	TYPE	TYPE	TYPE														
		Digital Outputs	52	ea		DI	DQ	AI	AQ														
		Analog Inputs	7	ea																			
		Analog Outputs	8	ea		Cable	Cable	Cable															
		Junction Boxes	14	ea		2pair x 1.0mm²	7c x 1.0mm²	12c x 1.0mm²															
		2pair x 1.0mm²	420	m																			
		7c x 1.0mm²	720	m																			
		12c x 1.0mm²	780	m																			
		4c x 1.0mm²	760	m																			
		21c x 1.0mm²	700	m																			

PROJECT: BLOEMHOF WATER TREATMENT WORKS SCHEME				WTW EXPANSION			PROJECT NO. : 6452						14004-K-E-T								
CLIENT: Dr Ruth Mpati Municipality							LOCATION: LEKWA TEEMANE MUNICIPALITY SOUTH AFRICA														
ISSUED FOR: APPROVAL							DETAILED DESIGN - WTW EXPANSION														
							DESIGNED BY: KIEREET CHOTU														
ISSUE DATE: 12 February 2016							CHECKED BY: KIEREET CHOTU														
REVISION: 00							APPROVED BY: TERENCE CHAUKE														
DRAWING No. 14004-E-CS-004							TITLE: CABLE SCHEDULE (INSTRUMENT LIST)														
Rec No	Dev No	Tag	Process Area	Equipment	Measurement	INTSR	TYPE	IJB	Volts	Cable	Type	Length (m)	Notes	Position	IO Card	IO No.	PB Address	Inp1 Add	Inp2 Add	Out1 Add	Out2 Add
1	1	INL-FM-001-PV	Pump Station Inlet	Raw Water Pump Station Inlet Flow	Flow Transmitter	FIT	AI	IJB-001	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened								
2	2	INL-BV-001-XY-OPN	Pump Station Inlet	Raw Water Pump Station Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-001	24	12c x 1.0mm²	OAM PVC	30	12 core								
3	3	INL-BV-001-XY-CLS	Pump Station Inlet	Raw Water Pump Station Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-001	24												
4	4	INL-BV-001-ZS-OPN	Pump Station Inlet	Raw Water Pump Station Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-001	24												
5	5	INL-BV-001-ZS-CLS	Pump Station Inlet	Raw Water Pump Station Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-001	24												
6	6	INL-BV-002-XY-OPN	Pump Station Inlet	Flocculation Valve Open Output	Solenoid	VLVx	DQ	IJB-001	24	12c x 1.0mm²	OAM PVC	30	12 core								
7	7	INL-BV-002-XY-CLS	Pump Station Inlet	Flocculation Valve Close Output	Solenoid	VLV	DQ	IJB-001	24												
8	8	INL-BV-002-ZS-OPN	Pump Station Inlet	Flocculation Valve Open Feedback	Limit Switch	VLV	DI	IJB-001	24												
9	9	INL-BV-002-ZS-CLS	Pump Station Inlet	Flocculation Valve Close Feedback	Limit Switch	VLV	DI	IJB-001	24												
10	10	POLY-TK1-V-01-XY-OPN	Polymer Dosing	Polymer Tank 1 Drain Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
11	11	POLY-TK1-V-01-XY-CLS	Polymer Dosing	Polymer Tank 1 Drain Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
12	12	POLY-TK1-V-01-ZS-OPN	Polymer Dosing	Polymer Tank 1 Drain Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
13	13	POLY-TK1-V-01-ZS-CLS	Polymer Dosing	Polymer Tank 1 Drain Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
14	14	POLY-TK1-V-02-XY-OPN	Polymer Dosing	Polymer Tank 1 Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
15	15	POLY-TK1-V-02-XY-CLS	Polymer Dosing	Polymer Tank 1 Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
16	16	POLY-TK1-V-02-ZS-OPN	Polymer Dosing	Polymer Tank 1 Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
17	17	POLY-TK1-V-02-ZS-CLS	Polymer Dosing	Polymer Tank 1 Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
18	18	POLY-TK1-V-03-XY-OPN	Polymer Dosing	Polymer Tank 1 Measuring Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
19	19	POLY-TK1-V-03-XY-CLS	Polymer Dosing	Polymer Tank 1 Measuring Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
20	20	POLY-TK1-V-03-ZS-OPN	Polymer Dosing	Polymer Tank 1 Measuring Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
21	21	POLY-TK1-V-03-ZS-CLS	Polymer Dosing	Polymer Tank 1 Measuring Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
22	22	POLY-TK1-V-04-XY-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
23	23	POLY-TK1-V-04-XY-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
24	24	POLY-TK1-V-04-ZS-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
25	25	POLY-TK1-V-04-ZS-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
26	26	POLY-TK1-RV-01-XY-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
27	27	POLY-TK1-RV-01-XY-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
28	28	POLY-TK1-RV-01-ZS-OPN	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
29	29	POLY-TK1-RV-01-ZS-CLS	Polymer Dosing	Polymer Tank 1 Primary Dosing Pump Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
30	30	POLY-TK1-V-05-XY-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
31	31	POLY-TK1-V-05-XY-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
32	32	POLY-TK1-V-05-ZS-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
33	33	POLY-TK1-V-05-ZS-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
34	34	POLY-TK1-RV-02-XY-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-002	24	12c x 1.0mm²	OAM PVC	30	12 core								
35	35	POLY-TK1-RV-02-XY-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-002	24												
36	36	POLY-TK1-RV-02-ZS-OPN	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-002	24												
37	37	POLY-TK1-RV-02-ZS-CLS	Polymer Dosing	Polymer Tank 1 Secondary Dosing Pump Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-002	24												
38	38	POLY-TK2-V-01-XY-OPN	Polymer Dosing	Polymer Tank 2 Drain Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
39	39	POLY-TK2-V-01-XY-CLS	Polymer Dosing	Polymer Tank 2 Drain Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
40	40	POLY-TK2-V-01-ZS-OPN	Polymer Dosing	Polymer Tank 2 Drain Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
41	41	POLY-TK2-V-01-ZS-CLS	Polymer Dosing	Polymer Tank 2 Drain Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
42	42	POLY-TK2-V-02-XY-OPN	Polymer Dosing	Polymer Tank 2 Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
43	43	POLY-TK2-V-02-XY-CLS	Polymer Dosing	Polymer Tank 2 Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
44	44	POLY-TK2-V-02-ZS-OPN	Polymer Dosing	Polymer Tank 2 Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
45	45	POLY-TK2-V-02-ZS-CLS	Polymer Dosing	Polymer Tank 2 Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
46	46	POLY-TK2-V-03-XY-OPN	Polymer Dosing	Polymer Tank 2 Measuring Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
47	47	POLY-TK2-V-03-XY-CLS	Polymer Dosing	Polymer Tank 2 Measuring Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
48	48	POLY-TK2-V-03-ZS-OPN	Polymer Dosing	Polymer Tank 2 Measuring Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
49	49	POLY-TK2-V-03-ZS-CLS	Polymer Dosing	Polymer Tank 2 Measuring Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
50	50	POLY-TK2-V-04-XY-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
51	51	POLY-TK2-V-04-XY-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
52	52	POLY-TK2-V-04-ZS-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
53	53	POLY-TK2-V-04-ZS-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Inlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												
54	54	POLY-TK2-RV-01-XY-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Open Output	Solenoid	VLVx	DQ	IJB-003	24	12c x 1.0mm²	OAM PVC	30	12 core								
55	55	POLY-TK2-RV-01-XY-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Close Output	Solenoid	VLV	DQ	IJB-003	24												
56	56	POLY-TK2-RV-01-ZS-OPN	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Open Feedback	Limit Switch	VLV	DI	IJB-003	24												
57	57	POLY-TK2-RV-01-ZS-CLS	Polymer Dosing	Polymer Tank 2 Primary Dosing Pump Outlet Valve Close Feedback	Limit Switch	VLV	DI	IJB-003	24												

[illegible]

142	142	FIL-TK2-VA-1011-OPN	Filters	Filter Tank 2 Filter Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-012	24	7c x 1.0mm²	OAM PVC	30	7 core										
143	143	FIL-TK2-VA-1011-CLS	Filters	Filter Tank 2 Filter Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-012	24														
144	144	FIL-TK2-VA-1012-OPN	Filters	Filter Tank 2 Sludge Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-012	24	7c x 1.0mm²	OAM PVC	30	7 core										
145	145	FIL-TK2-VA-1012-CLS	Filters	Filter Tank 2 Sludge Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-012	24														
146	146	FIL-TK2-MV-04	Filters	Filter Tank 2 Filter Inlet Motorised Control Valve Output	Control Valve	CVLVx	AQ	IJB-012	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
147	147	FIL-TK2-LI-001-PV	Filters	Filter Tank 2 Level	Level Transmitter	LIT	AI	IJB-012	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
148	148	FIL-TK3-VA-1009-OPN	Filters	Filter Tank 3 DAF Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
149	149	FIL-TK3-VA-1009-CLS	Filters	Filter Tank 3 DAF Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
150	150	FIL-TK3-VA-1010-OPN	Filters	Filter Tank 3 Disinfection Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
151	151	FIL-TK3-VA-1010-CLS	Filters	Filter Tank 3 Disinfection Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
152	152	FIL-TK3-VA-1011-OPN	Filters	Filter Tank 3 Filter Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
153	153	FIL-TK3-VA-1011-CLS	Filters	Filter Tank 3 Filter Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
154	154	FIL-TK3-VA-1012-OPN	Filters	Filter Tank 3 Sludge Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-013	24	7c x 1.0mm²	OAM PVC	30	7 core										
155	155	FIL-TK3-VA-1012-CLS	Filters	Filter Tank 3 Sludge Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-013	24														
156	156	FIL-TK3-MV-04	Filters	Filter Tank 3 Filter Inlet Motorised Control Valve Output	Control Valve	CVLVx	AQ	IJB-013	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
157	157	FIL-TK3-LI-001-PV	Filters	Filter Tank 3 Level	Level Transmitter	LIT	AI	IJB-013	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
158	158	FIL-TK4-VA-1009-OPN	Filters	Filter Tank 4 DAF Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
159	159	FIL-TK4-VA-1009-CLS	Filters	Filter Tank 4 DAF Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
160	160	FIL-TK4-VA-1010-OPN	Filters	Filter Tank 4 Disinfection Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
161	161	FIL-TK4-VA-1010-CLS	Filters	Filter Tank 4 Disinfection Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
162	162	FIL-TK4-VA-1011-OPN	Filters	Filter Tank 4 Filter Inlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
163	163	FIL-TK4-VA-1011-CLS	Filters	Filter Tank 4 Filter Inlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
164	164	FIL-TK4-VA-1012-OPN	Filters	Filter Tank 4 Sludge Outlet Motorised Valve Open Feedback	Limit Switch	MVLVx	DI	IJB-014	24	7c x 1.0mm²	OAM PVC	30	7 core										
165	165	FIL-TK4-VA-1012-CLS	Filters	Filter Tank 4 Sludge Outlet Motorised Valve Close Feedback	Limit Switch	MVLV	DI	IJB-014	24														
166	166	FIL-TK4-MV-04	Filters	Filter Tank 4 Filter Inlet Motorised Control Valve Output	Control Valve	CVLVx	AQ	IJB-014	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
167	167	FIL-TK4-LI-001-PV	Filters	Filter Tank 4 Level	Level Transmitter	LIT	AI	IJB-014	24	2pair x 1.0mm²	OAM PVC	30	Overall and Individual Screened										
							167					1920											
		SUMMARY	COUNTS	UNIT																			
		Digital Inputs	100	ea		TYPE	TYPE	TYPE	TYPE														
		Digital Outputs	52	ea		DI	DQ	AI	AQ														
		Analog Inputs	7	ea																			
		Analog Outputs	8	ea		Cable	Cable	Cable															
		Junction Boxes	14	ea		2pair x 1.0mm²	7c x 1.0mm²	12c x 1.0mm²															
		2pair x 1.0mm²	420	m																			
		7c x 1.0mm²	720	m																			
		12c x 1.0mm²	780	m																			
		4c x 1.0mm²	760	m																			
		21c x 1.0mm²	700	m																			

CIRCUIT NAME		PFC PANEL 600VAr	WTW REFURB MCC	WTW ABSTR MCC	WTW EXP MCC	WTW EXP MCC	WTW EXP MCC
TYPE	INCOMER	FEEDER	FEEDER	FEEDER	FEEDER	FEEDER	FEEDER
RATING	1600 A	1000A	600A	500A	600A	600A	800A
SHORT CIRCUIT	-	-	-	-	-	-	-
TRIPPING CURVE	D	D	D	D	D	D	D
PHASES	3P+N+E	3P+N+E	3P+N+E	3P+N+E	3P+N+E	3P+N+E	3P+N+E
ENERGY METER TYPE	-	-	-	-	-	-	-
FEEDER CABLE	6 x 1000mm² i – core cable	120mm² 4 core	120mm² 4 core	2 X 120mm² 4 core	2 X 120mm² 4 core	2 X 120mm² 4 core	2 X 120mm² 4 core
CABLE LENGTH	80m	80m	101m	80m	65m	65m	65m
UNIT AREA							

ISSUED FOR TENDER



SHEET: 1-1	SCALE: AS SHOWN
REV : 00	SIZE: A4

DRAWING TITLE EXPANSION WORKS -MAIN DB SCHEDULE	DRW. NO : 14004-E-DBS-005	DRAWN & DESIGNED BY : J.MOLEFE	APPROVED : T.CHAUKE	DATE : 25-10-2016	REV : 00	SIZE: A4

MAIN DB

400/230V 10kA BUSBAR 3P+N+Earth

CIRCUIT NAME		LOCAL PUMP STATION MCC	WORLEY PARSONS MCC
TYPE	INCOMER	FEEDER	FEEDER
RATING	800A	300A	500A
SHORT CIRCUIT	-	-	-
TRIPPING CURVE	D	D	D
PHASES	3P+N+E	3P+N+E	3P+N+E
ENERGY METER TYPE	-	-	-
FEEDER CABLE	2 X 120mm ² 4 core	120mm ² 4 core	-
CABLE LENGTH	80m	80m	-
UNIT AREA			

ISSUED FOR TENDER



SHEET:
1-1

SCALE:
AS SHOWN

DRAWING TITLE
EXPANSION WORKS - NEW PUMP STATION SUB DB-SCHEDULE

DRW. NO :
14004-E-DBS-006

DRAWN & DESIGNED BY :
J.MOLEFE

APPROVED :
T.CHAUKE

DATE :
25-10-2016

REV :
00

SIZE:
A4

Sl.No	Hardware / Type	Model No.	Quantity (approx)	Unit
PLC - Schneider Modicon Premium				
1	Central Processor (CPU)	TSXP573634M	573X4 ETH UNY PROCESSOR	1
2	Power Supply	TSXP5Y5500M	100/240VAC 55W POW.SUP.	4
3	Expansion Rack	TSXRKY6EX	6 SLOT EXT. RACK	1
4	Central Rack	TSXRKY12EX	12 SLOT EXT. RACK	1
5	Rack Connection Cable	TSXCBY500KT	BUS X EXT. CABLE 50M KIT	1
6	Terminal Connector	TSXCBYK9	SUB D MALE 9 P. CONNECT.	2
7	Bus Terminator	TSXTLYEX	2 BUS X TERMINATOR	1
8	Fan	TSXFANA5P	PLC FAN MODULE 220VAC	2
9	Digital Input	TSXDY32D2K	32I 24VDC SINK CONN	4
10	Digital Output	TSXD5Y32T2K	32Q 24VDC D,1A TR.BLK	2
11	Analog Input	TSXAEY800	8I ANA. HIGH LEVEL	2
12	Analog Output	TSXASY800	8Q ANA. HL NON INSULATED	2
13	Backup Battery	TSXPLP01	BATTERY FOR TSX 37	1
14	Program Storage	TSXMRPP224K	SRAM MEM 224KB PROG	1
UPS Module				
15	UPS Module (Siemens)	6EP1931-2DC21	SITOP DC UPS MODULE 24 V/6 A U	2
16	Battery Unit	6EP1935-6ME21	SITOP BATTERY MODULE 24 V/7 AH	2
NETWORKING				
1	Managed Switch	TCSES6083F23F0	CONNEXIUM BASIC SWITCH 8TX	8
2	Patch Cables	TCSECE3M3M10S4	ETHERNET CABLE 10M CAT 5E W/RJ45 - CE	80
3	Modbus RTU to TCP Gateway		ANYBUS MODBUS RTU to TCP GATEWAY	2
HMI				
1	HMI Panel	HMI6TD4310	7.5 Color Touch Panel VGA-TFT	1
2	Protective Cover	HMI2G64	Screen protection film for 7"5	1
3	PC Cable Adaptor	X8TZ925	CABLE USB ADAPTER	1
PROGRAMMER & SOFTWARE				
1	LAPTOP	DELL LATITUDE	Latitude E5470: One Intel Core i5-6440HQ, Windows 7 Pro	1
2	PLC Programming SW	UNYSPUSFUV1X	UNITY PRO 5 SINGLE LIC	1
3	HMI Designer	VJDSNDTGSV62M	Vijeo Designer, Single License	1
4	HMI Licence	VJDSNRTMPC	Vijeo Designer V5.1 Magellis IPC RT	1
5	Programming Cable	X8TZ945	CONFIGURATION CABLE	1

