

TENDER NO. 143Q/2020/21



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

SCM - 511

Approved by Branch Manager: 03/04/2020

Version: 4

Page 1 of 72

CONTRACT DOCUMENT

FOR THE

DESIGN AND BUILD OF THE ELECTRICAL LOW VOLTAGE AND MECHANICAL EQUIPMENT ASSOCIATED WITH THE POWDER ACTIVATED CARBON DOSING AT VOELVLEI WATER TREATMENT PLANT

VOLUME 3A

(NON-RETURNABLE DOCUMENT)

SCOPE OF WORK, PART C3.6 ANNEXES: SPECIFICATIONS

ISSUED BY:

**WATER AND WASTE:
WATER AND SANIATION
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BELLVILLE
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FOR OFFICIAL USE.

Tender Serial No.:

Signatures of City Officials at Tender
Opening

1.

2.

3.

OCTOBER 2020

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| NAME OF TENDERING ENTITY | |
| EMAIL ADDRESS OF TENDERING ENTITY | |
| FAX NUMBER OF TENDERING ENTITY | |

CITY OF CAPE TOWN

WATER AND WASTE: WATER AND SANITATION

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TREATMENT PLANT

General Tender Information

This Volume 3A constitutes the balance of the Tender Document in accordance with F1.2 in Part T1.2
Tender Data

This Volume 3A contains 70 pages (refer to Declaration in Part C2.2 Schedules of Quantities).

**TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS
TO ANY PARTICULAR TRADE MARK, NAME, PATENT, DESIGN, TYPE,
SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE
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C3.4 CONSTRUCTION: 3.4.1

STANDARD SPECIFICATION FOR MECHANICAL WORKS

Standard Specification for Mechanical Works is issued in an Electronic Version (USB), attached to Volume 3A

TRADE NAMES OR PROPRIETARY PRODUCTS

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C3.4 CONSTRUCTION: 3.4.1

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C3.4 CONSTRUCTION: 3.4.1

STANDARD SPECIFICATION FOR ELECTRONIC WORKS
(Not applicable to this tender)

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C3.4 CONSTRUCTION: 3.4.2

DETAILED MECHANICAL SPECIFICATION

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A0 TRADE NAMES OR PROPRIETARY PRODUCTS

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A1 GENERAL

This specification should be read in conjunction with C3.4.1 – Standard Specification for Mechanical Works; C3.4.2 – Standard Specification for Electrical Works; C3.4.5 Detailed Specification for Electrical Works and Volume 4 - Tender Drawings.

A2 SCOPE OF MECHANICAL WORKS

The Contractor is required to upgrade all equipment associated with the Powder Activated Carbon (PAC) dosing system as well as associated minor works as stated below. The contractor shall allow for cleaning of equipment and work place before commencing work. The Contractor shall further also allow for cleaning up after the works has been completed. All new equipment shall be rated for the use in Hazardous Locations Zone 21 in accordance with SANS 10108 – "*The classification of hazardous locations and the selection of equipment for use in such locations*" This includes:

- a) New motors for the PAC booster pumps
- b) New motors for the PAC dosing pumps
- c) New motors for the PAC screw feeder
- d) New vibrator assemblies
- e) New sump pump
- f) New Reverse Jet Filtration systems
- g) New isolation valve and pressure reducing valve on the potable water supply system
- h) Master Installation Electrician to assist with area classifications and upon completion of installation issue certificate of compliance
- i) Signage as required for hazardous locations
- j) Stainless Bulk bag discharge units

A3 NEW ELECTRICAL MOTORS

The Contractor shall replace the following with motors compatible to the existing infrastructure. Details of each of the motors to be replaced has been given below; All new/replacement equipment shall comply with clause D35: Electric Motors of C3.4.1 – Standard Specification for Mechanical Works. All motors shall be rated for the use with a VFC regardless of application. The contractor shall provide the detailed specification of the motors on offer with their tender and confirm it before commencing with the replacement.