ISSUED FOR TENDER



SHEET: 1-1	SCALE: AS SHOWN

DRAWING TITLE
EXPANSION WORKS -PROCESS CONTROL SCHEDULE

DRW. NO :
14004-E-PCS-037

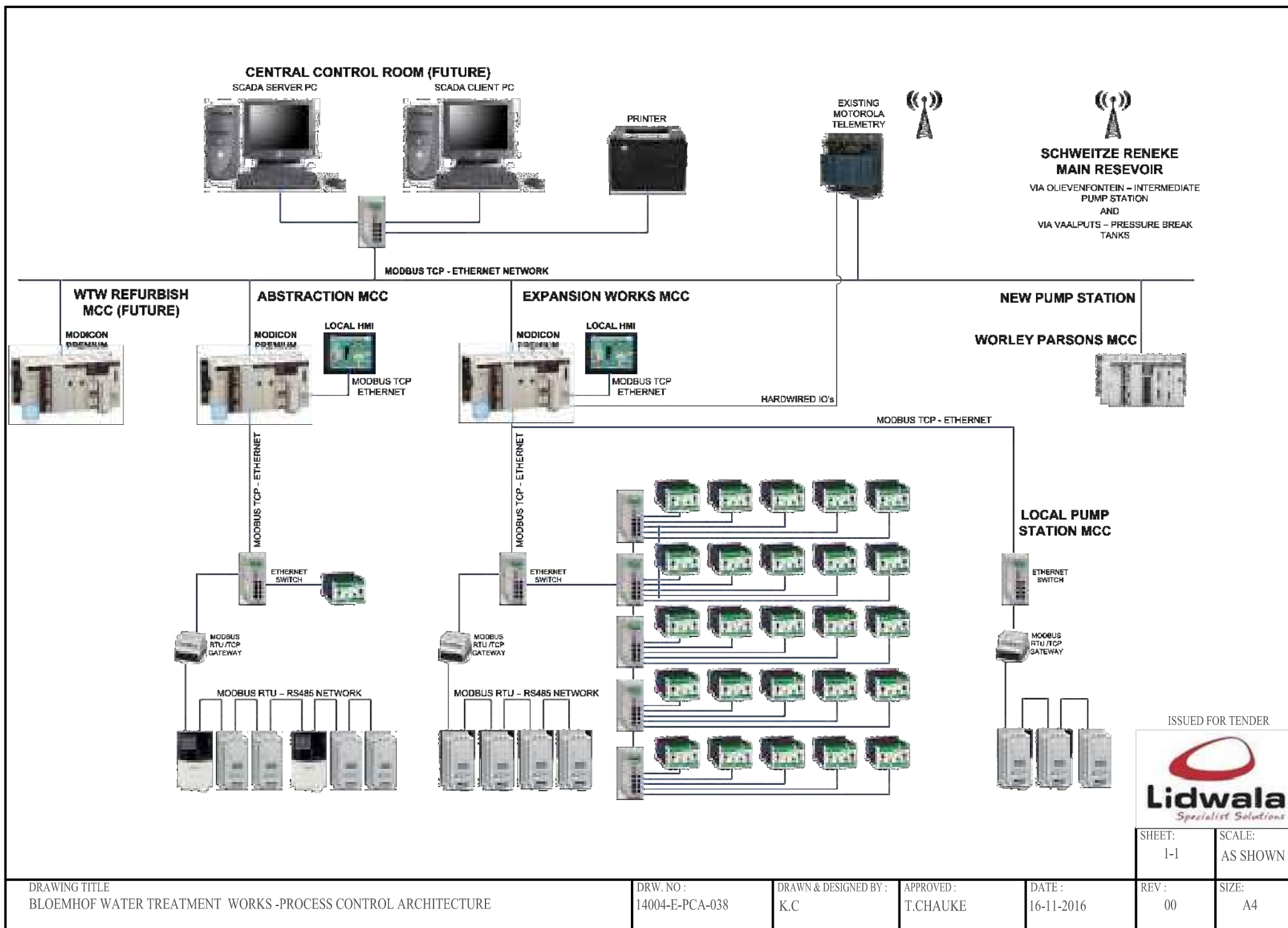
DRAWN & DESIGNED BY :
K.C

APPROVED :
T.CHAUKE

DATE :
15-11-2016

REV :
00

SIZE:
A4



DRAWING TITLE
BLOEMHOF WATER TREATMENT WORKS -PROCESS CONTROL ARCHITECTURE

DRW. NO :
14004-E-PCA-038

DRAWN & DESIGNED BY :
K.C

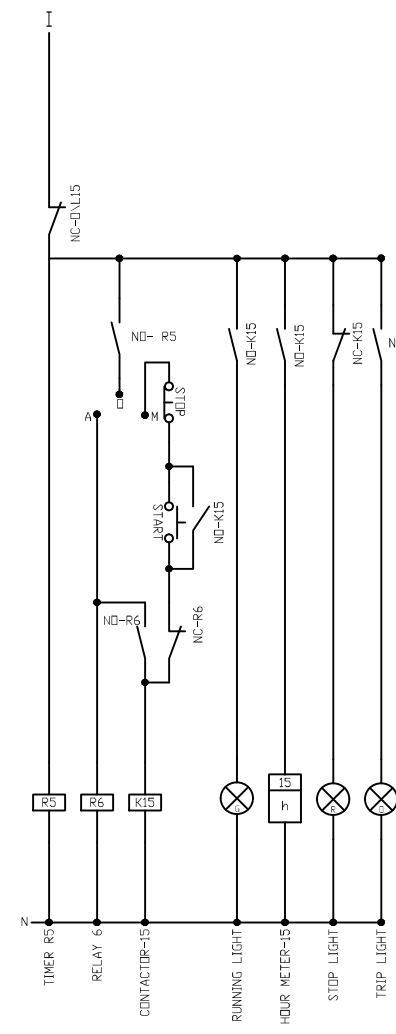
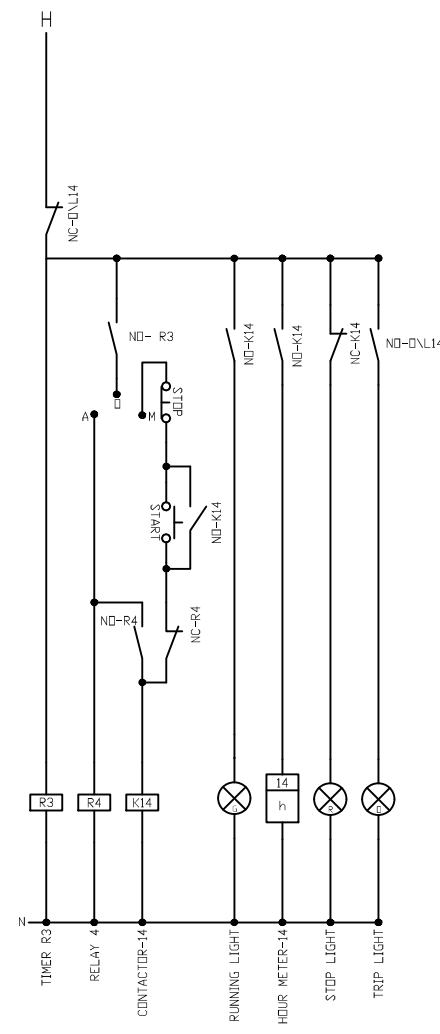
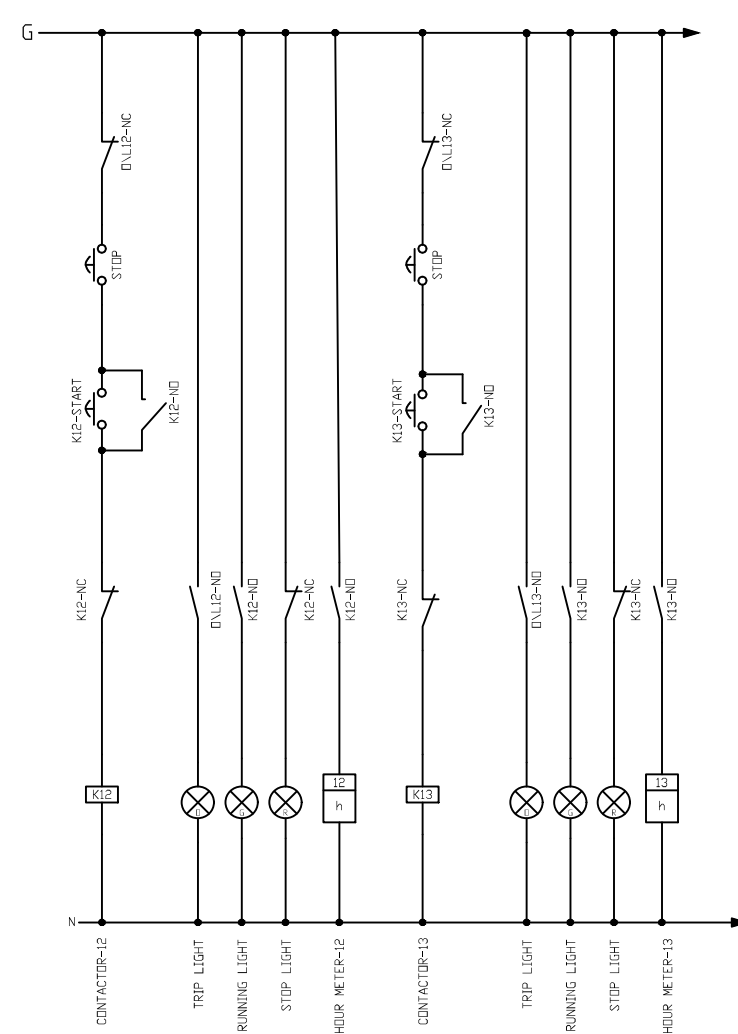
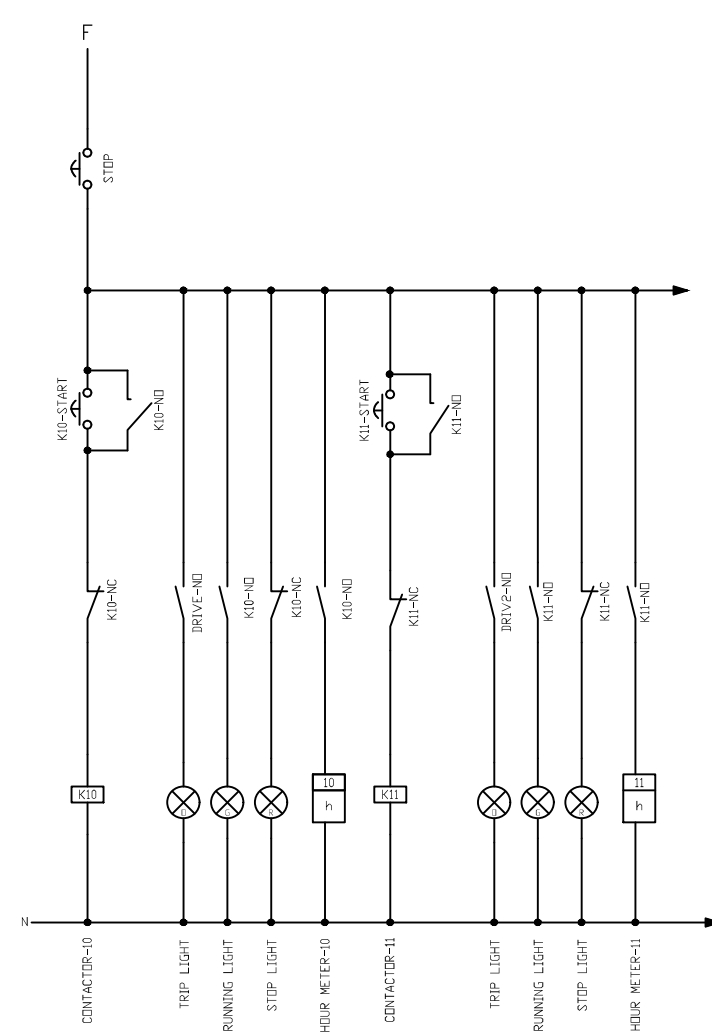
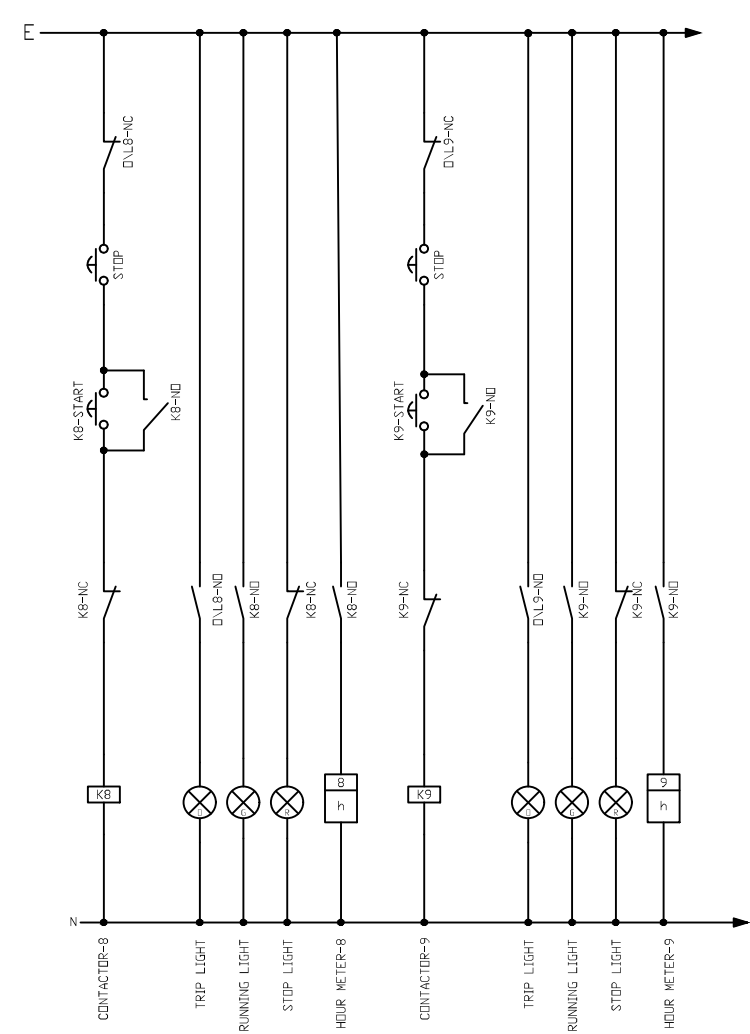
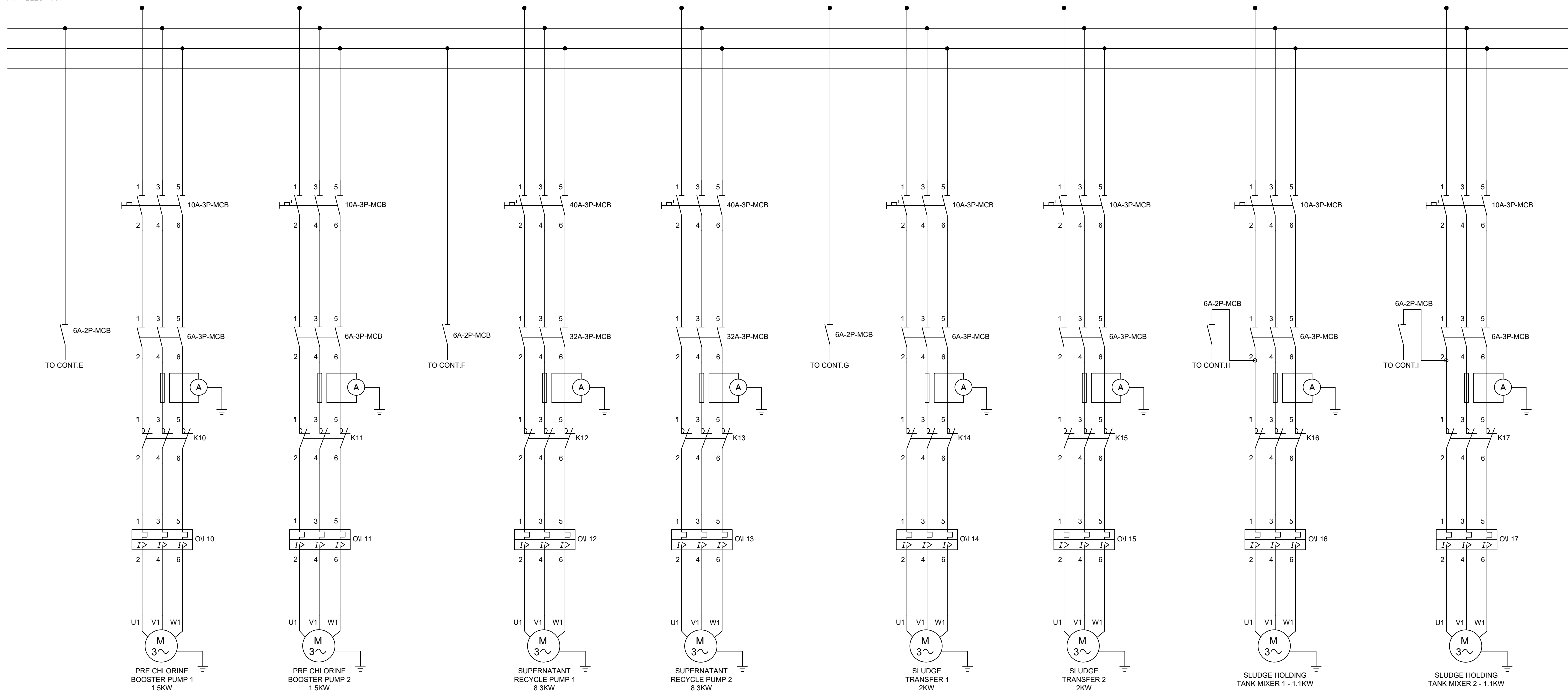
APPROVED :
T.CHAUKE

DATE :
16-11-2016

REV :
00

SIZE:
A4

FROM
031-A01-WTW-ELEC-001



CONTINUES ON
031-A01-WTW-ELEC-003

NOTES / LEGEND

THIS DRAWING IS TO BE READ IN CONNECTION WITH ALL RELEVANT DRAWINGS AND CONTRACT SPECIFICATIONS ANY DISCREPANCIES TO BE RECORDED AND THE ENGINEER'S ATTENTION PRIOR TO IMPLEMENTATION OF ANY WORK.

1. CONTRACTOR TO KEEP A FULL SET OF DRAWINGS ON SITE.
2. CONTRACTOR TO BE RESPONSIBLE FOR CORRECT SETTING OUT OF BUILDINGS OR WITH PARTICULAR INTEREST TO BOUNDARIES AND BUILDING LINES.
3. CONTRACTOR TO VERIFY ALL DIMENSIONS PRIOR TO COMMENCEMENT OF WORK.
4. SCALING OF DRAWINGS IS NOT PERMITTED. PREFERED DIMENSIONS ONLY TO BE USED.
5. CONTRACTOR TO IDENTIFY AND EXPOSE ALL UNDER GROUND SERVICES ON SITE WHERE RELEVANT.
6. CONSTRUCTION TO BE IN ACCORDANCE WITH ALL RELEVANT DRAWINGS AND CONTRACT SPECIFICATIONS.
7. THE ENGINEER IS REQUIRED ON SITE FOR ALL WORK NOTICED OR REQUESTED.
8. ELECTRICAL INSTALLATION TO BE IN ACCORDANCE WITH THE RELEVANT ELECTRICAL UNIFORM INSTALLATION TO BE AS PER SPANS 17424.
9. ALL WORK MUST BE TO THE RELEVANT BRITISH STANDARDS.
10. ALL CURRENT CABLES WILL BE RECD FROM MAIN SUBSTATION.

COPY RIGHT

DO NOT SCALE
IF IN DOUBT, REFER TO DRAWING OFFICE

CLIENT PLAN NUMBER

AMENDMENTS COD

INITIAL	No./CODE	REVISION DESCRIPTION

04,09,2024	0	Issued For Construction

APPROVED BY COUNCIL / CLIENT

CITY ENGINEER / CLIENT

REG. NO.

DATE _____

CONSULTANT



2 Payne Road
Corner Main Office Park
Bryanston
Johannesburg
1685

TEL: 011 793 5486
EMAIL: info@lidwala.com

CLIENT



34 Church Street
Vryburg
8601

Tel: (+27 53) 928-6400
Fax: (+27 53) 928-2400
Email: info@bophirima.co.za

PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE

EXPANSION MOTOR CONTROL
CENTER 02 – PRE
CHLORINE TO SLUDGE MIXER

SINGLE LINE DIAGRAM (SLD)

M NZOMBE
M. Nzombe
ENGINEER/TECHNOLOGIST

06/09/2024
DATE

SCALE	AS SHOWN	DRAWN	T. MCGATUIS

DATE	AS SHOWN	EXHIBIT	1. MODIFIED

DRAWING NUMBER

REVISION NO.

031-A01-WTW-ELEC-002

0

031-A01-WTW-ELEC-002

0

031-A01-WTW-ELEC-002

ABBREVIATIONS

A

AMMETER

AS

AMMETER SELECTION SWITCH

AWB

WIRE

AFS

AIR FLOW SWITCH

AW

ALARM WIRE

APS

AIR PRESSURE SWITCH

AC

ALARM CANCEL

AUTO

AUTOMATIC

B

BELL OR BUZZER

C

CONTACTOR

CC

CONTACTOR COIL

CT

CURRENT TRANSFORMER

COH

CRANK CASE HEATER

CPS

COMBINATION FUSE SWITCH

CB

CIRCUIT BREAKER

COM

CHANGE OVER RELAY

CR

CONTROL RELAY

D

DAMPEN

EL

EMERGENCY LEVEL

ELN

EARTH LEAKAGE RELAY

EAF

EXHAUST AIR FAN

F

FAN

FM

FAN MOTOR

FU

FUSE

FS

FUSE SWITCH

FSB

FIRE STAT

HS

HEATER BANK

HM

HOUR METER

HP

HIGH PRESSURE SWITCH

ISO

ISOLATOR

KW

KILOWATT

KWH

KILOWATT HOUR

LC

LEVEL CONTROL

LLS

LOW LEVEL SWITCH

LS

LIMIT SWITCH

MAN

MANUAL

MCB

MINIATURE CIRCUIT BREAKER

MCSB

MODULAR CASE CIRCUIT BREAKER

M.O.A

MANUAL OFF

N

NEUTRAL

NC

NORMALLY CLOSED

NO

NORMALLY OPEN

NL

NEUTRAL LINK

OL

OVER LOAD

OHG

OVER HEAT STAT

PE

PRESSURE OPERATING SWITCH

PT

PNEUMATIC TIMER

R

RELAY

RWF

RETURN AIR FAN

RWT

RETURN AIR THERMOSTAT

RR

REMOTE CONTROL RELAY

RT

ROOM THERMOSTAT

RSS

REMOTE STOP START

S

SOLINOID

SS

SELECTION SWITCH

SAT

SUPPLY AIR THERMOSTAT

SAP

SUPPLY AIR FAN

SV

SOLINOID VALVE

T

TIMER

TC

TIME CLOCK

TD

OT DAY TIMER

TR

TIME RELAY

TR

(ON ENERGISE, SLOW MAKE OR BREAK)

TS

TIMER SWITCH

TR

(ON ENERGISE, SLOW MAKE OR BREAK)

TF

TRANSFORMER

TV

THERMOSTAT

LV

LINE GROUND VALVE

WFS

WATER FLOW SWITCH

LEGEND

LAMP FLUORESCENT

NEON

RELAY

OFF DELAY TIMER

ON DELAY TIMER

OVERLOAD

AMMETER

VOLTMETER

CONTACTOR

ISOLATOR

FUSE

CIRCUIT BREAKER

LINK

FUSED ISOLATOR

DIODE

3 POSITION SELECTOR SWITCH MANUAL

MECHANICAL COUPLING OUTDOOR INTERLOCK

HAND OPERATED MECHANISM

TRANSFORMERS - CURRENT

VOLTAGE

3 PHASE INDUCTION MOTOR

2 PHASE INDUCTION MOTOR WITH 4 LEADS BROUGHT OUT

BELL

SOLONOID VALVE

CHAMFER MOTOR

EARTH

CONTACTS - MAKE (NO)

BREAK (NC)

CAM (NO)

FLOW (NC)

PRESSURE (NC)

TEMPERATURE (NC)

LIQUID LEVEL (NO)

CHANGE OVER

MANUALLY OPERATED SWITCH

PUSH BUTTON (NO)

PUSH BUTTON (NC)

PUSH BUTTON (STOP LOCK)

TIMED CONTACT (MAKE DELAYED MAKE)

TIMED CONTACT (BREAK DELAYED BREAK)

TIMED CONTACT (MAKE DELAYED MAKE)

EARTH LEAKAGE

MCB/MCCB

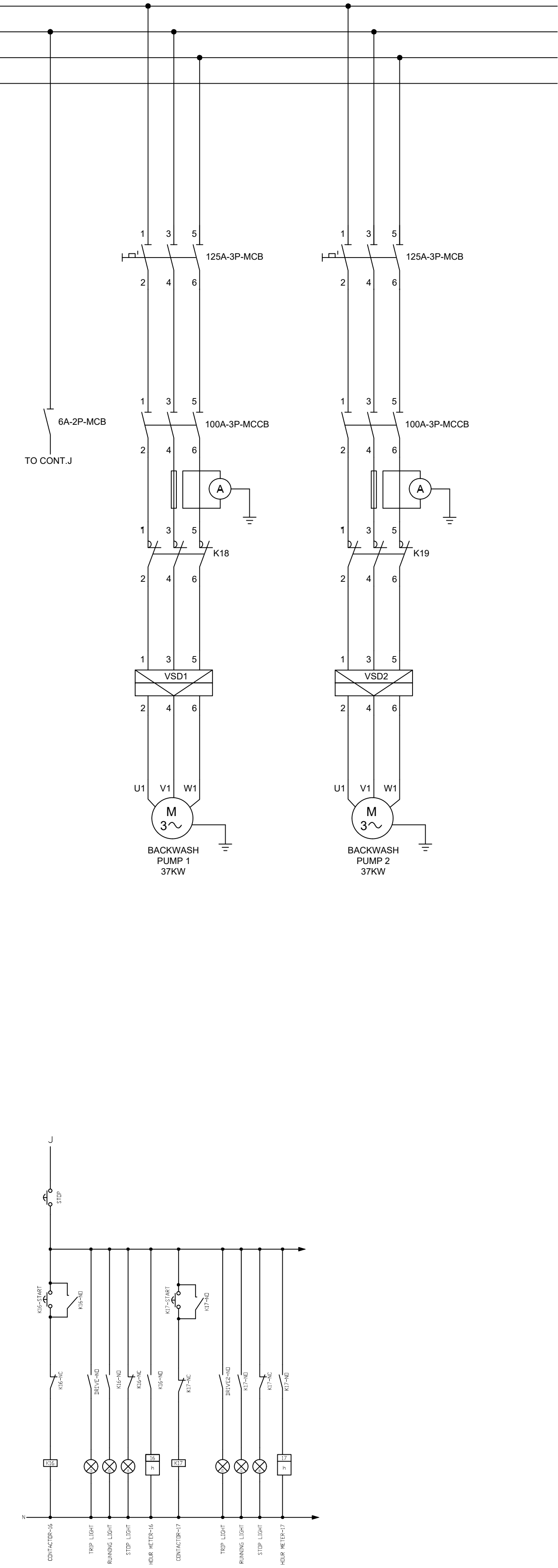
SWITCH

ISOLATOR

TIMER

FROM
031-A01-WTW-ELEC-002

CONTINUES ON
031-A01-WTW-ELEC-004



- NOTES / LEGEND
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND CONTRACT SPECIFICATIONS AND REQUIREMENTS TO BE OBSERVED BY THE ENGINEER'S ATTENTION PRIOR TO IMPLEMENTATION OF ANY WORK.
 2. CONTRACTOR TO KEEP A FULL SET OF DRAWINGS ON SITE.
 3. CONTRACTOR IS RESPONSIBLE FOR CORRECT SETTING OUT OF BUILDINGS ON SITE WITH PARTICULAR INTEREST TO DIMENSIONS AND BULK DIMENSIONS.
 4. CONTRACTOR TO VERIFY ALL LEVELS AND DIMENSIONS ON SITE.
 5. SCALE OF DRAWINGS IS NOT PERMITTED. FIELDWORK DIMENSIONS ONLY TO BE USED.
 6. CONTRACTOR TO IDENTIFY AND EXPOSE ALL UNDERGROUND SERVICES ON SITE WHERE RELEVANT.
 7. CONSTRUCTION TO BE IN ACCORDANCE WITH ALL RELEVANT DRAWINGS, CONTRACT SPECIFICATIONS.
 8. SHOULD THE ENGINEER BE REQUIRED ON SITE, 24 HOURS NOTICE IS REQUESTED.
 9. ELECTRICAL ALL ELECTRICAL INSTALLATION BY THE REGISTERED ELECTRICAL ENGINEER/TECHNOLOGIST.
 10. ALL MATERIAL MUST BE OF A SAME APPROVED STANDARD.
 11. ALL CURRENT CARRYING CABLES WILL BE TESTED FROM MINIMUM SUBSTATION.

COPY RIGHT

DO NOT SCALE

IF IN DOUBT, REFER TO DRAWING OFFICE

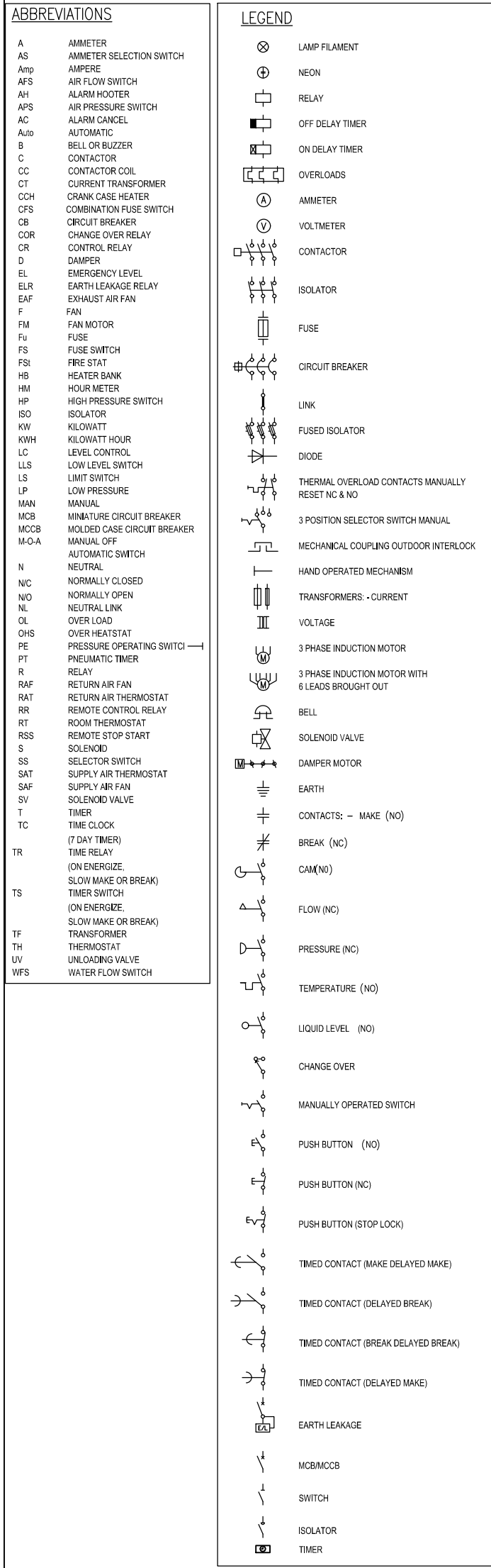
CLIENT PLAN NUMBER

AMENDMENTS CODE

INITIAL	No./CODE	REVISION	DESCRIPTION
04/09/2024	0	Issued For Construction	
APPROVED BY COUNCIL / CLIENT			
CITY ENGINEER / CLIENT		REG. NO.	DATE
CONSULTANT			
			
2 Payne Road Corner Main Office Park Bryanston Johannesburg 1685			
TEL: 011 793 5486 EMAIL: info@lidwala.com			
CLIENT			
			
34 Church Street Vryburg 8601			
Tel: (+27 53) 928-6400 Fax: (+27 53) 928-2401 Email: info@bophirima.co.za			
PROJECT			
UPGRADE & EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS			
DRAWING TITLE			
EXPANSION MOTOR CONTROL CENTER 02 – BACKWASH PUMPS			
SINGLE LINE DIAGRAM (SLD)			
M. NZOMBE 06/09/2024 ENGINEER/TECHNOLOGIST DATE			
SCALE	AS SHOWN	DRAWN	T. MOGATSI
DESIGNED REG. NO.	L. MULAUDI #20190924	CHECKED REG. NO.	AA. MAHERRY #20190924
DRAWING NUMBER		REVISION NO.	
031-A01-WTW-ELEC-003		0	

031-A01-WTW-ELEC-003

CONTINUES ON
031-A01-WTW-ELEC-005



THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND CONTRACT SPECIFICATIONS ANY DISCREPANCIES TO BE BROUGHT TO ENGINEERS ATTENTION PRIOR TO IMPLEMENTATION OF ANY WORK.

CONTRACTOR TO KEEP A RECORD OF ALL DRAWINGS ON SITE.

CONTRACTOR IS RESPONSIBLE FOR CORRECT SETTING OUT OF BUILDINGS ON SITE WITH PARTICULAR INTEREST TO BOUNDARIES AND BUILDING LINES.

CONTRACTOR TO VERIFY ALL LEVELS AND DIMENSIONS ON SITE.

SCALING OF DRAWINGS IS NOT PERMITTED. FIELD DIMENSIONS ONLY TO BE USED.

CONTRACTOR TO IDENTIFY AND EXPOSE ALL UNDER GROUND SERVICES ON SITE WHERE RELEVANT.

CONSTRUCTION IS TO BE IN ACCORDANCE WITH ALL RELEVANT DRAWINGS, CONTRACT SPECIFICATIONS.

THE ENGINEER BE REQUIRED ON SITE, 24 HOURS NOTICE IS REQUESTED.

ELECTRICAL ALL ELECTRICAL INSTALLATION BY THE REGISTERED ELECTRICIAN/HANDYMAN.

INSTALLATION TO BE AS PER SANS 1014-1.

ALL MATERIAL MUST BE OF A QUALITY APPROVED STANDARD.

ALL CURRENT EXISTING LOGS SHALL BE FEE FROM SUBJ. MATERIAL.

DO NOT SCALE
IF IN DOUBT, REFER TO DRAWING OFFICE

AMENDMENTS COD

04/09/2024		0	Issued For Construction
APPROVED BY COUNCIL / CLIENT			

CITY ENGINEER / CLIENT	REG. NO.	DATE

CONSULTANT

CLIENT

34 Church Street
Vryburg
8601

Tel: (+27 53) 928-
Fax: (+27 53) 928-
Email: info@bophirima.

UPGRADE & EXTENSION

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

EXPANSION MOTOR CONTR
CENTER 02 - OVERHEA
CRANE

SINGLE LINE DIAGRAM (SLD)

SCALE	AS SHOWN	DRAWN	T MOGATUS
DESIGNED REG. NO.	L MULAUDI	CHECKED REG. NO.	AA MAHEFI #2019092

DRAWING NUMBER	REVISION NO.

031-A01-WTW-ELEC-004 0

031-A01-WTW-ELEC-005

NOTES / LEGEND		
THE DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND CONTRACT SPECIFICATIONS AND TO BE OBSERVED TO BE SUBORDINATE TO ENGINEER'S ATTENTION PRIOR TO IMPLEMENTATION OF ANY WORK.		
CONTRACTOR TO KEEP A FULL SET OF DRAWINGS ON SITE.		
CONTRACTOR IS RESPONSIBLE FOR CORRECT SETTING OUT OF BUILDINGS ON SITE WITH PARTICULAR REFERENCE TO DIMENSIONS AND BEARING LINES.		
CONTRACTOR TO VERIFY ALL LEVELS AND DIMENSIONS ON SITE.		
SOUNDING OF DIMENSIONS ARE FOR INFORMATION ONLY. NO DIMENSIONS ONLY TO BE USED.		
CONSTRUCTION TO BE IN ACCORDANCE WITH ALL RELEVANT DRAWINGS, CONTRACT SPECIFICATIONS.		
A HOLD THE ENGINEER BE REQUIRED ON SITE, 24 HOURS NOTICE IS REQUESTED.		
ELECTRICAL AND ELECTRICAL INSTALLATION BY THE REQUESTED ELECTRICIAN/ENGINEER.		
INSTALLATION TO BE AS PER STANDARDS.		
ALL MATERIALS MUST BE OF A CLASS APPROVED STANDARD.		
ALL CURRENT CARRYING LOADS MUST BE PROVIDED FROM A SUBSTATION.		
COPY RIGHT		
DO NOT SCALE		
IF IN DOUBT, REFER TO DRAWING OFFICE		
CLIENT PLAN NUMBER		
AMENDMENTS CODE		
INITIAL	No./CODE	REVISION DESCRIPTION
04.09.2024	0	Issued For Construction
APPROVED BY COUNCIL / CLIENT		
CITY ENGINEER / CLIENT		
REG. NO.		
DATE		
CONSULTANT		
		
2 Payne Road Corner Main Office Park Bryanston Johannesburg 1685		
TEL: 011 793 5486 EMAIL: info@lidwala.com		
CLIENT		
		
34 Church Street Veyburg 8601		
Tel: (+27 53) 928-6400 Fax: (+27 53) 928-2401 Email: info@bophirima.co.za		
PROJECT		
UPGRADE & EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS		
DRAWING TITLE		
EXPANSION MOTOR CONTROL CENTER 02 – COMPRESSORS TO LOCAL DB		
SINGLE LINE DIAGRAM (SLD)		
M. NZOMBE W. Nkombe ENGINEER/TECHNOLOGIST		
06/09/2024 DATE		
SCALE	AS SHOWN	DRAWN T. MCGATUSSI
DESIGNED	L. MULAUDZI	CHECKED REG. NO.
REG. NO.		AA MAHERRY #20190924
DRAWING NUMBER		REVISION NO.
031-A01-WTW-ELEC-005		0

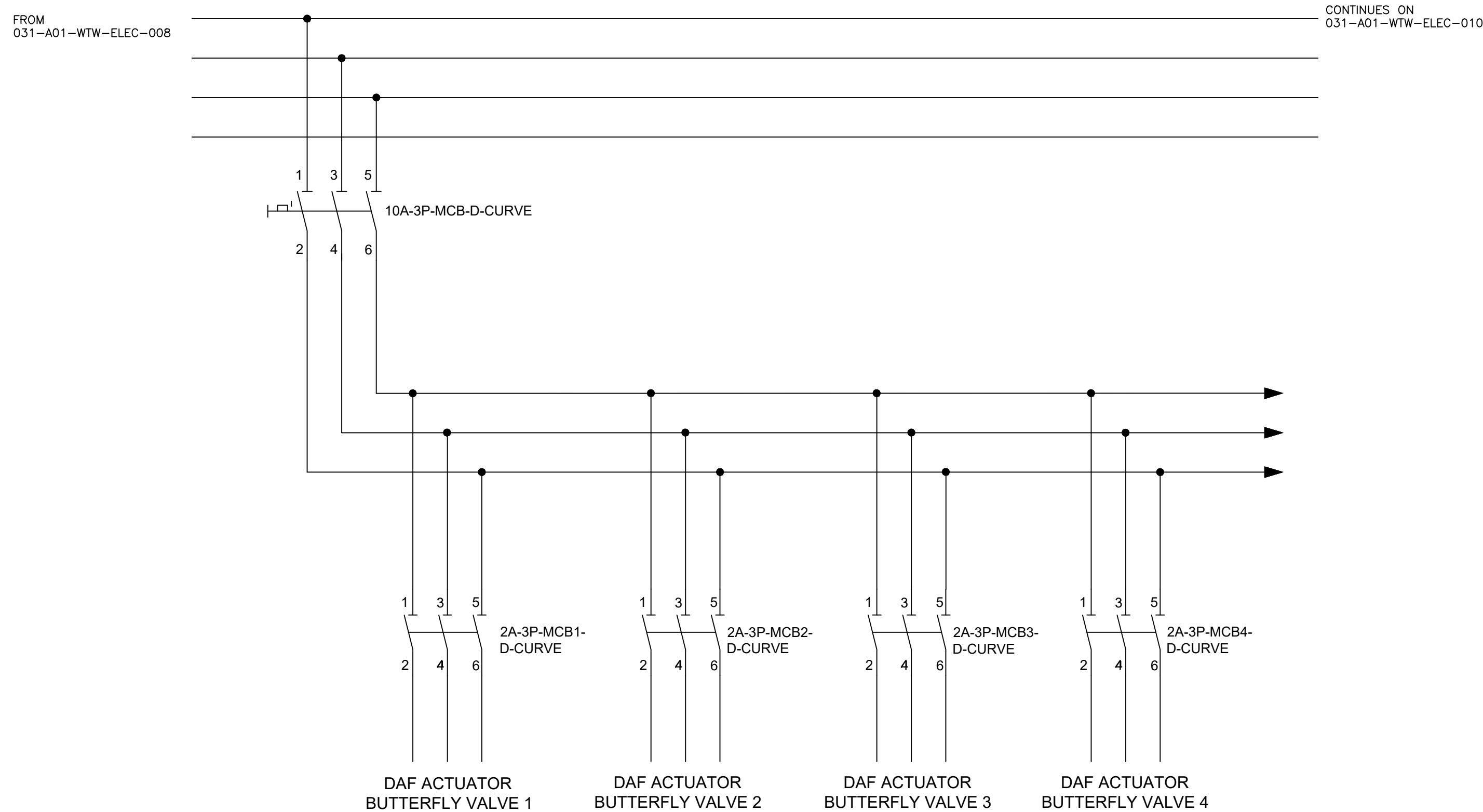
EXPANSION MOTOR CONTROL
CENTER 02 -
COMPRESSORS TO LOCAL
DB

SINGLE LINE DIAGRAM (SLD)

M NZOMBE
M. Nzombe
ENGINEER/TECHNOLOGIST

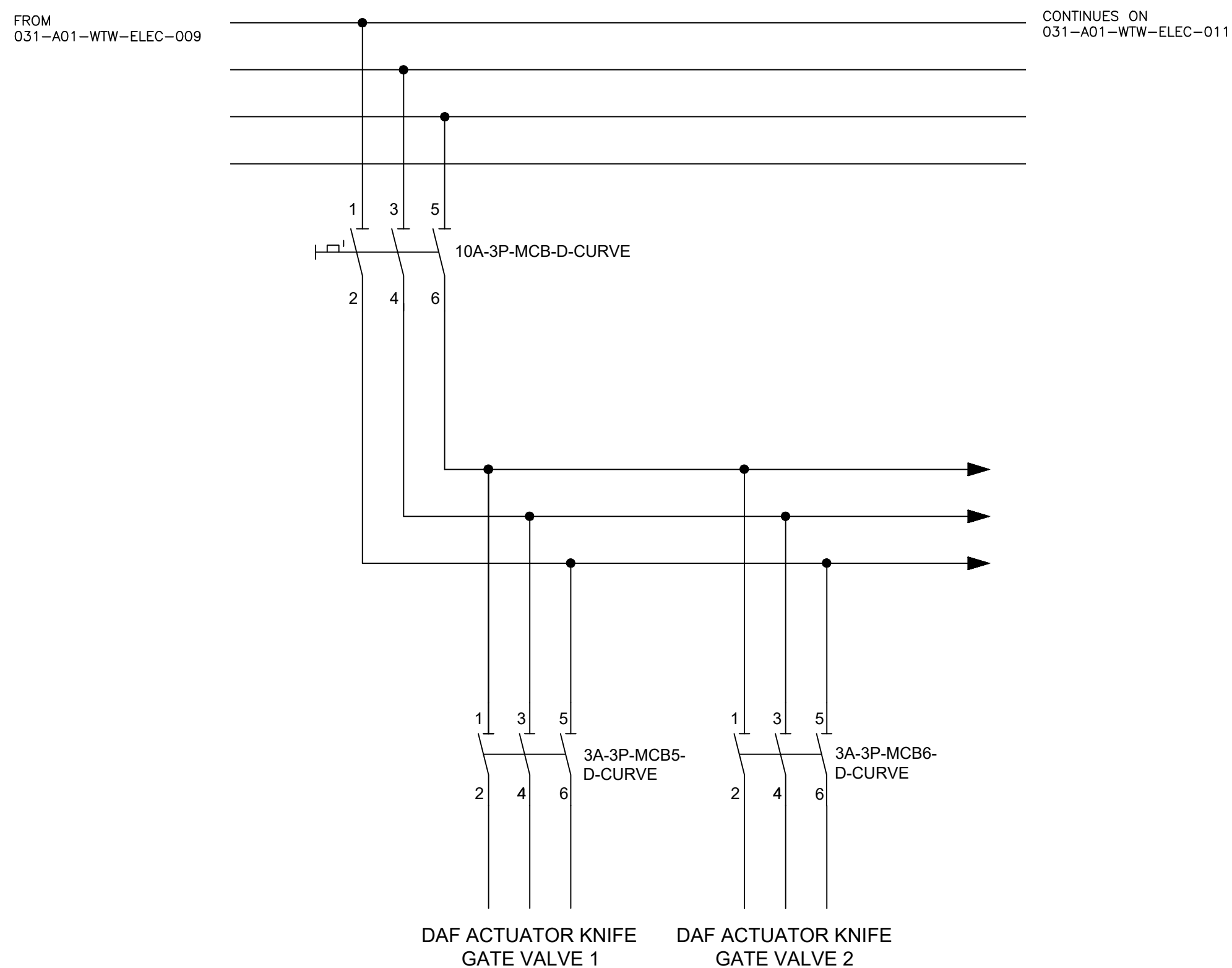
06/09/2024
DATE

SCALE	AS SHOWN	DRAWN	T MOGATUSI
DESIGNED REG. NO.	L MULAUDZI	CHECKED REG. NO.	AA MAHERRY #20190924
DRAWING NUMBER		REVISION NO.	
031-A01-WTW-ELEC-005		0	

[illegible]

NOTES / LEGEND THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND CONTRACT SPECIFICATIONS AND DISCREPANCIES TO BE BROUGHT TO THE ENGINEER'S ATTENTION PRIOR TO IMPLEMENTATION OF ANY WORK. CONTRACTOR TO KEEP A FULL SET OF DRAWINGS ON SITE. CONTRACTOR IS RESPONSIBLE FOR CORRECT SETTING OUT OF BUILDINGS ON SITE WITH PARTICULAR INTEREST TO BOUNDARIES AND BUILDING LINES. CONTRACTOR TO VERIFY ALL LEVELS AND DIMENSIONS ON SITE. ISSUANCE OF CHANGES IS NOT PERMITTED. ISSUED DIMENSIONS ONLY TO BE USED. CONTRACTOR TO IDENTIFY AND EXPOSE ALL LARGE GROUND SERVICES ON SITE BEFORE RELEVANT CONSTRUCTION IS TO BE IN ACCORDANCE WITH ALL RELEVANT DRAWINGS, CONTRACT SPECIFICATIONS. IF SHOULD THE ENGINEER BE REQUIRED ON SITE, 24 HOURS NOTICE IS REQUESTED. ALL ELECTRICAL AND ELECTRICAL INSTALLATION BY THE REGISTERED ELECTRICAL ENGINEER/INSTALLER TO BE AS PER SANS 9142-1. ALL MATERIAL MUST BE OF A SAND APPROVED STANDARD. ALL CURRENT EXISTING LOADS MUST BE FED FROM MAIN SUBSTATION.																															
COPY RIGHT DO NOT SCALE IF IN DOUBT, REFER TO DRAWING CLIENT PLAN NUMBER																															
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CONSULTANT																															
 Lidwala 2 Payne Road Corner Main Office Park Bryanston Johannesburg 1685 TEL: 011 793 EMAIL: info@lidwala.co.za																															
CLIENT																															
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PROJECT																															
UPGRADE & EXTENSION OF THE BLOEMHOF WASTEWATER TREATMENT WORKS																															
DRAWING TITLE																															
EXPANSION MOTOR CONTROL CENTER 02 – DAY ACTUATOR BUTTERFLY VALVE																															
SINGLE LINE DIAGRAM																															
M. NZOMBE <i>M. Nzombe</i> ENGINEER/TECHNOLOGIST 19/0																															
SCALE	AS SHOWN	DRAWN	TH																												
DESIGNED REG. NO.	L. MULAUDZI	CHECKED REG. NO.	AA #2																												
DRAWING NUMBER		REVISION NO.																													
031-A01-WTW-ELEC-009		0																													

031-A01-WTW-ELEC-009

[illegible]

NOTES / LEGEND

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- CONTRACTOR TO VERIFY ALL SET OF DRAWINGS ON SITE
- CONTRACTOR IS RESPONSIBLE FOR CORRECT SETTING OF BUILDINGS ON SITE WITH PARTICULAR INTEREST TO BOUNDARIES AND BUILDING LINES
- CONTRACTOR TO VERIFY ALL SET OF DRAWINGS ON SITE
- SCALING OF DRAWINGS IS NOT PERMITTED, FOLLOWS DIMENSIONS ONLY TO BE USED
- CONTRACTOR TO IDENTIFY AND GROUND ALL LIQUID GROUND SERVICES ON SITE WHERE RELEVANT
- CONTRACTORS TO BE IN AGREEMENT WITH THE REGISTERED ELECTRICAL ENGINEER CONTRACT SPECIFICATIONS
- SHOULD THE ENGINEER BE REQUIRED, SITE, 24 HOURS NOTICE IS REQUESTED
- ELECTRICAL CONTRACTUAL MATERIALS TO THE REGISTERED ELECTRICAL ENGINEERMAN
- INSTALLATION TO BE AS PER SPAN 1014-1
- ALL MATERIAL MUST BE OF UNIFORM QUALITY STANDARD
- ALL CURRENT CARRYING LINES WILL BE FED FROM MAIN SUBSTATION