- a) New motors for the booster pumps (2 off)
- b) New motors for the dosing pumps (2 off)
 - i. The Contractor shall allow for a new set of drive belts for each pump if applicable.
- c) New motors for the PAC screw feeders (2 off)
- d) New silo vibrator assemblies (4 off)

A4 PUMPS AND GEARBOXES

a) Sump Pump

The Contractor shall allow for the removal, of the existing sump pump and the installation of a new sump pump. The replacement sump pump shall have a duty of 5l/s (rated at booster pump delivery per design) at a head of minimum 5m before considering piping and design implications. The pump shall be of a vortex type submersible pump with integrated controls. The sump pump can be single phase (220V, 50HZ) or 3 Phase (400V,50HZ) made of 304 stainless steel. The motor should be rated according to the correct hazardous location zoning.

b) Booster Pump

The Contractor shall allow for the removal, of the existing booster pump and the installation of a new booster pump. The booster pump should be able to feed the dosing pump and provide sufficient pressure and flow for the proposed venturi to operate and to feed the dosing pump. The motor should be 3 phase 50HZ (400V). Furthermore, the motor should be rated according to the correct hazardous location zoning.

c) Dosing Pump

The Contractor shall allow for the removal, of the existing dosing pump and the installation of a new dosing pump. The dosing pump should be able to provide the desired slurry feed rate as indicated by the current guideline details in tender drawings and schedules (volume 4) . Furthermore, the motor should be rated according to the correct hazardous location zoning.

d) Screw feeder Gearbox

The Contractor shall allow for the removal, of the existing screw feeder gearbox and the installation of a new screw feeder gearbox. The current design can be used as a guideline. The existing gearbox is a helical worm type, with a 28:1 ratio coupled to a Bonfiglioli MVF49/P. Current maximum feed rate is 393Kg per hour.

A5 REVERSE JET FILTRATION SYSTEMS (2 OFF)

The Contractor shall allow for the removal, of the existing Reverse Jet Filtration Systems and the installation of a new Reverse Jet Filtration Systems. The replacement systems shall suit the existing installation without any structural modifications.

For clarity the existing equipment is as per the following:

- Make: DCE Vockes Siloair
- Model: VS10
- Filter Area: 10m²

- Number of Cartridges: 4
- Motor: As specified below
- Air Requirements: 4.8 Bars
- Air Volume: 11.2m³/h
- Pulse Duration: 200milliseconds

The installation shall take compressed air from the site compressed air mains. The air shall be filtered before passing through a pressure regulator and into a compressed air accumulator. The compressed air reservoir shall be suitably sized to clean all of the cartridges simultaneously, however a maximum of two cartridges shall be cleaned at any given time. The Contractor shall ensure that all pipes and equipment is supported and that no movement of pipework and/or equipment is visible during or after operation.

The Contractor shall allow for the following as a minimum but shall ensure that the installation forms a fully operational unit (i.e. packaging plant):

- a) Isolation ball valve and non-return valve
- b) Compressed air filters
- c) Isolation ball valve
- d) Adjustable pressure regulator with upstream as well as downstream pressure indication
- e) Compressed air accumulator
- f) Isolation ball valve
- g) Fast acting, high flow solenoid actuated diaphragm valves, each with upstream isolation ball valve
- h) Venturi (if applicable) air purge pipe
- i) Control system (refer to B8.5 – **"PAC DOSING SYSTEM"**)
- j) Filter Cartridges
- k) Pipework, fittings, supports, and fasteners as required.

The corrosion protection shall conform to in accordance with paint system clause D14.5.12 of C3.4.1 – Standard Specification for Mechanical Works.

A6 ISOLATION VALVE AND PRESSURE REDUCING VALVE

The Contractor shall provide a new pressure reducing valve as well as upstream pneumatic isolation valve with local solenoid valve control and pneumatic tubing. The Contractors shall assume a 10bar working pressure and 4bar compressed air pressure when selecting equipment.

The contractor shall allow for a new section of carbon steel pipe coated in accordance with paint system clause D14.5.12 of C3.4.1 – Standard Specification for Mechanical Works. The section is estimated to be 6m long with nominal diameter of 100mm and shall house the pressure reducing valve as well as pneumatic isolation valve. The Contractor shall allow for sufficient couplings, supports and adaptors.