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CITY ENGINEER / CLIENT	REG. NO.	DATE

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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE	

EXPANSION MOTOR CONTROL
CENTER 02 - DAF
ACTUATOR KNIFE GATE
VALVE

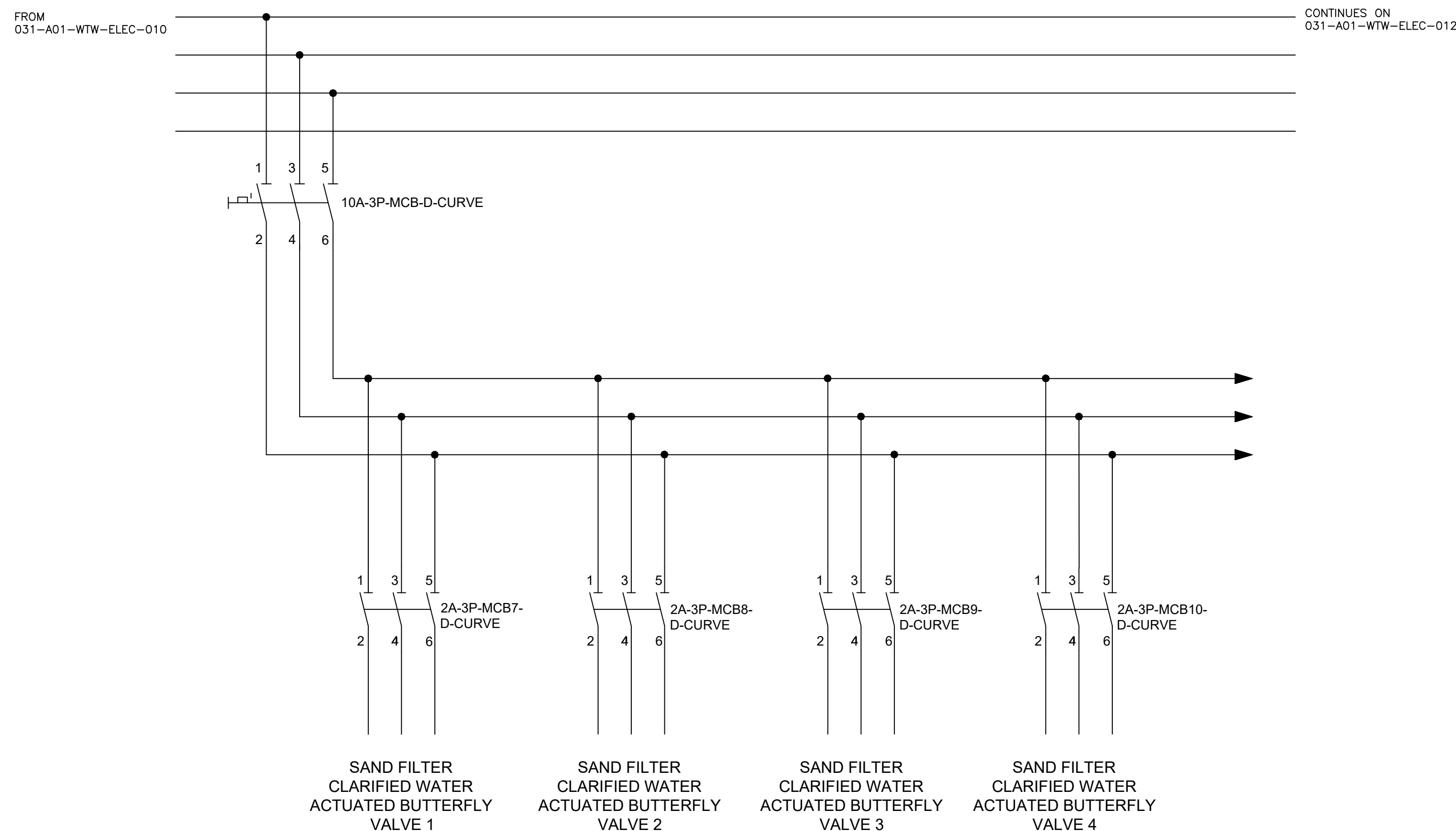
SINGLE LINE DIAGRAM (SLD)

M NZOMBE
M. Nzombe
ENGINEER/TECHNOLOGIST

19/09/2024
DATE

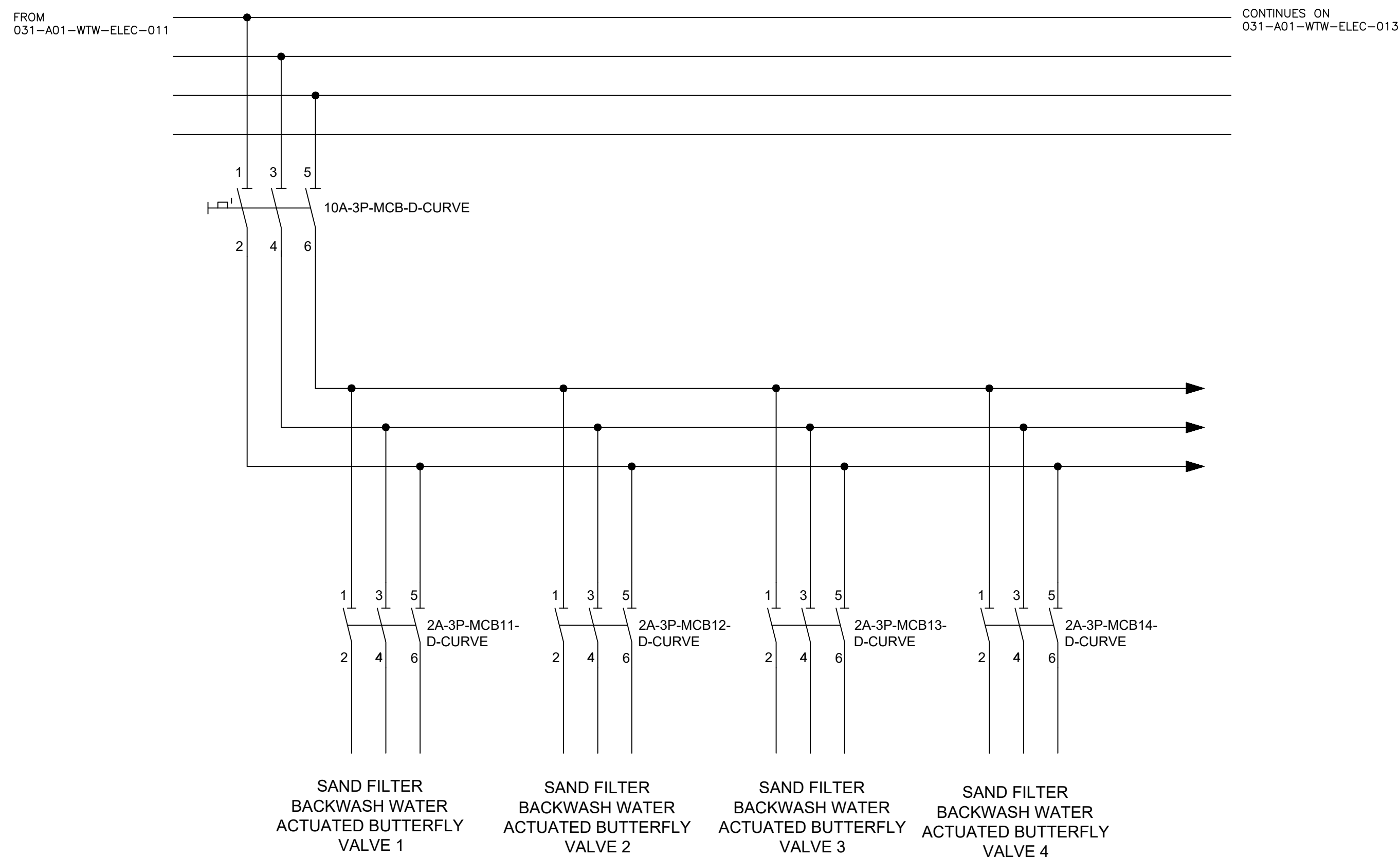
SCALE	AS SHOWN	DRAWN	T MOGATUSI
DESIGNED REG. NO.	L MULAUDZI	CHECKED REG. NO.	AA MAHERRY #20190924
DRAWING NUMBER		REVISION NO.	
031-A01-WTW-ELEC-010		0	

031-A01-WTW-ELEC-010



ABBREVIATIONS		LEGEND	
AA	AMMETER		LAMP FILAMENT
AS	AMMETER SELECTION SWITCH		NEON
AW	AIRPUMP		RELAY
AFS	AIR FLOW SWITCH		ON DELAY TIMER
AFV	AIR PRESSURE SWITCH		ON DELAY TIMER
AC	ALTERNATE		OVERLOADS
AAa	ALARM BELL		AMMETER
AL	ALTERNATE		VOLTMETER
ALC	ALTERNATE		ISOLATOR
ALC	ALTERNATE		CIRCUIT BREAKER
CC	CONTACTOR		LINK
CC	CONTACTOR		FUSED ISOLATOR
CC	CONTACTOR		DIODE
CC	CONTACTOR		THERMAL OVERLOAD CONTACTS MANUALLY RESET NC NO
CC	CONTACTOR		3 POSITION SELECTOR SWITCH MANUALLY
CC	CONTACTOR		MECHANICAL COUPLING OUTPUT INTERLOCK
CC	CONTACTOR		HAND OPERATED MECHANISM
CC	CONTACTOR		TRANSFORMERS - CURRENT
CC	CONTACTOR		VOLTAGE
CC	CONTACTOR		3 PHASE REDUCTION MOTOR
CC	CONTACTOR		3 PHASE REDUCTION MOTOR WITH 5 LEADS BROUGHT OUT
CC	CONTACTOR		BELL
CC	CONTACTOR		SOLENOID VALVE
CC	CONTACTOR		DAMPING MOTOR
CC	CONTACTOR		EARTH
CC	CONTACTOR		CONTACTS - MAKE (NO)
CC	CONTACTOR		BREAK (NC)
CC	CONTACTOR		COMMON (C)
CC	CONTACTOR		FLOW (IN)
CC	CONTACTOR		PRESSURE (PI)
CC	CONTACTOR		TEMPERATURE (NI)
CC	CONTACTOR		LIQUID LEVEL (NO)
CC	CONTACTOR		CHANGE OVER
CC	CONTACTOR		MANUALLY OPERATED SWITCH
CC	CONTACTOR		PUSH BUTTON (NO)
CC	CONTACTOR		PUSH BUTTON (NO)
CC	CONTACTOR		PUSH BUTTON (STOP LOCK)
CC	CONTACTOR		TWO CONTACT MAKE DELAYED MAKE
CC	CONTACTOR		TWO CONTACT DELAYED BREAK
CC	CONTACTOR		TWO CONTACT BREAK DELAYED BREAK
CC	CONTACTOR		TWO CONTACT DELAYED MAKE
CC	CONTACTOR		EARTH LEAKAGE
CC	CONTACTOR		MEMBRANE
CC	CONTACTOR		SWITCH
CC	CONTACTOR		TOLER

[illegible]

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NOTES / LEGEND

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CONTRACTOR TO KEEP A FULL SET OF DRAWINGS ON SITE.

CONTRACTOR IS RESPONSIBLE FOR CORRECT SETTING OUT OF BUILDINGS ON SITE WITH PARTICULAR REFERENCE TO DIMENSIONS AND BOUNDARY LINES.

CONTRACTOR TO VERIFY ALL LEVELS AND DIMENSIONS ON SITE.

SCALING OF DRAWINGS IS NOT PERMITTED. PLOTTED DIMENSIONS ONLY TO BE USED.

CONTRACTOR TO NOTIFY THE OFFICIAL LAND SURVEYING OFFICERS ON SITE WHERE RELEVANT.

CONSTRUCTION IS TO BE IN ACCORDANCE WITH ALL RELEVANT DRAINAGE CONTRACT REQUIREMENTS.

SHOULD THE ENGINEER BE REQUIRED ON SITE, AN HOUR'S NOTICE IS REQUESTED.

ELECTRICAL AND ELECTRICAL INSTALLATION BY THE REGISTERED ELECTRICIAN/HANDMAN.

ALL MATERIAL MUST BE OF A GRADE APPROVED ENDORSED.

ALL CURRENT EXISTING LOADS WILL BE FED FROM MAIN SUBSTATION.

COPY RIGHT

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PROJECT														
UPGRADE & EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS														
DRAWING TITLE														
EXPANSION MOTOR CONTROL CENTER 02 – SAND FILTER BACKWASH WATER ACTUATED BUTTERFLY VALVE														
SINGLE LINE DIAGRAM (SLD)														
M NZOMBE Nk Nkombe ENGINEER/TECHNOLOGIST 19/09/2024 DATE														
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REG. NO.		FIG. NO.	#20190924											
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031-A01-WTW-ELEC-012

0

ABBREVIATIONS

A

AMMETER

AS

AMMETER SELECTION SWITCH

AW

AMPERE

AFS

AIR FLOW SWITCH

AR

ALARM ROUTER

APS

AIR PRESSURE SWITCH

AC

ALARM CANCEL

AD

AUTOMATIC

B

BELL OR BUZZER

C

CONTACTOR

CC

CONTACTOR COIL

CT

CURRENT TRANSFORMER

CDH

CRANK CASE HEATER

CDS

COMBINATION FUSE SWITCH

CB

CIRCUIT BREAKER

CR

CRANK CASE RELAY

Q

CONTROL RELAY

D

DAMPEN

EL

EMERGENCY LEVEL

ELR

EARTH LEAKAGE RELAY

EXF

EXHAUST AIR FAN

F

FAN

FM

FAN MOTOR

FL

FUSE

FS

FUSE SWITCH

FRL

FIRE STAT

HB

HEATER BANK

HM

HOUR METER

HP

HIGH PRESSURE SWITCH

ISO

ISOLATOR

KWH

KILOWATT HOUR

LCL

LEVEL CONTROL

LLS

LOW LEVEL SWITCH

LST

LIMIT SWITCH

LP

LOW PRESSURE

MAN

MANUAL

MCB

MINIATURE CIRCUIT BREAKER

MCB

MINIATURE CIRCUIT BREAKER

M.O.A

MANUAL OFF

N

NEUTRAL

N/C

NORMALLY CLOSED

N/O

NORMALLY OPEN

NL

NEUTRAL LINK

OL

OVER LOAD

OS

OVER HEAT/STAT

OS

PRESSURE OPERATING SWITCH

PT

PNEUMATIC TIMER

R

RELAY

RAF

RETURN AIR FAN

RAI

RETURN AIR THERMOSTAT

RR

REMOTE CONTROL RELAY

RT

ROOM THERMOSTAT

RHS

REMOTE STOP START

S

SOLINOID

SS

SELECTOR SWITCH

SAT

SUPPLY AIR THERMOSTAT

SAF

SUPPLY AIR FAN

SV

SOLINOID VALVE

T

TIMER

TC

TIME CLOCK

TD

7 DAY TIMER

TR

TIME RELAY

(SLOW MAKE OR BREAK)

(SLOW MAKE OR BREAK)

TS

THERMISTOR

TF

TRANSFORMER

Th

THERMISTAT

UV

UNLOADING VALVE

WFS

WATER FLOW SWITCH

LEGEND

LAMP FILAMENT

NEON

RELAY

OFF DELAY TIMER

ON DELAY TIMER

OVERLOADS

AMMETER

VOLTMETER

CONTACTOR

ISOLATOR

FUSE

CIRCUIT BREAKER

LINK

FUSED ISOLATOR

DIODE

THERMAL OVERLOAD CONTACTS MANUALLY RESET (L&NO)

3 POSITION SELECTOR SWITCH MANUAL

MECHANICAL COUPLING OUTDOOR INTERLOCK

HAND OPERATED MECHANISM

TRANSFORMERS - CURRENT

VOLTAGE

3 PHASE REDUCTION MOTOR

3 PHASE REDUCTION MOTOR WITH FLEADS BROUGHT OUT

BELL

SOLINOID VALVE

DAMPEN MOTOR

EARTH

CONTACTS - MAKE (NO)

BREAK (NC)

CMAKE (NO)

FLOW (NC)

PRESSURE (NC)

TEMPERATURE (NO)

LIQUID LEVEL (NO)

CHANGE OVER

MANUALLY OPERATED SWITCH

PUSH BUTTON (NO)

PUSH BUTTON (NC)

PUSH BUTTON (STOP LOCK)

TIMED CONTACT MAKE DELAYED MAKE

TIMED CONTACT DELAYED BREAK

TIMED CONTACT BREAK DELAYED BREAK

TIMED CONTACT DELAYED MAKE

EARTH LEAKAGE

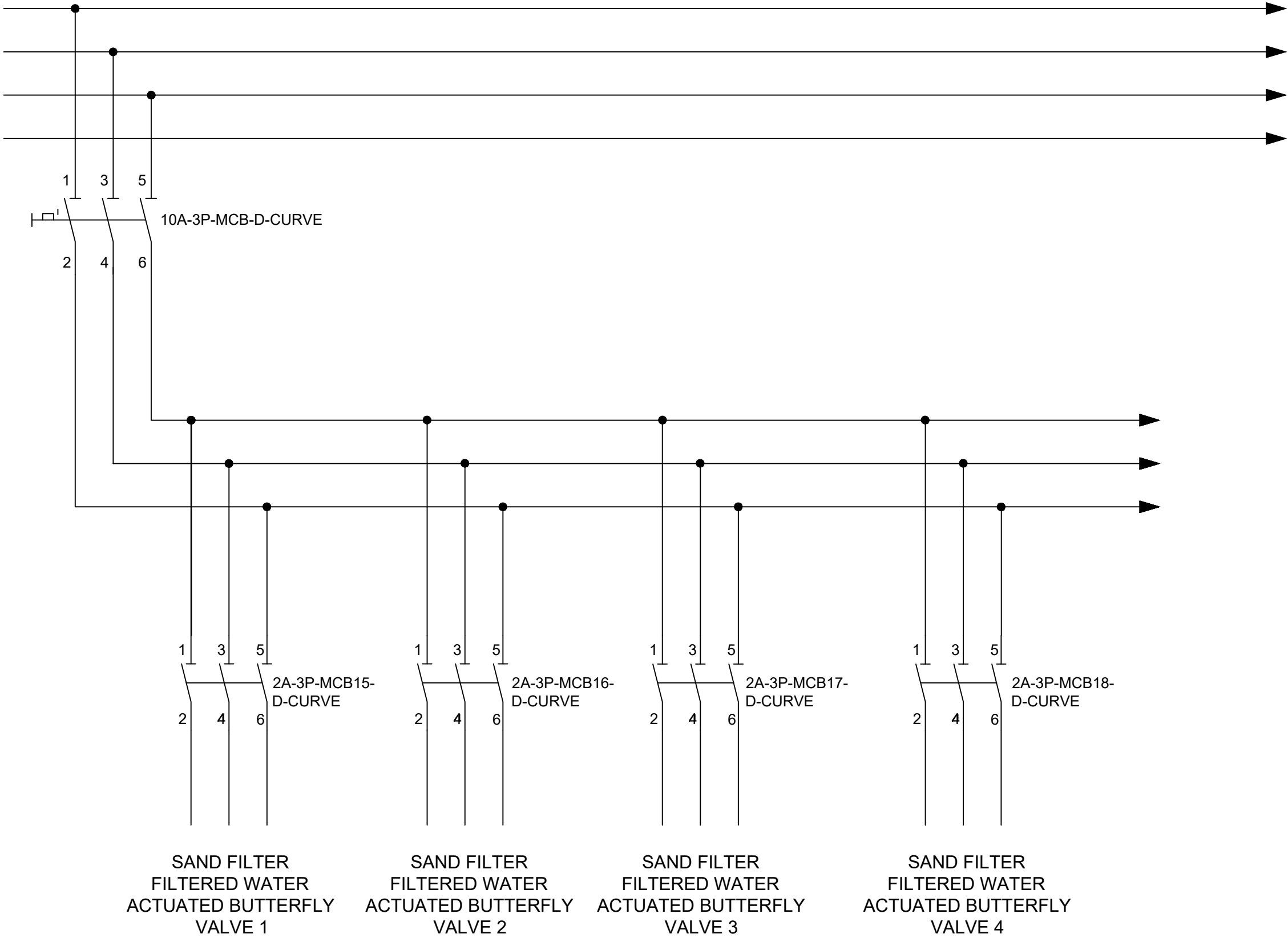
MECHANICAL

SWITCH

ISOLATOR

TIMER

FROM
031-A01-WTW-ELEC-012



- NOTES / LEGEND
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 4. CONTRACTOR TO VERIFY ALL LEVELS AND DIMENSIONS ON SITE.
 5. SCALE OF DRAWINGS IS NOT PERMITTED. FURNISHED DIMENSIONS ONLY TO BE USED.
 6. CONTRACTOR TO IDENTIFY AND EXPOSE ALL UNDERGROUND SERVICES ON SITE WHERE RELEVANT.
 7. CONSTRUCTION TO BE IN ACCORDANCE WITH ALL RELEVANT DRAWINGS, CONTRACT SPECIFICATIONS.
 8. SHOULD THE ENGINEER BE REQUIRED ON SITE, 24 HOURS NOTICE IS REQUESTED.
 9. ELECTRICAL ALL ELECTRICAL INSTALLATION BY THE REGISTERED ELECTRICAL ENGINEER.
 10. INSTALLATION TO BE AS PER DRAWING.
 11. ALL MATERIAL MUST BE OF A SAAS APPROVED STANDARD.
 12. ALL CURRENT CARRYING CABLES WILL BE TESTED FROM MINIMUM SUBSTATION.