A7 MASTER INSTALLATION ELECTRICIAN APPROVALS

The Contractor shall allow for a Master Installation Electrician (M.I.E) with active registration at the department of labour and proven experience in hazloc environments to assess the contractors design and provide approval of the design before manufacturing or installation. The M.I.E. should issue a certificate of compliance and additional test reports for hazardous locations (section 8.8.2) upon completion of the installation.

The Contractor shall submit the registration documentation and CV to the Engineer for approval, if the person is no deemed to be suitably qualified, the Contractor shall provide alternative candidates.

The Contractor shall allow for 3 officials from the city and 3 members of the Engineering team.

A8 SIGNAGE

The Contractor shall allow for the appropriate signage and operating procedures, including but not limited to the following:

- a) Caution signage stipulating PPE requirements when entering hazardous area
- b) Danger signage for explosive atmospheres
- c) Danger signage for electrical shock
- d) Emergency shut-down procedure

A9 ASSET IDENTIFICATION

Labelling and barcoding of equipment shall be done in line with City equipment identity coding (coding to be confirmed by Employer's representative / Engineer before labelling)

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C3.4 CONSTRUCTION: 3.4.2

DETAILED ELECTRICAL SPECIFICATION

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B0 TRADE NAMES OR PROPRIETARY PRODUCTS

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B1 REFERENCE DOCUMENTS

The Contractor shall comply with the standard specification, detail specification, as well as Codes and Standards listed below.

B1.1 APPLICABLE STANDARDS

| Doc Number | Description |
|----------------|--|
| IEC 60079-10-2 | Explosive atmospheres Part 10-2: Classification of areas – Combustible dust atmospheres |
| IEC 60617 | Graphical symbols for electrical power, telecommunications and electronics diagrams |
| IEC 61082 | Preparation of documents used in electro technology |
| IEC 61158 | Digital data communications for measurement and control – Fieldbus for use in industrial control systems |
| IEC 61326 | Electrical equipment for measurement, control and laboratory use - EMC requirements |
| IEC 61643 | Low-voltage surge protective devices. |
| IEC 81346 | Structuring principles and reference designations |
| IEEE 802.3 | IEEE Standard for Information technology-- Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications |
| ISO 14617 | Graphic symbols for diagrams |
| ISA-95.1 | Integration of enterprise and control systems |
| ISA-5.1 | Instrumentation symbols and identification |
| OHSA no.85 | Occupational health and safety act no.85 of 1993 |

| Doc Number | Description |
|--------------|--|
| NRS 048-2 | Electricity supply - Quality of supply Part 2: Voltage characteristics, compatibility levels, limits and assessment methods |
| SANS 780 | Distribution transformers |
| SANS 1063 | Earth rods, couplers and connections |
| SANS 1091 | National colour standard |
| SANS 1239 | Plugs, socket-outlets and couplers for industrial purposes |
| SANS 1464-22 | Safety of luminaires Part 22: Luminaires for emergency lighting |
| SANS 1507-1 | Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 1: General |
| SANS 1507-3 | Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 3: PVC Distribution cables |
| SANS 1804 | Induction motors |
| SANS 10108 | The classification of hazardous locations and the selection of equipment for use in such locations |
| SANS 10114-1 | Interior lighting Part 1: Artificial lighting of interiors |
| SANS 10142-1 | The wiring of premises Part 1: Low-voltage installations |
| SANS 10199 | The design and installation of earth electrodes |
| SANS 10292 | Earthing of low voltage distribution systems |
| SANS 10389-1 | Exterior lighting Part 1: Artificial lighting of exterior areas for work and safety |
| SANS 60034 | Rotating electrical machines |
| SANS 60044 | Instrument transformers |
| SANS 60529 | Degrees of protection provided by enclosures(IP Code) |
| SANS 60884-1 | Plugs and socket-outlets for household and similar purposes Part 1: General requirements |
| SANS 60439 | Low-voltage switchgear and controlgear assemblies |
| SANS 62040 | Uninterruptible power systems (UPS) |
| SANS 62305-1 | Protection against lightning Part 1: General principles |

| Doc Number | Description |
|--------------|--|
| SANS 62305-2 | Protection against lightning Part 2: Risk management |
| SANS 62305-3 | Protection against lightning Part 3: Physical damage to structures and life hazard |
| SANS 62305-4 | Protection against lightning Part 4: Electrical and electronic systems within structures |