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CITY ENGINEER / CLIENT REG. NO. DATE

CONSULTANT



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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

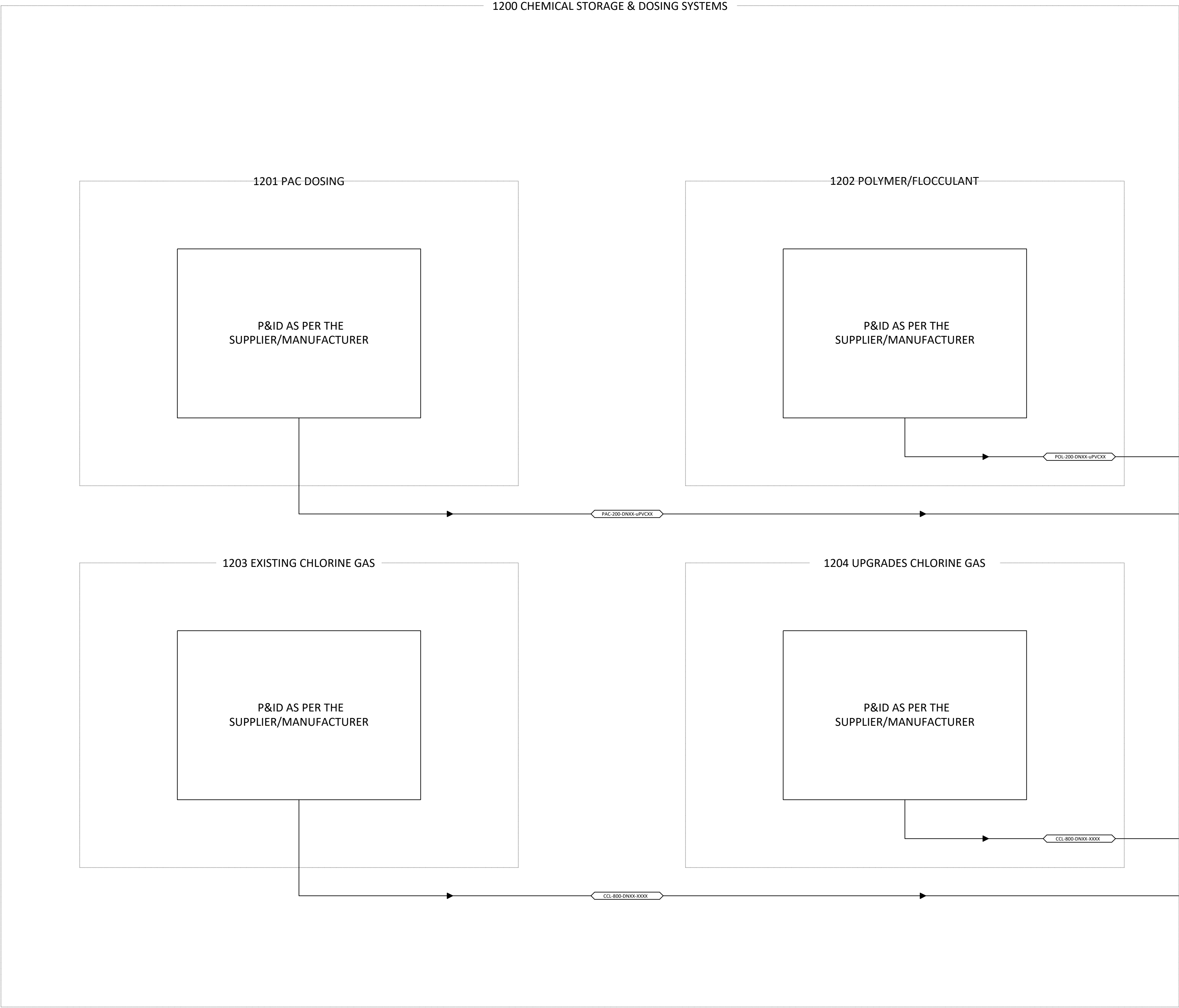
DRAWING TITLE

EXPANSION MOTOR CONTROL
CENTER 02 – SAND FILTER
FILTERED WATER ACTUATED
BUTTERFLY VALVE

SINGLE LINE DIAGRAM (SLD)

M. NZOMBE
19/09/2024
ENGINEER/TECHNOLOGIST DATE

SCALE	AS SHOWN	DRAWN	T. MOGATSI
DESIGNED REG. NO.	L. MULAUDI	CHECKED REG. NO.	AA MAHERRY #20190924
DRAWING NUMBER	REVISION NO.		
031-A01-WTW-ELEC-013	0		



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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE

CHEMICAL STORAGE &
DOSING SYSTEMS
PIPING & INSTRUMENTATION
DIAGRAM (P&ID)

ENGINEER/TECHNOLOGIST

04/09/24
DATE

SCALE	AS SHOWN	DRAWN	T MOGATUSI
DESIGNED REG. NO.	T MOGATUSI	CHECKED REG. NO.	AA MAHERRY #20190924
DRAWING NUMBER	REVISION NO.		

031-A12-WTW-P&ID-012

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031-A12-WTW-P&ID-012

1300 LEGENDS

PROCESS CONDUIT OR SIGNAL CABLE REFERENCE TAGS				LINE TYPES	EQUIPMENT SYMBOLS
PAGE ENTRY LABEL AA-BBCC-DD-EEFF FROM DRAWING NUMBER PAGE EXIT LABEL AA-BBCC-DD-EEFF TO DRAWING NUMBER				- PROCESS PIPE - ELECTRICAL/SIGNAL - AIR	- EXPANSION TANK - RUPTURE DISC - BULK CHLORINE TANK - PRESSURE SWITCH - PRESSURE INDICATOR - DIAPHRAGM SEAL - EVAPORATOR - LEVEL INDICATOR - LEVEL SWITCH - TEMPERATURE INDICATOR - TEMPERATURE SWITCH / THERMOSTAT - LIQUID CHLORINE TRAP / HEATED CATCH POT - ROTAMETER - VACUUM SWITCH - CHLORINATOR - CHLORINE INJECTOR - VENT - FUNNEL / COLLECTION DEVICE / INTAKE - OPERATING WATER LEVEL - DRAIN / SCOUR / DISCHARGE - STATIC MIXER - SAMPLE - SLUICE GATE - CENTRIFUGAL PUMP - AIR BLOWER - MOTOR - ULTRASONIC LEVEL UNIT - ORIFICE PLATE - SUBMERSIBLE PUMP - SCREEN
EQUIPMENT TAG CONVENTION				PIPING COMPONENT SYMBOLS	
AA	BB	CC	E		
PROCESS UNIT NUMBER	EQUIPMENT / INSTRUMENT	EQUIPMENT / INSTRUMENT NUMBER	R REPLACE N NEW		
EQUIPMENT TYPE V - VALVE TK - TANK PJ - PUMP BC - BLOWER/COMPRESSOR PV - PRESSURE VESSEL FN - FAN PS - PRESSURE SWITCH PG - PRESSURE GAUGE FI - FLOW INDICATOR FT - FLOW INDICATING TRANSMITTER FK - FLOW INDICATING CONTROLLER FS - FLOW SWITCH TI - TEMPERATURE INDICATOR TS - TEMPERATURE SWITCH DS - DIAPHRAGM SEAL LS - LEVEL SWITCH LI - LEVEL INDICATOR LIC - LEVEL INDICATING CONTROLLER LIT - LEVEL INDICATING TRANSMITTER RD - RUPTURE DISC VS - VACUUM SWITCH SM - STATIC MIXER AI - ANALYTICAL INDICATOR AIC - ANALYTICAL INDICATING CONTROLLER AIT - ANALYTICAL INDICATING TRANSMITTER MOV - MOTOR OPERATED VALVE RT - RADIO TRANSMITTER SC - SPEED CONTROLLER ST - STARTER PLC - PROGRAMMABLE LOGIC CONTROLLER RIO - REMOTE INPUT OUTPUT LHMI - LOCAL HMI HMI - HMI SCADA - SCADA OP - ORIFICE PLATE SP - SUMP PUMP CS - CYLINDRICAL SCREEN IS - INCLINED SCREEN SG - SLUICE GATE FS - FLOW SWITCH				- BSP THREADED / UNION NUT - WELDED - FLANGED - REDUCER	
MATERIAL TYPE CS - CARBON STEEL PVC - POLYVINYL CHLORIDE FRP - FIBRE REINFORCED PLASTIC SS - STAINLESS STEEL MS - MILD STEEL uPVC - UNPLASTICIZED POLYVINYL CHLORIDE RC - REINFORCED CONCRETE				- GATE VALVE - KNIFE VALVE - BALL VALVE - BUTTERFLY VALVE - ANGLE VALVE - NON-RETURN VALVE - PLUG VALVE - DIAPHRAGM VALVE - NEEDLE VALVE - PRESSURE RELIEF VALVE / VENT - VACUUM REGULATOR VALVE - PRESSURE REGULATING VALVE	
CONDUIT TAG CONVENTION				VALVE SYMBOLS	
FLOW DIRECTION AA-BBCC-DD-EEFF WATER DATA START WATER DATA END				- MANUAL LEVER OR WHEEL OPERATED - ROTARY, MOTOR, PNEUMATIC OR HYDRAULIC OPERATED - MODULATING SOLENOID ACTUATOR - SIDE MOUNTED HAND WHEEL - SPRING OR WEIGHT ACTUATED - PILOT ACTUATED - PILOT ACTUATED ON PRESSURE - PILOT ACTUATED ON VACUUM	
AA - MEDIA/FLUID/COMMUNICATION TYPE BB - AREA NUMBER CC - PIPE ID DD - DIAMETER NOMINAL (DN) FOR PIPES / CN FOR CHANNEL EE - MATERIAL TYPE FF - CLASS MEDIA/FLUID RW - RAW WATER CW - CLARIFIED WATER SW - SLUDGE OR WASTE WATER COX - CHEMICAL OXIDANT CLI - CHEMICAL LIME CTL - CHEMICAL FLOCCULENT CBI - CHEMICAL DISINFECTANT AIR - AIR CCL - CHEMICAL CHLORINE CPO - CHEMICAL POLYMER FW - FILTRATE WATER COMMUNICATION TYPE SC - SIGNAL CABLE / DATA CABLE				CONTROL ELEMENT / ACTUATOR SYMBOL	

NOTES / LEGEND

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CLIENT



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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE

LEGENDS
PIPING & INSTRUMENTATION
DIAGRAM (P&ID)

ENGINEER/TECHNOLOGIST

04/09/24
DATE

SCALE	AS SHOWN	DRAWN	T MOGATUSI
DESIGNED	T MOGATUSI	CHECKED	AA MAHERRY
REG. NO.		REG. NO.	#20190924
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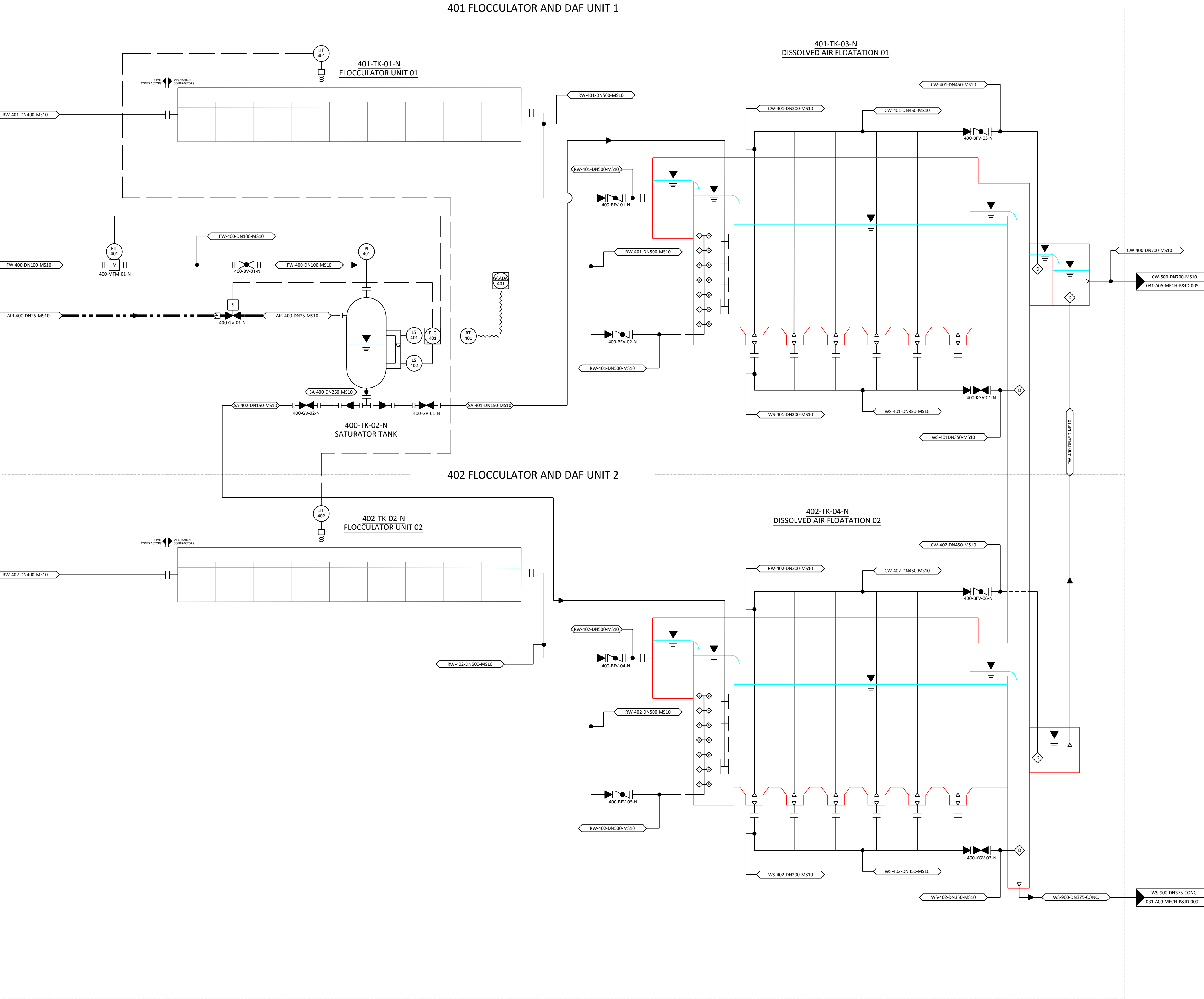


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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE

FLOCCULATOR AND DAF
UNIT
PIPING & INSTRUMENTATION
DIAGRAM (P&ID)

ENGINEER/TECHNOLOGIST

04/09/24
DATE

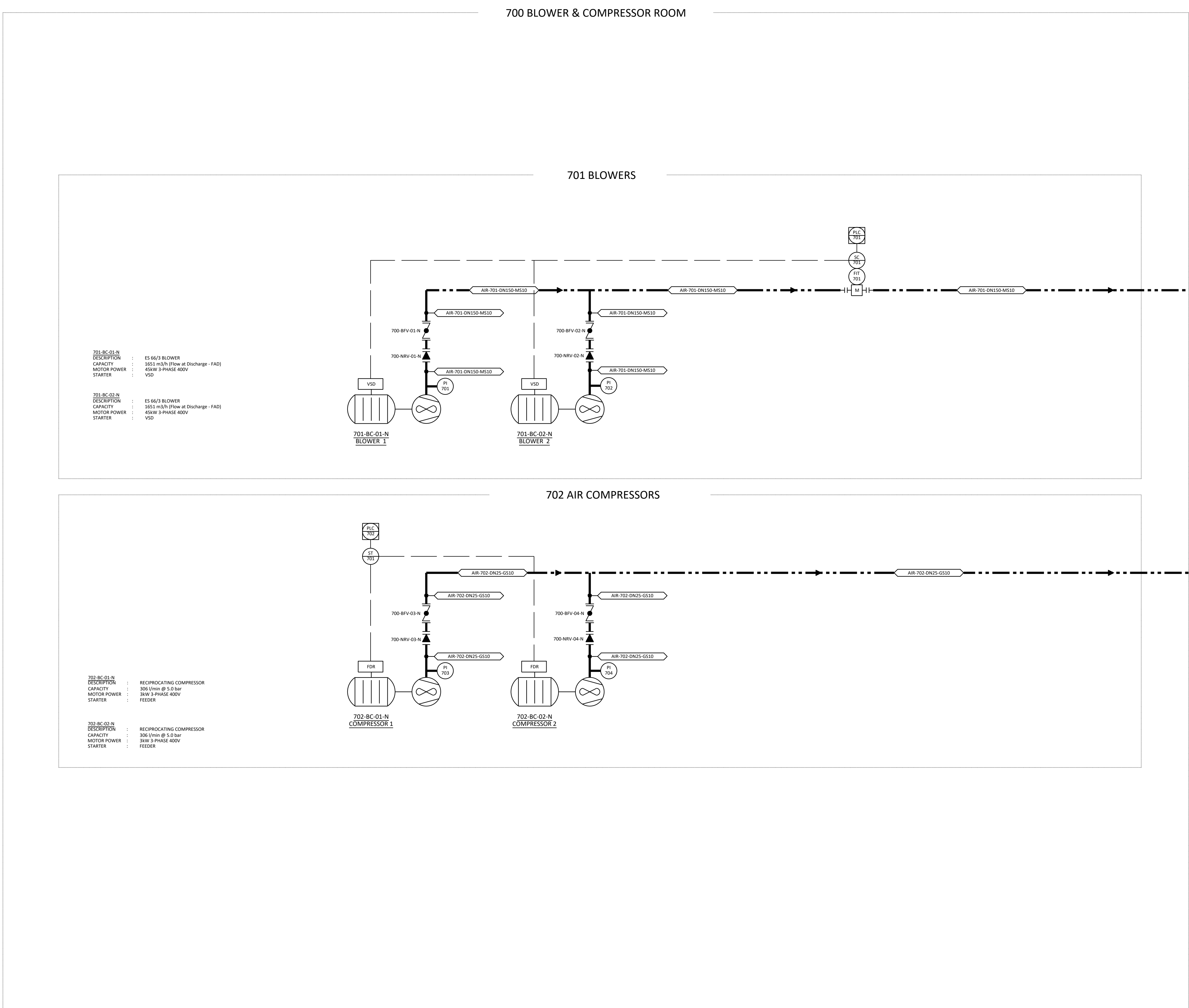
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REG. NO.		REG. NO.	#20190924

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CITY ENGINEER / CLIENTREG. NO. DATE

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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE

BLOWER & COMPRESSOR
ROOM

PIPING & INSTRUMENTATION
DIAGRAM (P&ID)

ENGINEER/TECHNOLOGISTDATE

04/09/24

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0001503

UPGRADE & EXTENSION

DRAWING TITLE	

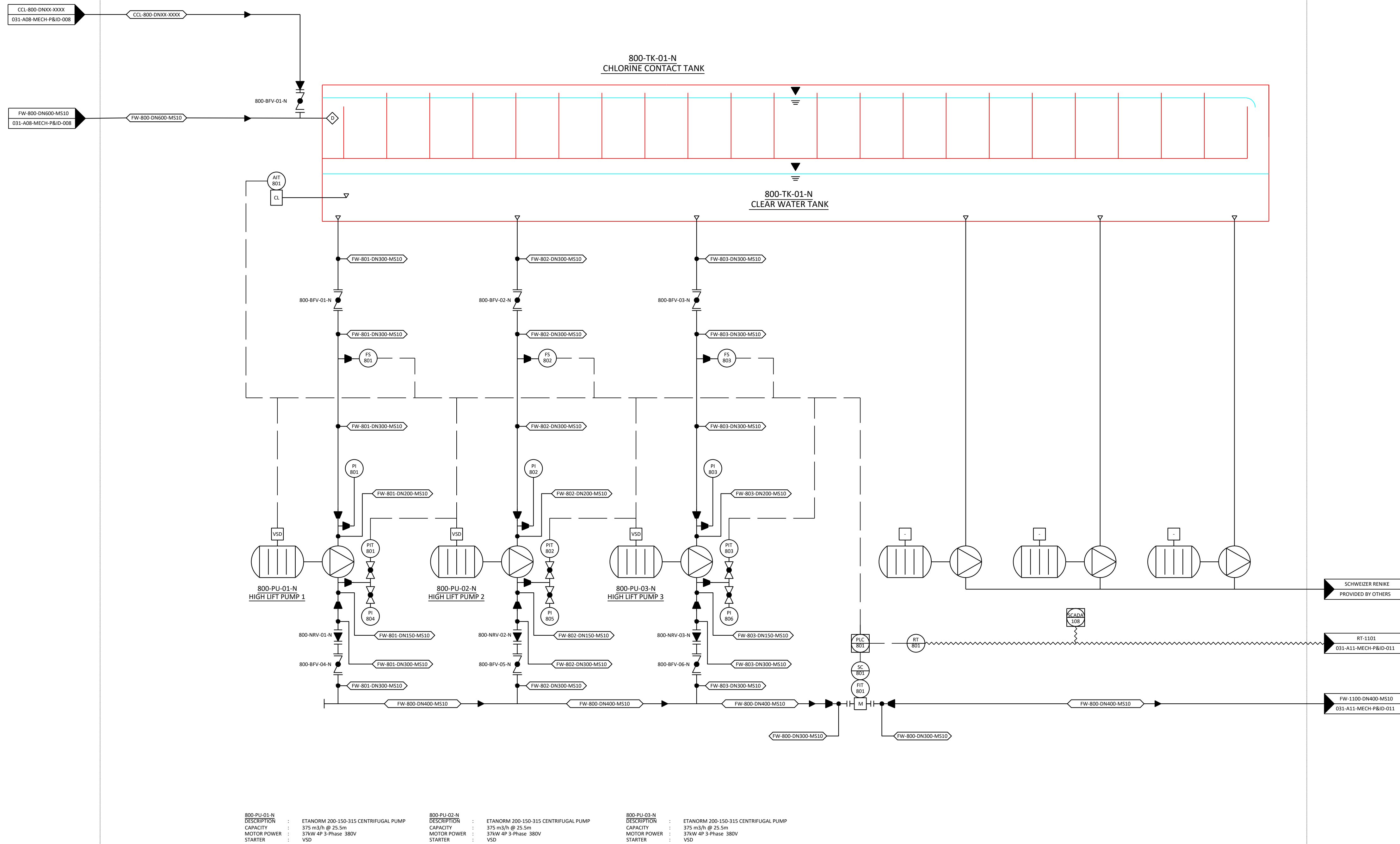
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01/09/21