B1.2 SUPPORTING INFORMATION

The general electrical layouts and diagrams are

| Doc Number | Title |
|---------------------------|--|
| C00690-01-EL-DGA-0001-001 | Motor Control Centre General Arrangement |
| C00690-01-EL-DSL-0001-001 | Motor Control Centre Single Line Diagram Sheet 1 |
| C00690-01-EL-DSL-0001-002 | Motor Control Centre Single Line Diagram Sheet 2 |
| C00690-01-EL-DSL-0001-003 | Motor Control Centre Single Line Diagram Sheet 3 |
| C00690-01-EL-DAL-0003-001 | Motor Control Centre Room Layout |

B1.3 ORDER OF PRECEDENCE

The following order of precedence shall apply.

- 1 Local Laws and Regulations
- 2 This Specification (Project, Standards and Specification)
- 3 Data Sheets
- 4 Latest International Codes and Standards

B2. ACRONYMS

| | |
|------|---|
| A | Ampere |
| AC | Alternating Current |
| ATA | Aluminium Tape Armour |
| CCR | Central Control Room |
| BCEW | Bare Copper Earth Wire |
| C&I | Control and Instrumentation |
| DB | Distribution Board |
| DC | Direct Current |
| DE | Drive End |
| DOL | Direct On Line |
| FLC | Full Load Current |
| HMI | Human Machine Interface |
| IEC | International Electrotechnical Commission |

| | |
|------|----------------------------------|
| ICEW | Insulated Copper Earth Wire |
| IP | Ingress Protection |
| I/O | Input / Output |
| IOS | Individual and Overall Screened |
| LED | Light Emitting Diode |
| LV | Low Voltage |
| MCB | Miniature Circuit Breaker |
| MCC | Motor Control Centre |
| MCCB | Moulded Case Circuit Breaker |
| NDE | Non Drive End |
| OLM | Optical Link Module |
| OS | Overall Screened |
| ONAN | Oil Natural Air Natural |
| PTC | Positive Temperature Coefficient |
| PVC | Poly Vinyl Chloride |
| RTU | Remote Terminal Unit |
| SANS | South African National Standards |
| SLD | Single Line Diagram |
| STP | Shielded Twisted Pair |
| SWA | Steel Wire Armour |
| TBC | To Be Confirmed |
| TBD | To Be Determined |
| TEFC | Totally Enclosed Fan Cooled |
| UPS | Uninterruptable Power Supply |
| V | Voltage |
| VA | Volt Amperes |
| VFC | Variable Frequency Controller |
| XLPE | Cross Linked Poly Ethylene |

B3. INTRODUCTION

This section of the contract covers the related design, supply, delivery, programming, installation, testing, commissioning and maintenance during the defects liability period of the electrical, control and instrumentation installation for the Works consisting of the Motor Control Centre (MCCs, control gear, cables and all electrical, control and instrumentation equipment necessary to upgade the **Voëlville Water Treatment Works (WTW) Powder Activated Carbon (PAC) Plant**. Electric motors must be provided as part of the relevant driven equipment in section C3.4.4 - Detailed mechanical specification.

All equipment and work carried out must be in accordance with section C3.4.2 – Standard specification for electrical works, unless stated otherwise in this project specification. Particular attention must be paid to specific clauses stipulated in the following paragraphs.

Control parameter settings given are provisional, and it will be the Contractor's responsibility to verify and adjust these settings in accordance with the site and system specific conditions, to be verified with the Engineer prior to and during commissioning. Provision must be made in the price for monitoring of parameters and adjustment to optimise the system operation and ensure operation as per the intent of the specification. Provision shall be made by the contractor for cleaning of equipment and work place before commencing work and upon completion of the works.

This sections must be read in conjunction with the associated mechanical sections to form a holistic picture and understanding of the Employer's requirements.