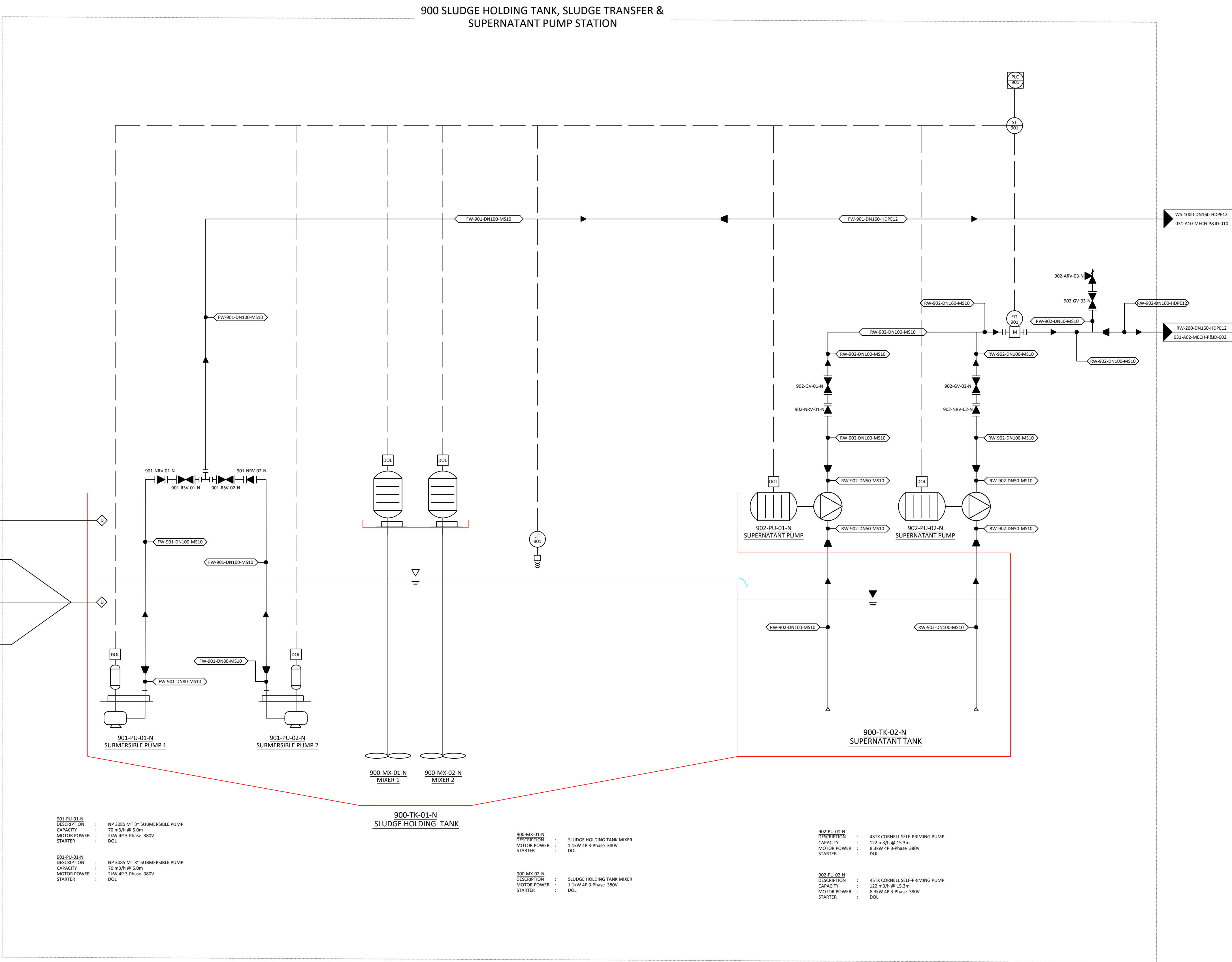
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031-A08-WTW-P&ID-008	0	



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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE

SLUDGE HOLDING TANK,
SLUDGE TRANSFER &
SUPERNATANT PUMP
STATION

PIPING & INSTRUMENTATION
DIAGRAM (P&ID)

ENGINEER/TECHNOLOGIST

04/09/24
DATE

SCALE AS SHOWN DRAWN T MOGATUSI

DESIGNED T MOGATUSI CHECKED AA MAHERRY

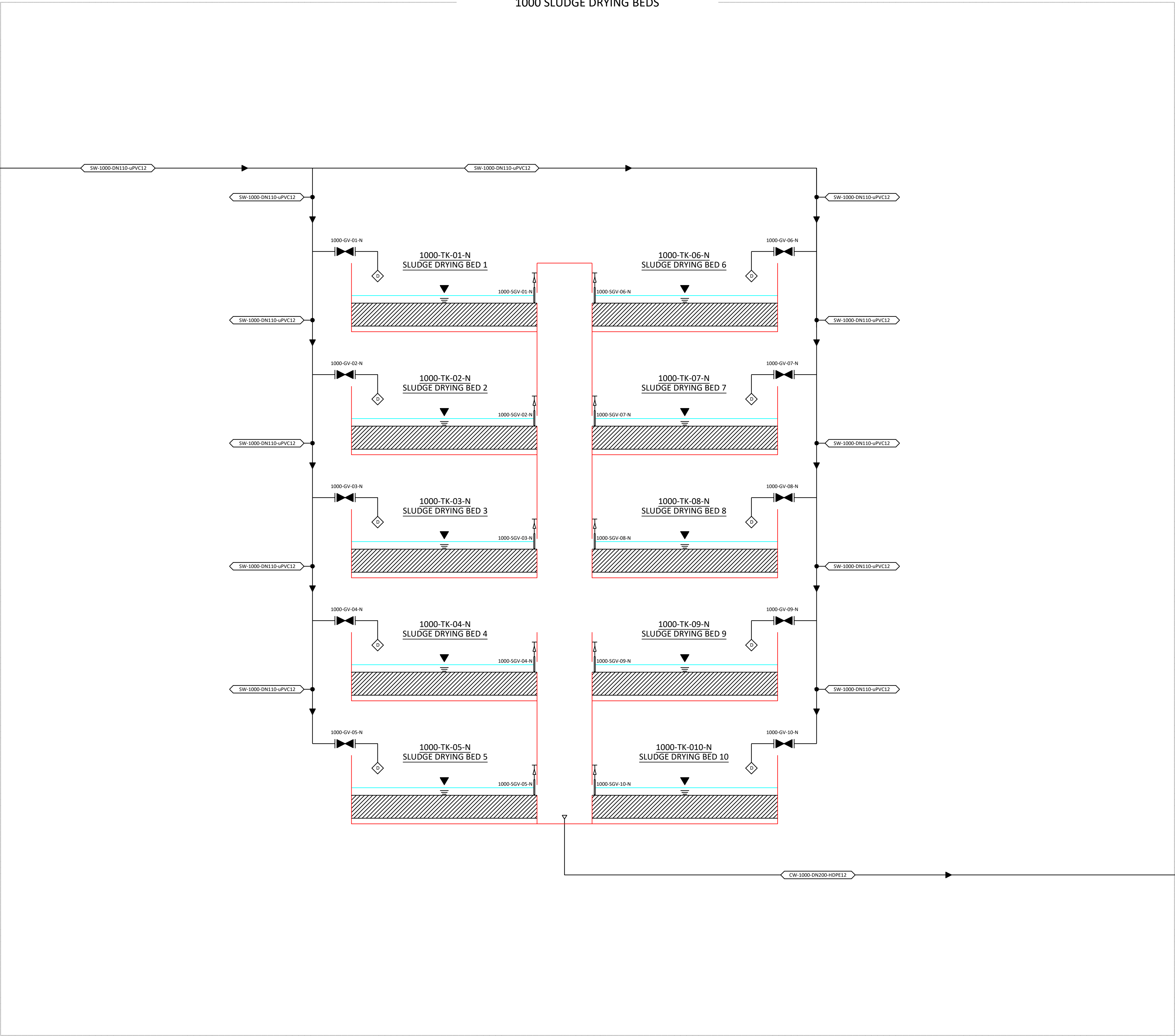
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PROJECT

UPGRADE & EXTENSION
OF THE BLOEMHOF WATER
TREATMENT WORKS

DRAWING TITLE

SLUDGE DRYING BEDS
PIPING & INSTRUMENTATION
DIAGRAM (P&ID)

ENGINEER/TECHNOLOGIST

04/09/24
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PROJECT

PROJECT _____

UPGRADE & EXTENSION
OF THE DRAINAGE WATER

TREATMENT WORKS

BLOCKMODE COMMAND

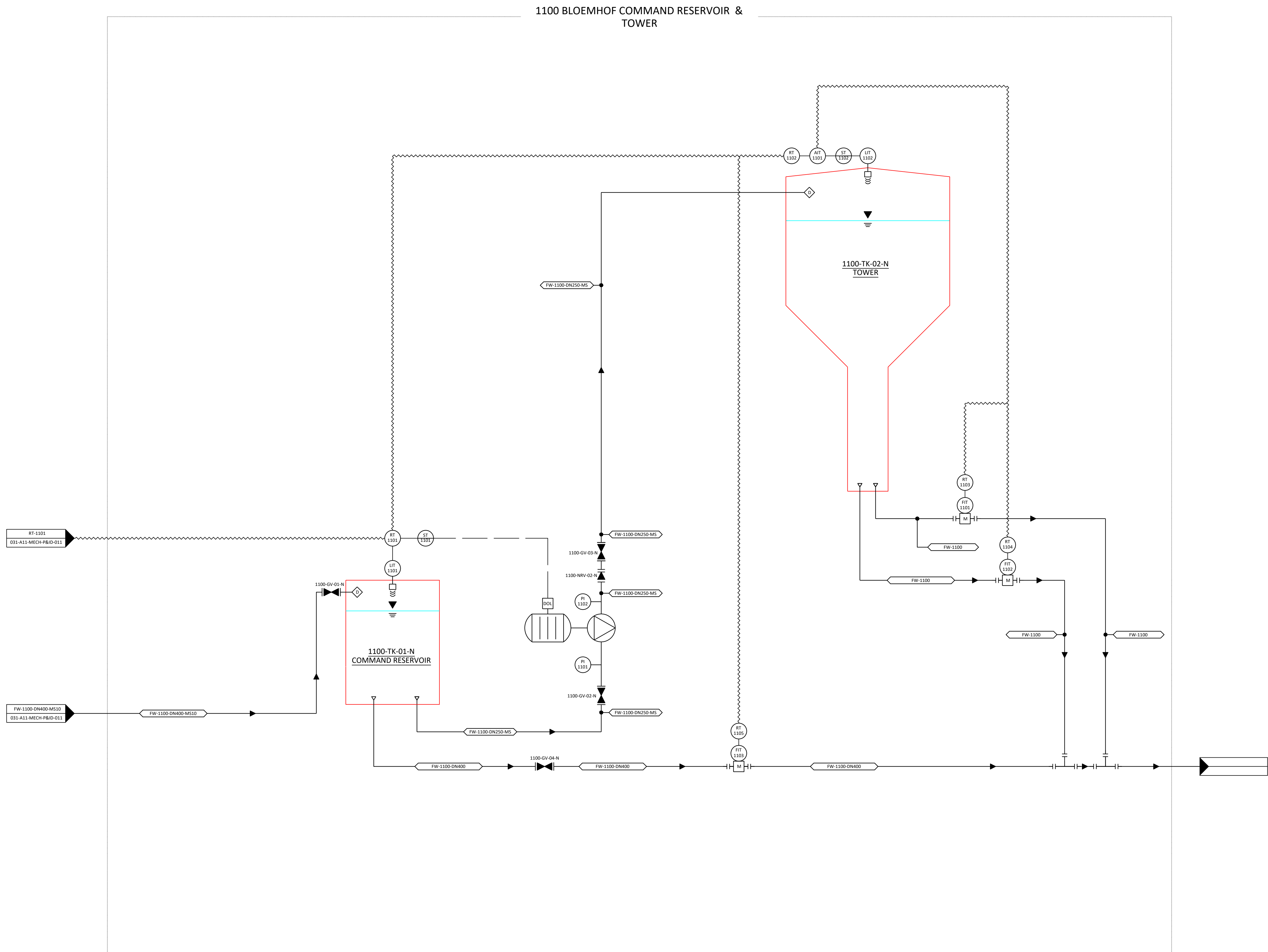
PIPING &

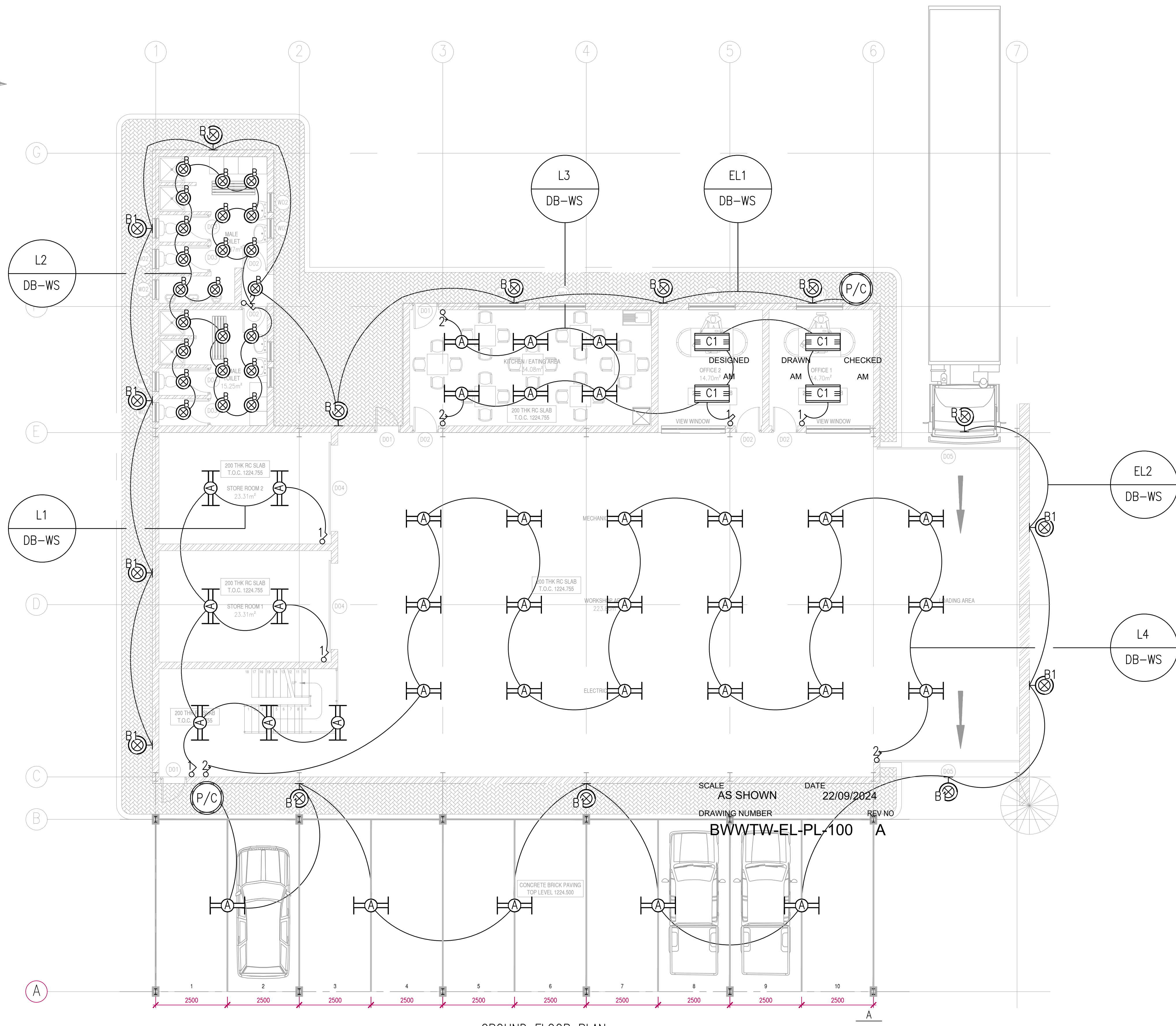
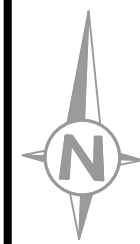
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DRAWING NUMBER	REVISION NO.

031-ATT-WIW-P&ID-011	0	





GROUND FLOOR PLAN
WORKSHOP & CARPORT - LIGHTING LAYOUT
SCALE 1:75

LEGEND

- TYPE A: 1200mm SURFACE MOUNTED LED LIGHT FITTING, POLYCARBONATE OPTICAL COVER, 46W LAMP, 7062 LUMENS, 4000K COLOUR TEMPERATURE, IP65 PROTECTION, ELECTRONIC CONTROL GEAR.
- TYPE HB: 2500mm SURFACE MOUNTED LED LIGHT FITTING, POLYCARBONATE OPTICAL COVER, 46W LAMP, 7062 LUMENS, 4000K COLOUR TEMPERATURE, IP65 PROTECTION, ELECTRONIC CONTROL GEAR.
- TYPE B: RECESSED MOUNTED LED DOWNLIGHT, 165mm DIAMETER, ALUMINIUM HOUSING COMPLETE WITH SPECULAR WHITE TRIM RING FINISH, 15W LED LAMP, 2100 LUMENS, 4000K COLOUR TEMPERATURE, IP20 PROTECTION, ELECTRONIC CONTROL GEAR.
- TYPE B1: RECTANGULAR BULKHEAD LUMINAIRE WITH HIGH PRESSURE DIE-CAST ALUMINIUM BASE AND HIGH IMPACT ACRYLIC DIFFUSER, 8W LED LAMP, 1095 LUMENS, 4000K COLOUR TEMPERATURE, IP65 PROTECTION, ELECTRONIC CONTROL GEAR.
- TYPE C1: RECESS MOUNTED LED PANEL LUMINAIRE, 1200mm X 600mm, POLY-CARBONATE BODY, ACRYLIC OPAL DIFFUSER, 65W LED LAMP, 5850 LUMENS, 4000K COLOUR TEMPERATURE, IP20 PROTECTION, ELECTRONIC CONTROL GEAR.
- TYPE C2: SURFACE-MOUNTED LED PANEL LUMINAIRE, 600mm X 600mm, POLY-CARBONATE BODY, ACRYLIC OPAL DIFFUSER, 36W LED LAMP, 3240 LUMENS, 4000K COLOUR TEMPERATURE, IP20 PROTECTION, ELECTRONIC CONTROL GEAR.
- 2x35W 1600mm DUST-PROOF, JET-PROOF AND SHOCKPROOF FLUORESCENT SURFACE-MOUNTED LUMINAIRE, TL-5 LAMP, 6650 LUMENS, IP66 PROTECTION AND ELECTRONIC CONTROL GEAR.
- OCCUPANCY SENSOR
- 10A 1GANG 1WAY LIGHT SWITCH
- 10A 1GANG 2WAY LIGHT SWITCH
- 10A 2GANG 2WAY LIGHT SWITCH
- ELECTRICAL DISTRIBUTION BOX
- PHOTO CELL
- CIRCUIT NUMBER
- DISTRIBUTION BOARD NUMBER

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<i>M. Nkombe</i>		08/10/2024
CONSULTING ENGINEER		DATE

CLIENT _____ DATE _____

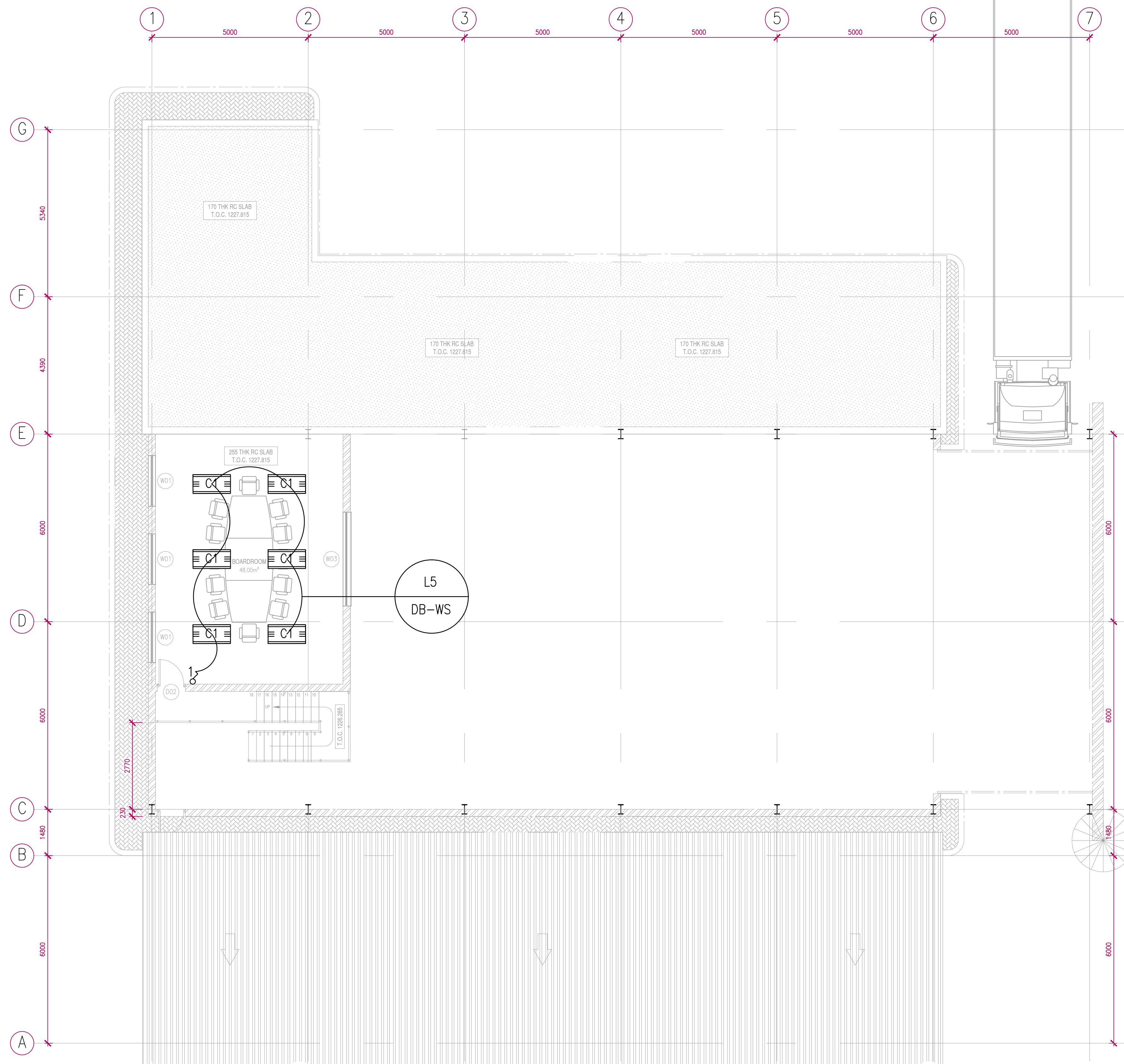


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BLOEMHOF WASTE
WATER TREATMENT
WORKSHOP