Note that the final offer, under this section, must be fully aligned in terms of scope with the final mechanical offers.

The scope of works comprises in short:

- Supply, delivery, installation, termination and testing of low voltage cables including cable ladders.
- Design, supply, delivery, installation, testing and commissioning of a Motor Control Centre (MCC) complete with starters, uninterruptible power supply and associated control.
- Design, supply, programming, delivery, installation, testing and commissioning of a programmable controller, complete with operator interface.
- Supply, delivery, installation, testing and commissioning of ancillary electrical equipment (local control stations).
- Earthing of equipment supplied as part of this contract.
- Design, supply, delivery, installation, testing and commissioning of building small power and lighting.
- Disconnect, decommission and hand over of existing equipment to be removed during this project.
- The PAC system shall be design and built as such that it allows for the integration into the existing SCADA system. The contractor shall thus allow for the mimics to be added to the existing SCADA system. All SCADA work shall be done in accordance with City of Cape Town standards and verified by a City Engineer or project manager prior to commencing of installation.
- Supply, delivery, installation, testing and commissioning of various instrument types, instrumentation stands, enclosures and field termination boxes.
- Provide operating, maintenance and "as-built" documentation.
- Provide personnel training.

The broad scope listed above, with functional Employer's requirements detailed in the following section, provide the project and costing framework for the Contractor to provide a fully priced and compliant offer, making provision for final Contractor designs and overall successful and compliant project and system implementation.

B4. ELECTRICAL SUPPLY

The point of supply for the upgraded PAC system will be the secondary terminals of a 40A (3Ø 400 V nominal, at 50 Hz) circuit breaker fitted inside a distribution board labeled (DB.C11) mounted outside of the existing PAC system MCC room. The LV cable, from the point of supply to the PAC system new MCC must be supplied and installed under this contract.

The provisional cable sizes and lengths are given in the price schedule for purpose of tendering. The size for ordering must be confirmed with the Engineer and the length must be determined on-site.

It will be the responsibility of the Contractor to make the necessary arrangements for the electrical connection timeously with the plant manager. Once connected, the Contractor must ensure that the supply i.r.o. voltage and earthing is in order before switching power onto his equipment. Claims for damage arising from non-compliance, will not be accepted.

B5. PROGRAMMABLE LOGIC CONTROLLER

Overall plant control shall be done by a Schneider M580 or equivalent. The PLC shall be installed in the MCC section for monitoring and control, and shall be mounted behind a glass cut-out in the door in order to view the PLC lights.

All I/O must be surge protected. Digital inputs must be galvanically isolated and all digital I/O must be fitted with interposing relays.

Manual operation of equipment shall not be implemented through the PLC.

B6. OPERATOR INTERFACE

The operator interface to the plant control must be by means of a Human Machine Interface (HMI), comprising a 15" touch sensitive screen mounted on the panel door of the MCC section for monitoring and control, Schneider Magelis XBT GT or equivalent, for plant status display and to provide direct access to the PLC for control parameter adjustment. This interface will be supplemented with discrete control devices on individual panels such as function selector switches/manual start/stop push buttons and discrete status indication lights.

The HMI shall be upgraded to include an additional 32Gb dynamic memory for logging of data as required.

The following graphic screen layouts must be provided as a minimum:

- **Main menu**

This shall be the HMI default opening screen, displaying the listing of screens below, for selection. Each listed screen must have an alarm flag to indicate if there is an active alarm on the relevant screen. It must be possible to return to the main menu from any other screen.

- **Plant section overview**

These screens give a graphic representation of the various plant sections and associated equipment with detailed status indication, as set out in the relevant functional control section of this specification.

- Equipment motor drive main status
- System analogue status
- Protection and process interlocks
- Emergency stop active

- **Alarm page**

This screen must display current alarms and hystorical alarms.

- **Event log**

This screen must log, time and date stamp main events.

B7. MOTOR CONTROL CENTRE (MCC)

B7.1 GENERAL REQUIREMENTS

B7.1.1 Compliance

All MCCs and associated equipment provided under this contract must generally be designed and constructed in-line with section C3.4.2 – Standard specification for electrical works. All MCCs must fully comply with SANS 60439. The contractor shall allow for MCC equipment to have item numbers by which they can be identified in the Bill of Materials section in drawings.