LIGHTING LAYOUT
GROUND FLOOR

SCALE	DATE
AS SHOWN ORIGINAL DWG SIZE A1	22/09/2024
DRAWING NUMBER	REV NO
BWWTW-EL-PL-200	A



FIRST FLOOR PLAN
WORKSHOP & CARPORT – LIGHTING LAYOUT
SCALE 1:75

LEGEND

- TYPE A: 1200mm SURFACE MOUNTED LED LIGHT FITTING, POLYCARBONATE OPTICAL COVER, 46W LAMP, 7062 LUMENS, 4000K COLOUR TEMPERATURE, IP65 PROTECTION, ELECTRONIC CONTROL GEAR.
- TYPE HB: 2500mm SURFACE MOUNTED LED LIGHT FITTING, POLYCARBONATE OPTICAL COVER, 46W LAMP, 7062 LUMENS, 4000K COLOUR TEMPERATURE, IP65 PROTECTION, ELECTRONIC CONTROL GEAR.
- TYPE B: RECESSED MOUNTED LED DOWNLIGHT, 165mm DIAMETER, ALUMINIUM HOUSING COMPLETE WITH SPECULAR WHITE TRIM RING FINISH, 15W LED LAMP, 2100 LUMENS, 4000K COLOUR TEMPERATURE, IP20 PROTECTION, ELECTRONIC CONTROL GEAR.
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- TYPE C2: SURFACE-MOUNTED LED PANEL LUMINAIRE, 600mm X 600mm, POLY-CARBONATE BODY, ACRYLIC OPAL DIFFUSER, 36W LED LAMP, 3240 LUMENS, 4000K COLOUR TEMPERATURE, IP20 PROTECTION, ELECTRONIC CONTROL GEAR.
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- OCCUPANCY SENSOR
- 10A 1GANG 1WAY LIGHT SWITCH
- 10A 1GANG 2WAY LIGHT SWITCH
- 10A 2GANG 2WAY LIGHT SWITCH
- ELECTRICAL DISTRIBUTION BOX
- PHOTO CELL
- CIRCUIT NUMBER
- DISTRIBUTION BOARD NUMBER

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M. Ngombe 08/10/2024
CONSULTING ENGINEER DATE

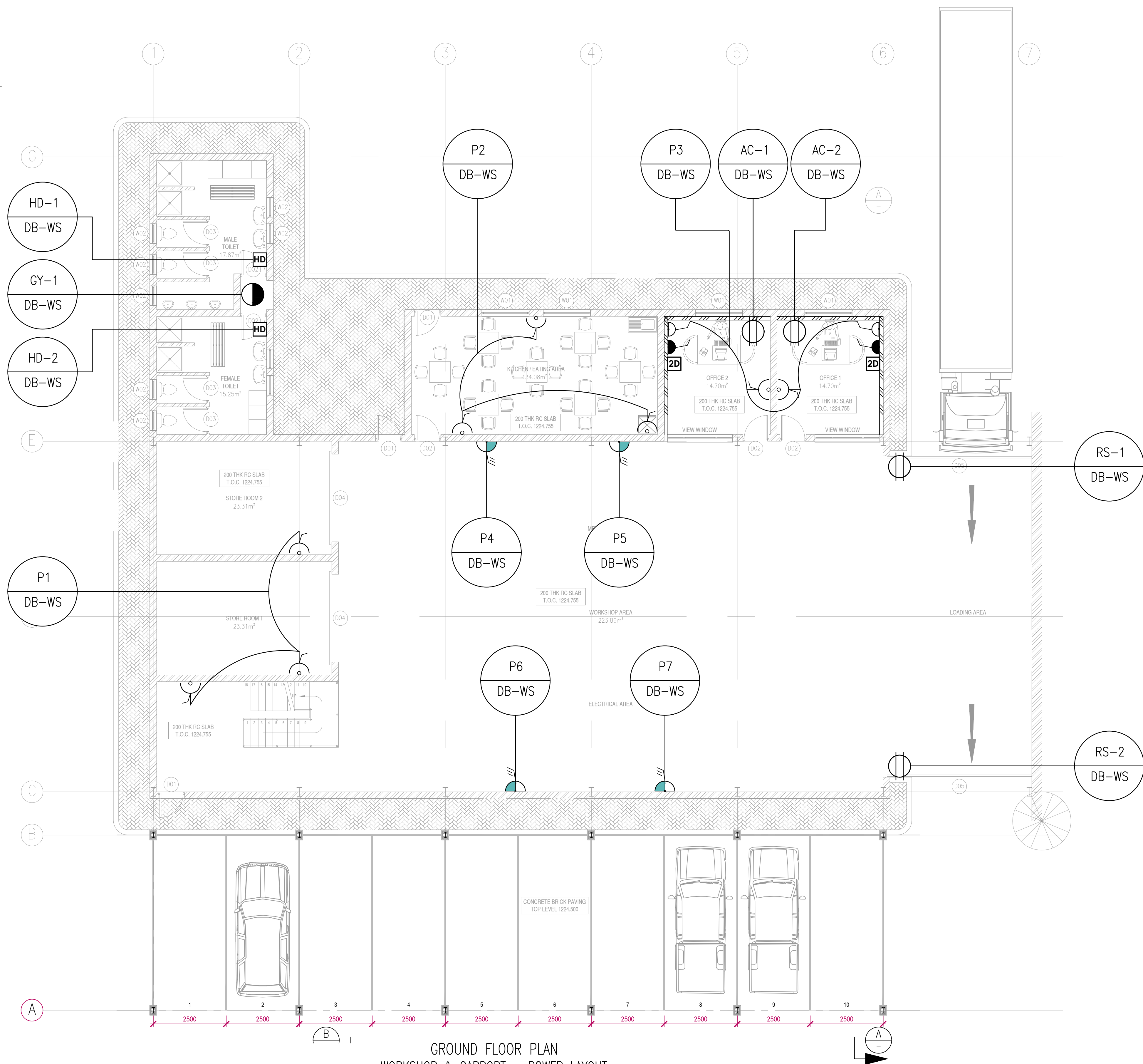
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BLOEMHOF WASTE
WATER TREATMENT
WORKSHOP

FIRST FLOOR
LAYOUT

SCALE	DATE
AS SHOWN ORIGINAL DWG SIZE A1	22/09/2024
DRAWING NUMBER	REV NO
BWWTW-EL-PL-100	0



GROUND FLOOR PLAN
WORKSHOP & CARPORT – POWER LAYOUT
SCALE 1:75

LEGEND

- UPVC SLEEVE (SIZE AS INDICATED)
- 16A 3-PIN DOUBLE SOCKET OUTLET,
WALL MOUNTED AT 1100mm A.F.F.L.
- 16A 3-PIN DOUBLE SOCKET OUTLET,
WALL MOUNTED AT 300mm A.F.F.L.
- THREE PHASE 5-PIN INDUSTRIAL WELDING
SOCKET OUTLET
- 16A 3-PIN SINGLE NORMAL
SOCKET OUTLET POWER SKIRTING MOUNTED
- 16A 3-PIN SINGLE DEDICATED SOCKET OUTLET
POWER SKIRTING / WALL MOUNTED
- COMBINATION OUTLET, FLUSH MOUNTED, CONSISTING
OF 16A 3 Pin BLUE SWITCHED SOCKET OUTLET,
COMBINED TELEPHONE AND DATA POINT, 2-PIN
SOCKET OUTLET, USB OUTLET AT 300mm A.F.F.L
UNLESS OTHERWISE SPECIFIED.
- FLOOR BOX, FLOOR FLUSH MOUNTED AND COMES
WITH 1x RSA (164-1), 2x SLIMLINE (164-2) AND
2x USB TYPE A, 2x RJ45, ARTEOR 8 MODULE
WITH USB POWER CLUSTER – MAGNESIUM
OR APPROVED EQUAL SUPPLY
- AUDIO VISUAL CLUSTERS: 1x16A DOUBLE SURFACE
MOUNTED SOCKET, VGA/DVI/HDMI OUTLET MOUNTED
AGAINST P2000
- HAND DRYER, BRUSHED STAINLESS STEEL FINISH,
298x322x170mm, 7.26Kg, 230V, 14-10W,
AUTOMATED SENSOR OPERATED.
- 2 COMPARTMENT 2 COVER POWER SKIRTING
- 20A, DOUBLE POLE GEYSER ISOLATOR MOUNTED IN
CEILING NEXT TO GEYSER.
- 20A, DOUBLE POLE ISOLATOR
- WALL MOUNTED TPN ISOLATOR
(SIZE AS INDICATED)
- DOUBLE DATA POINT RJ45, HEIGHT AS SPECIFIED
- TELEPHONE POINT
- ELECTRICAL DISTRIBUTION BOARD
- DATA CABINET
- CIRCUIT NUMBER
- DISTRIBUTION BOARD NUMBER

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M. Nzombi 08/10/2024
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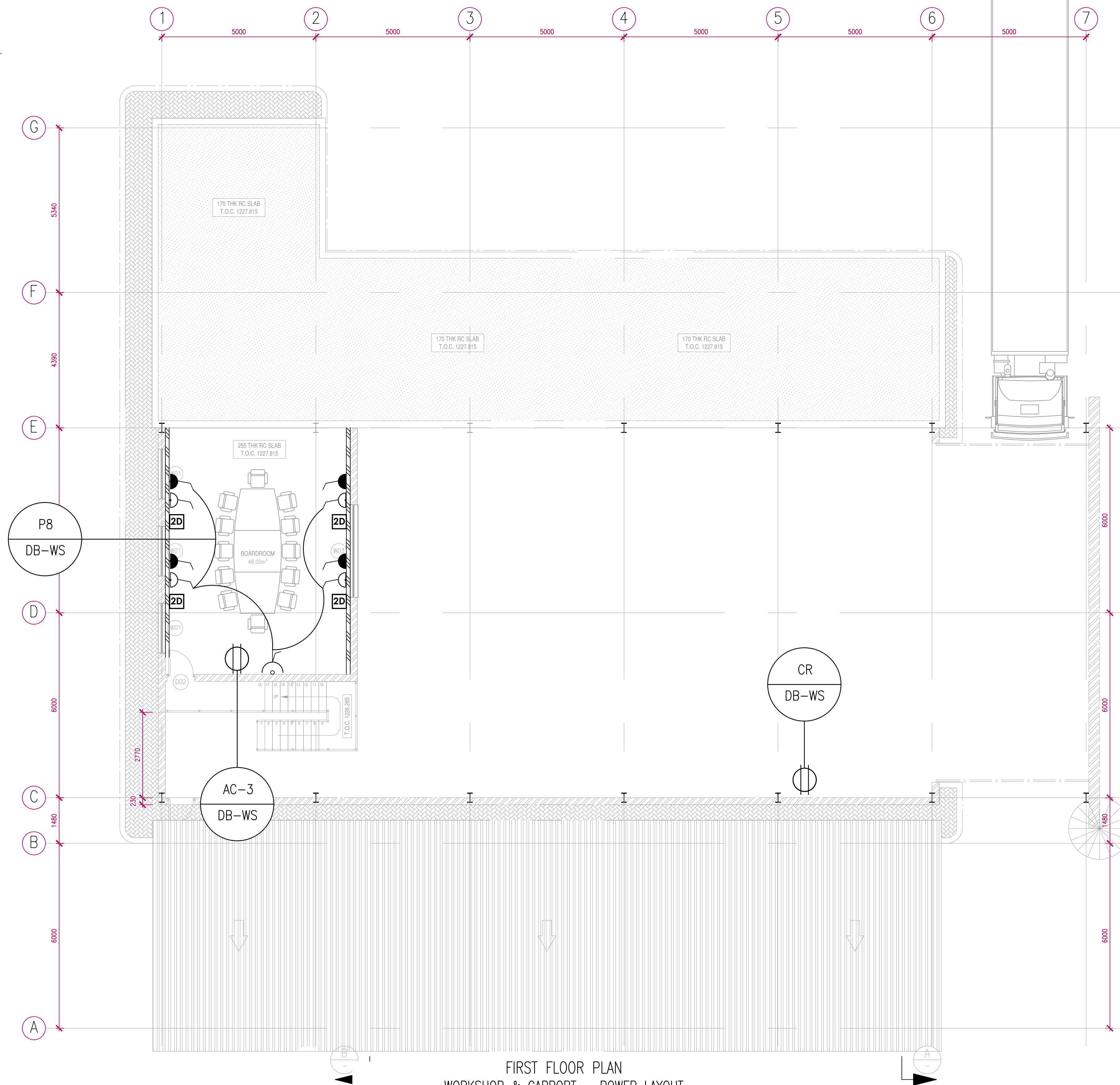
CLIENT DATE


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BLOEMHOF WASTE
WATER TREATMENT
WORKSHOP

POWER LAYOUT
GROUND FLOOR

SCALE AS SHOWN ORIGINAL DWG SIZE A1	DATE 22/09/2024
DRAWING NUMBER BWWTW-EL-PL-100	REV NO A



FIRST FLOOR PLAN
WORKSHOP & CARPORT – POWER LAYOUT
SCALE 1:75

LEGEND

- UPVC SLEEVE (SIZE AS INDICATED)
- 16A 3-PIN DOUBLE SOCKET OUTLET,
WALL MOUNTED AT 1100mm A.F.F.L.
- 16A 3-PIN DOUBLE SOCKET OUTLET,
WALL MOUNTED AT 300mm A.F.F.L.
- THREE PHASE 5-PIN INDUSTRIAL WELDING
SOCKET OUTLET
- 16A 3-PIN SINGLE NORMAL
SOCKET OUTLET POWER SKIRTING MOUNTED
- 16A 3-PIN SINGLE DEDICATED SOCKET OUTLET
POWER SKIRTING / WALL MOUNTED
- COMBINATION OUTLET, FLUSH MOUNTED, CONSISTING
OF 16A 3 Pin BLUE SWITCHED SOCKET OUTLET,
COMBINED TELEPHONE AND DATA POINT, 2-PIN
SOCKET OUTLET, USB OUTLET AT 300mm A.F.F.L
UNLESS OTHERWISE SPECIFIED.
- FLOOR BOX, FLOOR FLUSH MOUNTED AND COMES
WITH 1x RSA (164-1), 2x SLIMLINE (164-2) AND
2x USB TYPE A, 2x RJ45, ARTEOR 8 MODULE
WITH USB POWER CLUSTER – MAGNESIUM
OR APPROVED EQUAL SUPPLY
- AUDIO VISUAL CLUSTERS: 1x16A DOUBLE SURFACE
MOUNTED SOCKET, VGA/DVI/HDMI OUTLET MOUNTED
AGAINST P2000
- HAND DRYER, BRUSHED STAINLESS STEEL FINISH,
298x322x170mm, 7.26Kg, 230V, 14-10W,
AUTOMATED SENSOR OPERATED.
- 2 COMPARTMENT 2 COVER POWER SKIRTING
- 20A, DOUBLE POLE GEYSER ISOLATOR MOUNTED IN
CEILING NEXT TO GEYSER.
- 20A, DOUBLE POLE ISOLATOR
- WALL MOUNTED TPN ISOLATOR
(SIZE AS INDICATED)
- DOUBLE DATA POINT RJ45, HEIGHT AS SPECIFIED
- TELEPHONE POINT
- ELECTRICAL DISTRIBUTION BOARD
- DATA CABINET
- CIRCUIT NUMBER
- DISTRIBUTION BOARD NUMBER

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M. Ngemba 08/10/2024
CONSULTING ENGINEER DATE

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BLOEMHOF WASTE
WATER TREATMENT
WORKSHOP

FIRST FLOOR
LAYOUT

SCALE	DATE
AS SHOWN ORIGINAL DWG SIZE A1	22/09/2024
DRAWING NUMBER	REV NO
BWWTW-EL-PL-100	0

	MOULDED CASE CIRCUIT BREAKER (xA, rating Amps)(xP, poles)
	ON LOAD ISOLATOR (xA, rating Amps)(xP, poles)
	EARTH LEAKAGE (xA, rating Amps) (xP, poles)(xmA, relay value)
	CONTACTOR (xA, rating Amps) (xP, poles)
	EARTH LEAKAGE WITH OVERLOAD (xA, rating Amps)(xP, poles) (xmA, relay value)
	3PHASE, NEUTRAL & EARTH BAR (xkA, fault level rating)
	SURGE ARRESTOR (xV, rating Amps) (xkA, fault level rating)
	TRANSFORMER



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DESIGNED	DRAWN	CHECKED
AM	AM	AM

W. Nzombe	08/10/2024
CONSULTING ENGINEER	DATE

CLIENT _____ DATE _____



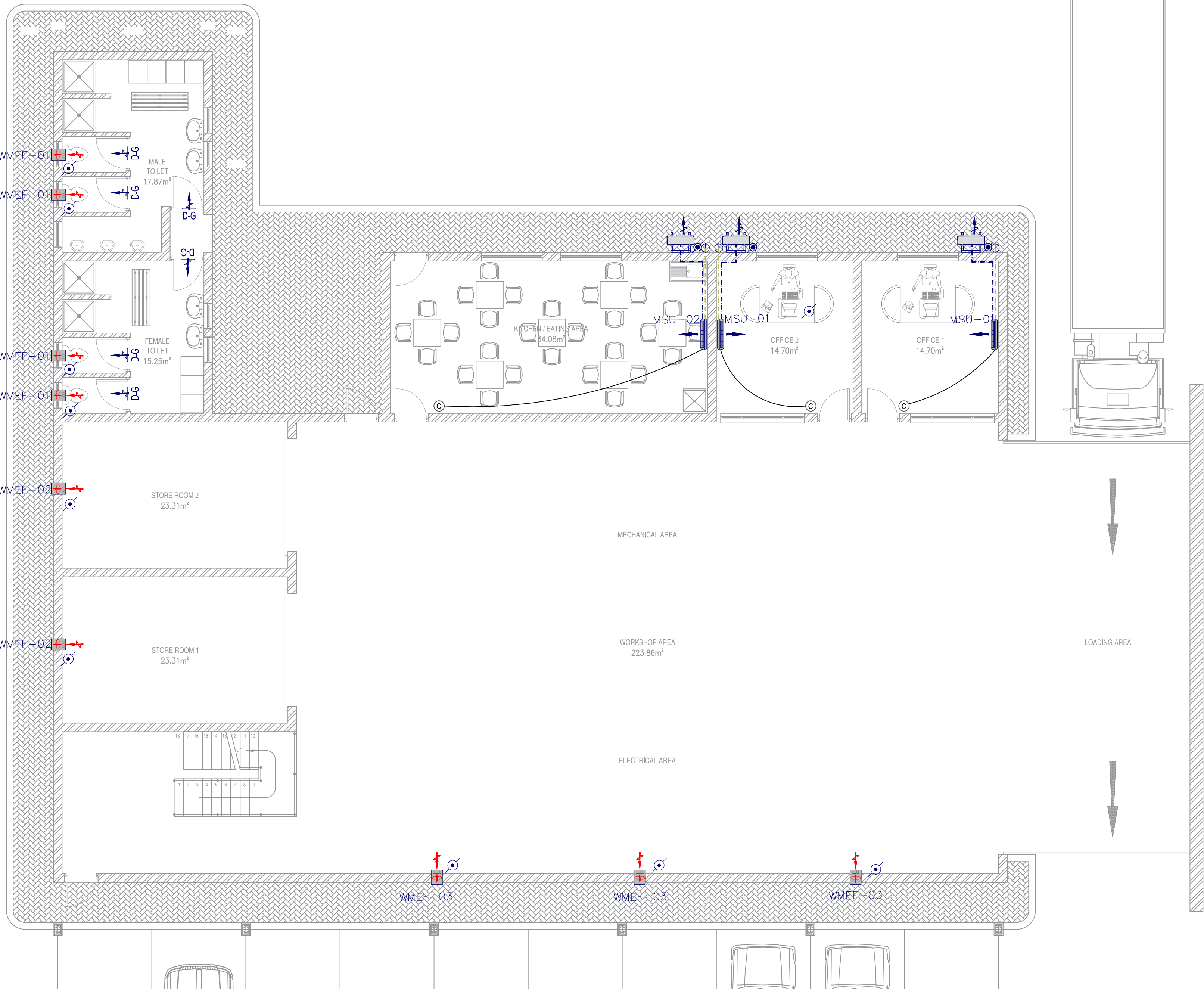
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BLOEMHOF WASTE WATER TREATMENT WORKSHOP

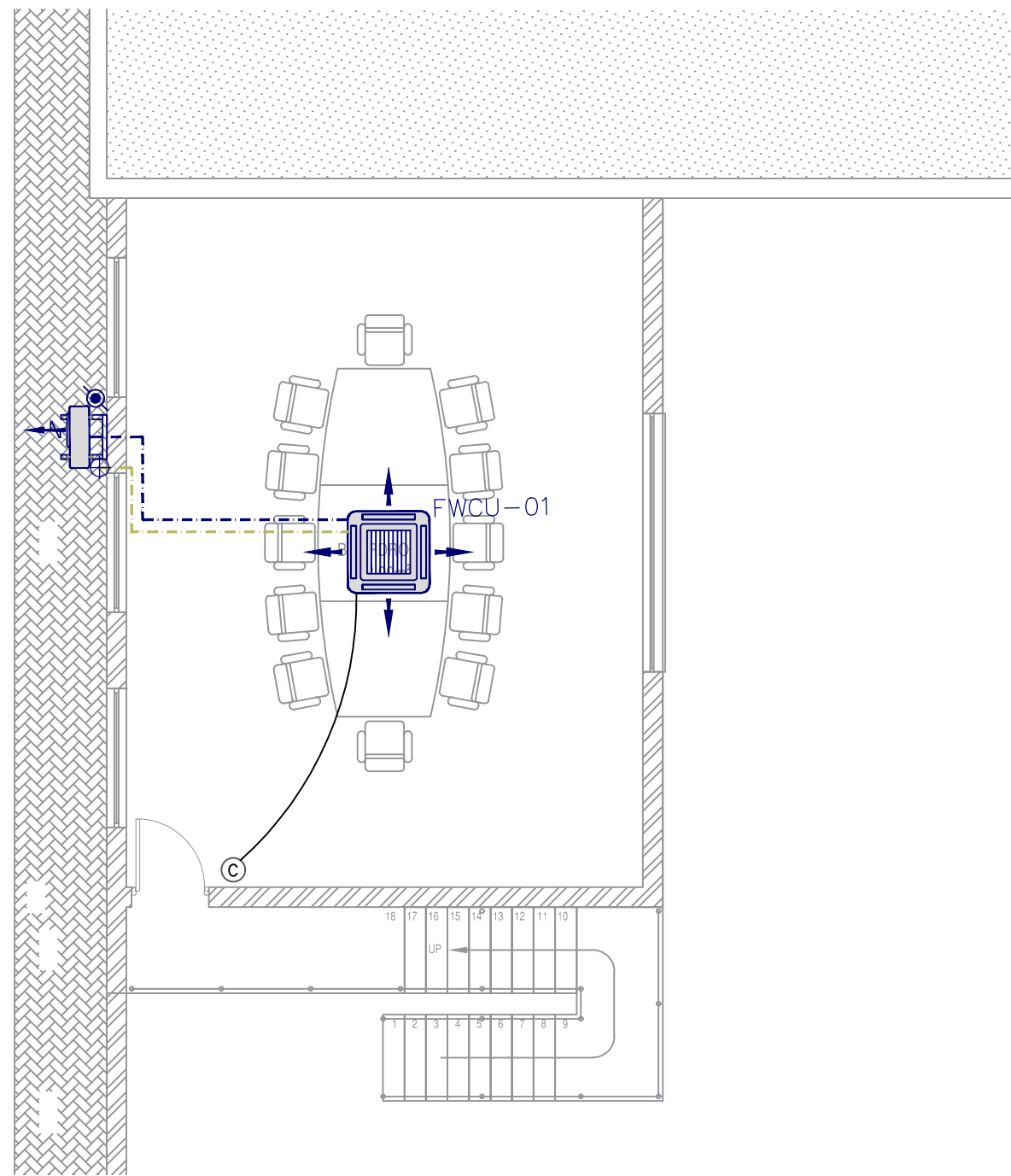
SINGLE LINE DIAGRAM

SCALE AS SHOWN ORIGINAL DWG SIZE A1	DATE 22/09/2024
DRAWING NUMBER BWWTW-EL-PL-300	REV NO A

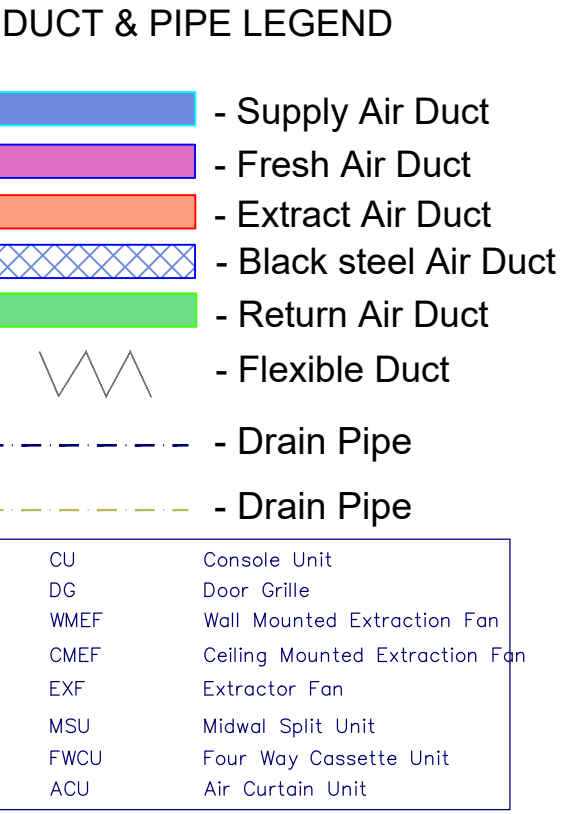
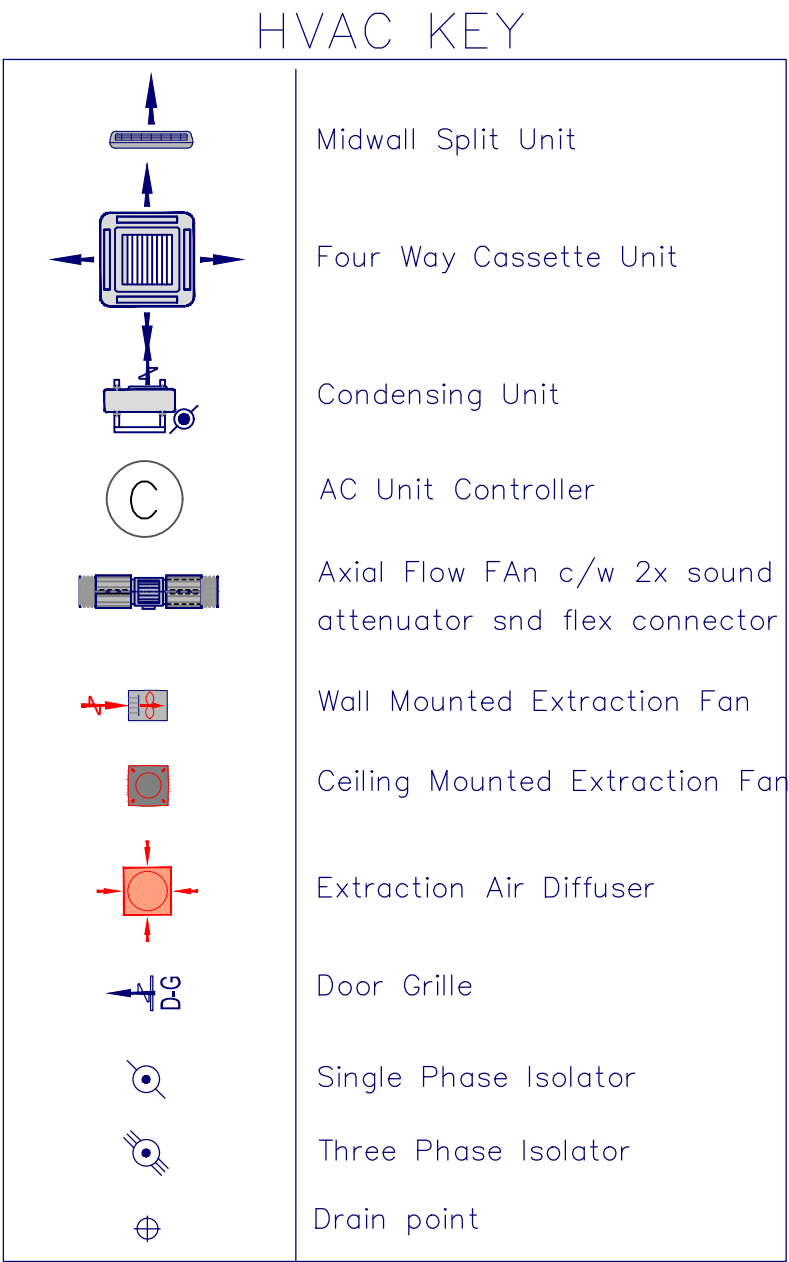


GROUND FLOOR LAYOUT. SCALE 1:75

ITEM	QTY	COOLING CAPACITY (kW)	HEATING CAPACITY (kW)	FLOW RATE (L/S)	POWER SUPPLY (pH/Hz/V)	CURRENT (A)	POWER INPUT (kW)
MSU-01	2	3.3	3.5	168.33	1/50/220-240	9.3(MCA), 16(MFA)	1.0
MSU-02	1	9.5	10.8	383.33	1/50/220-240	21.2(MCA), 25(MFA)	3.16
FWCU-02	1	9.5	10.8	293.33	1/50/220-240	21.5(MCA), 25(MFA)	2.88
WMEF-01	4	—	—	24.0	1/50/220-240	0.09	0.15
WMEF-02	2	—	—	49.0	1/50/220-240	0.12	0.20
WMEF-03	3	—	—	331.67	1/50/220-240	0.75 (FLC)	0.10



FIRST FLOOR FLOOR LAYOUT. SCALE 1:75



- NOTES / LEGEND
- This drawing is to be read in conjunction with the relevant Architectural, Structural and Electrical drawings
 - The Contractor is responsible for correct field dimensions, clearances, heights, quantities, fabrication processes, techniques of construction and co-ordination of his work with that of all other trades and is to provide all devices necessary for safe and satisfactory operation.
 - The Contractor must adhere to the co-ordination principal shown on the drawing and must inspect all the architectural drawings and other design drawings pertaining to the works and acquaint himself with the general arrangement of all other services and ensure that in fixing his work it will not obstruct the fixing or future maintenance of other services.
 - All duct sizes shown are sheet metal sizes and shall be installed in accordance with the requirements of SMACNA.
 - All ducting to be manufactured and installed in accordance with SANS 1238:2005 and SANS 10173:2003.
 - Dampers to be installed in supply and extraction systems to control air flow.
 - Power supply to all air conditioning and ventilation equipment is by the Electrical contractor.
 - Final positions of all air conditioning equipment and fans is to be determined on site after co-ordination with the other services and building elements.
 - All condensate drains shall be directed to the nearest drain point.
 - This drawing must not be used for manufacture of ductwork, etc. The contractor is to produce his own Working / Shop drawings for approval by the Engineer before manufacture and installation

COPY RIGHT			
DO NOT SCALE			
IF IN DOUBT, REFER TO DRAWING OFFICE			
CLIENT PLAN NUMBER			
AMENDMENTS CODE			
DATE	INITIAL	No./CODE	REVISION DESCRIPTION
8,10,2024	JK	0	Issued For Construction

Lidwala

2 Payne Road
Corner Main Office Park
Bryanston
Johannesburg
1685

TEL: 011 793 5486
EMAIL: info@lidwala.com

Dr Ruth S Mompoti
DISTRICT MUNICIPALITY

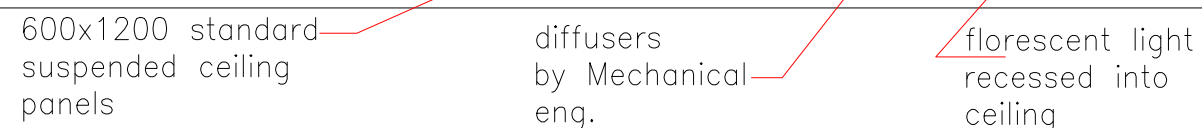
34 Church Street
Vryburg
8601

Tel: (+27 53) 928-6400
Fax: (+27 53) 928-2401
Email: info@bophirima.co.za

UPGRADE & EXTENSION OF THE BLOEMHOF WATER TREATMENT WORKS

WORKSHOP HVAC LAYOUT

ENGINEER/TECHNOLOGIST			
SCALE	1:75	J. KIBULUNGU	
DESIGNED REG. NO.	J. KIBULUNGU	CHECKED REG. NO.	AA MAHERRY #20190924
DRAWING NUMBER		REVISION NO.	
031-A02-HVAC-DRW-001		0	



CEILING & LIGHTING LAYOUT



1. All local, national by-laws and SANS code 10400 shall be complied with.
2. Site boundary pegs or co-ordinates to be identified before commencement of any work.
3. Contractors and subcontractors to check all dimensions, level etc on site prior to commencement of work.
4. All work shown on drawings to be finished unless otherwise stated.
5. All new work to match and line up with existing.
6. No dimensions to be scaled, only figured dimensions to be used and large scale details supersede small scale drawings.
7. Any queries or discrepancies in dimensions or detail on the drawings or between drawings and specifications to be reported to the architect for clarification before relevant materials are ordered or work put in hand.
8. The information on a drawing is the property of Ledwala and its doors.
9. All wall openings i.e. doors, windows etc. to have pressed concrete lintols over, unless otherwise detailed.
10. All electrical work to be done by the contractor registered with the electrical contracting board and to be in accordance with SANS 10400
11. A certificate of compliance by an accredited person to be provided for the installations.
12. Contractor to allow for testing and inspection of the existing electrical installation as required by the certificate of compliance and provide details list if any.

PROJECT STAGE

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All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

AMENDMENT

[illegible]

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Northolff +27 861 543 9252
2115 Fax: +27 11 793-5476
Republic of South Africa e-mail: gautea@lidwala.com

DESIGNED	DRAWN	CHECKED

CONSULTING ENGINEER	DATE

CLIENT _____ DATE _____



Dr. RUTH S MOMPATI
DISTRICT MUNICIPALITY
P.O. BOX 21
VRYBURG 8600
TEL : (053) 937 2222
FAX : (053) 927 2401

UPGRADING OF THE BLOEMHOF WATER TREATMENT WORKS

MCC ROOM FLOOR PLAN CEILING & LIGHTING LAYOUT

ISSUED FOR TENDER	SCALE	DATE
	SCALE ORIGINAL DWG SIZE A1	DATE
	DRAWING NUMBER	REV NO
	14004-E-SP-050	A

COORDINATE LIST		
WGS84 (Lo 25)		
TEST PITS		
POINT	Y-COORD	X-COORD
CONST:		
BTP1	-58 760,000	3 059 868,000
BTP2	-58 748,000	3 059 910,000



LEGEND	
	1230x52 2x58W Surface Mount
	400W Flooding Light Waterproof
	1x250W Suspended Light
	26W Exterior Wall Light

00	11.11.2016	JM	TC
01	31.01.2015	FvV	AS CvdW
ISSUED FOR CONSTRUCTION			
Rev	Date	Prepared by	Checked by
Description			
Status			

Dr. RUTH S. MOMPATI DISTRICT MUNICIPALITY

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Phosnet Suite 258, Private Bag X1026, Lyttelton, 0140, South Africa
Tel : +27 (0)12 667 6260 Fax : +27 (0)86 654 5951
E-mail : csv@csvwater.co.za

CLIENT ACCEPTANCE	CONSULTANT APPROVAL
THIS ACCEPTANCE IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OR LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWEVER ARISING.	Name : A. Smith Prof. Reg. No. : 2004 700 82 Date : DD / MM / YYYY
Date :	THE ABOVE SIGNATORY CERTIFIES THAT THE DESIGNER AND CHECKER HAVE CONSENTED TO THEIR NAMES BEING INSERTED ON THIS DRAWING AND THAT THEY HAVE SEEN AND APPROVED THE DRAWING.

Project description:
**UPGRADE AND EXTENSION OF THE
BLOEMHOF WATER TREATMENT PLANT**

Drawing name:
LIGHTING LAYOUT

Client project number: XXX	Consultant reference: 8003 - WSI - DD	Original size: A1
Scale: 1 : 200	Project No. Discipline Stage	Revision
Sheet: 1 of 3	Drawing number: 14004-E-LS-045	00
	Project Type Number	

PRINT DATE: 11.11.2016

LOWER LEVEL

8003-WSI-DD-CP-LOWER LEVEL

COORDINATE LIST		
WGS84 (Lo 25)		
TEST PITS		
POINT	Y-COORD	X-COORD
CONST:		
BTP1	-58 760,000	3 059 868,000
BTP2	-58 748,000	3 059 910,000

LEGEND	
	1230x52 2x58W Surface Mount
	400W Flooding Light Waterproof
	1x250W Suspended Light
	26W Exterior Wall Light

ISSUED FOR CONSTRUCTION		DD
Rev	Date	Prepared by
Checked by	Approved by	Status

CLIENT

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Email: info@lidwala.com Web: www.lidwala.com

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Specialist Consultant:

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THIS ACCEPTANCE IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OR LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWEVER ARISING.	Name : I. A. Smith Prof Reg No : - 2004 700 82 Date : DD / MM / YYYY
Date :	THE ABOVE SIGNATORY CERTIFIES THAT THE DESIGNER AND CHECKER HAVE CONSENTED TO THEIR NAMES BEING INSERTED ON THIS DRAWING AND THAT THEY HAVE SEEN AND APPROVED THE DRAWING.

Project description:	
UPGRADE AND EXTENSION OF THE BLOEMHOF WATER TREATMENT PLANT	
Drawing name:	
LIGHTING LAYOUT	
Client project number:	Consultant reference:
8003	8003 - WSI - DD
Scale:	Project No. Discipline Stage
1 : 200	
Drawing number:	Revision
14004-E-LS-045	00
Sheet:	Project Type Number
2 of 3	

PRINT DATE: 11.11.2016
BOTTOM LEVEL

8003-WSI-DD-CP-BOTTOM LEVEL

COORDINATE LIST		
WGS84 (Lo 25)		
TEST PITS		
POINT	Y-COORD	X-COORD
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BTP1	-58 760,000	3 059 868,000
BTP2	-58 748,000	3 059 910,000

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	1230x52 2x58W Surface Mount
	400W Flooding Light Waterproof
	1x250W Suspended Light
	26W Exterior Wall Light

CLIENT

**Dr. RUTH S.
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Lidwala
Specialist Solutions

<u>CLIENT ACCEPTANCE</u>	<u>CONSULTANT APPROVAL</u>						
THIS ACCEPTANCE IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OR LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWEVER ARISING.	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding-bottom: 5px;">Name</td> <td style="width: 50%; border-bottom: 1px solid black; padding-bottom: 5px;">- A. Smith</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding-bottom: 5px;">Prof. Reg. No. -</td> <td style="border-bottom: 1px solid black; padding-bottom: 5px;">- 2004 700 82</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding-bottom: 5px;">Date</td> <td style="border-bottom: 1px solid black; padding-bottom: 5px;">- DD / MM / YYYY</td> </tr> </table> THE ABOVE SIGNATORY CERTIFIES THAT THE DESIGNER AND CHECKER HAVE CONSENTED TO THEIR NAMES BEING INSERTED ON THIS DRAWING AND THAT THEY HAVE SEEN AND APPROVED THE DRAWING.	Name	- A. Smith	Prof. Reg. No. -	- 2004 700 82	Date	- DD / MM / YYYY
Name	- A. Smith						
Prof. Reg. No. -	- 2004 700 82						
Date	- DD / MM / YYYY						

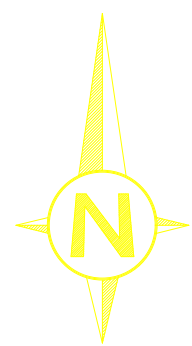
Drawing name:

LIGHTING LAYOUT

Client project number:	Consultant reference:			Original size
XXX	8003 - WSI - DD			A1
Scale:	Project No.	Discipline	Stage	
1 : 200	Drawing number:			Revision
Sheet:	14004-E-LS-045			00
2 of 2	Project	Type	Number	

PRINT DATE: 11.11.2016
First Floor

8003-WSI-~~DDM~~3-GP-FIRST FLOOR



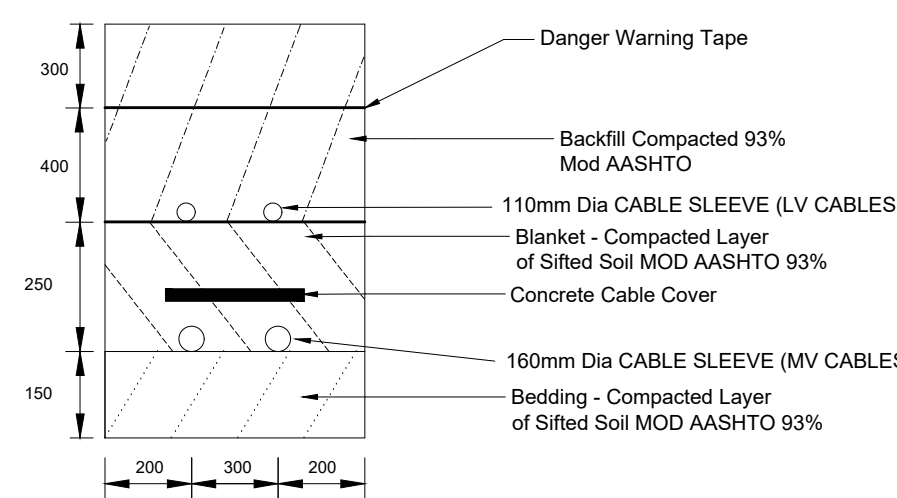
GENERAL NOTES

1. ALL WORK MUST COMPLY WITH SAN 10142
2. CABLE TRENCHES TO BE MINIMUM 1000mm FROM ROAD CURBS AND BOUNDARY WALLS

LEGEND

- EXISTING CABLE LADDERS (RE-USE)
- NEW POWER CABLE TRENCH
- X - NUMBER OF SLEEVES
p - 160mm DIA CABLE SLEEVE
- MOTOR CONTROL CENTRE (MCC)

ELECTRICAL CABLE TRENCH DETAILS



02	24.06.2021	F.H	M.T	M.T	
ISSUED FOR CONSTRUCTION					DD
Rev	Date	Prepared by	Checked by	Approved by	
Description					Status

CLIENT

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Postnet Suite 258, Private Bag X1028, Lyttelton, 0140, South Africa
Tel: +27 (0)12 667 6260 Fax: +27 (0)86 654 5951
E-mail: csv@csvwater.co.za

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WHATEVER CAUSE OR HOWEVER
ARISING.

Date

CONSULTANT APPROVAL

Name : A. Smith
Prof. Reg. No. : 2004 700 82
Date : DD / MM / YYYY

THE ABOVE SIGNATORY CERTIFIES
THAT THE DESIGNER AND CHECKER
HAVE CONSENTED TO THEIR NAMES
BEING INSERTED ON THIS DRAWING
AND THAT THEY HAVE SEEN AND
APPROVED THE DRAWING.

Project description:

UPGRADE AND EXTENSION OF THE
BLOEMHOF WATER TREATMENT PLANT

Drawing name:

SITE PLAN
ELECTRICAL RETICULATION LAYOUT

Client project number: BDM 2007-027A	Consultant reference: 8003 - WSI - DD	Original size: A1
Scale: 1 : 200	Project No. Discipline Stage	Revision
Sheet: 1 of 2	Drawing number: 8003 -ESR- 001	01
	Project Type Number	

PRINT DATE: 02.08.2020