Item numbering of equipment shall be done in line with City equipment identity coding (coding to be confirmed by Employer's representative / Engineer before labelling) Additional requirements are listed below.

B7.1.2 PAC Plant: MCC Construction

Design, supply, delivery, installation, testing and commissioning of a new indoor type free standing MCC within the space at the bottom of the staircase, adjacent to the existing PAC system MCC room. The MCC must be manufactured from (B26) powder coated 3CR12 sheet steel, 2mm thick with front access, top entry, form of internal separation 3b and ingress protection IP44.

The MCC and switchgear symmetrical fault level must be 6 kA (minimum) at a short circuit withstand rating of 3 seconds, to be confirmed with the Engineer before construction.

Note: The Contractors attention is drawn to the photos added to section 3.4.9 which illustrates the access constraints associated with the MCC room. No additional claims, over and above the the tendered labour rate of the MCC installation, will be entertained during construction phase to reimburse the Contractor for additional cost incurred for installing the MCC in the specified position.

The PAC MCC must comprise of the following:

Incoming section equipped with:

- 40 A Main circuit breaker.
- Lightning surge arrestors of the SURGETEK (or similar and equal) type, manufactured in conformance with the guidelines of SANS 10142-1 Class 2, installed within a vented PVC box with clear lid, inside the MCC. The surge arrestors must have healthy status indication.
- Voltmeter with 7 position selector switch.
- Three combination maximum demand and instantaneous type CT operated ampere meters.
- Power meter, similar or equal to the Lovato DMG 600 series, to monitor and display real power, apparent power, power factor, frequency, voltage per phase, current per phase, Total Harmonic Distortion (THD) and energy consumption.
- 3 x Class 1,0 CT's of suitable ratio and burden for the application.

- Three phase over voltage, under voltage and phase imbalance protection relay with adjustable pickup values and delay timer.
- Fault indication lights on the cubicle door to indicate supply abnormality (Powered from UPS).

Outgoing section for UPS distribution equipped with:

- 3000VA Online double conversion UPS
- 16 A double pole UPS supply circuit breaker.
- 10 A double pole UPS output circuit breaker.
- 6 A SP circuit breaker feeding through supply healthy relay contact for control supply.
- 6 A SP circuit breaker for PLC supply.
- 9 x 2 A SP circuit breakers for instrumentation supplies.
- 3 x 2 A spare SP circuit breakers for future expansion.

Outgoing section for Reverse Jet Filter Fans (2 no) equipped with:

- All control devices and equipment necessary to ensure operation as specified in B8.5.
- DOL starter (0.75 kW), in accordance with C3.4.2 – Standard specification for electrical works.

Outgoing section for Silo Vibrators (2 sets of 2 no) equipped with:

- All control devices and equipment necessary to ensure operation as specified in B8.5.
- DOL starter (0.75 kW), in accordance with C3.4.2 – Standard specification for electrical works.

Outgoing section for PAC Screw Feeders (2 no) equipped with:

- All control devices and equipment necessary to ensure operation as specified in B8.5.
- VFC starter (0.75 kW), in accordance with C3.4.2 – Standard specification for electrical works.

Outgoing section for Dosing Pumps (2 no) equipped with:

- All control devices and equipment necessary to ensure operation as specified in B8.5.
- VFC starter (2.2 kW), in accordance with C3.4.2 – Standard specification for electrical works.

Outgoing section for Booster Pumps (2 no) equipped with:

- All control devices and equipment necessary to ensure operation as specified in B8.5.
- DOL starter (5.5 kW), in accordance with C3.4.2 – Standard specification for electrical works.

Section for monitoring and control

- A separate totally enclosed compartment with its own door must be provided, fitted with PLC, door mounted Human Machine Interface (HMI), cable termination and marshalling equipment

as described under the relevant equipment. Provision shall be made for a redundant fiber connection from the existing network to a managed switch in the PAC cabinet, to allow for the PAC cabinet to be added to the existing network.

B8. CONTROL SYSTEM

B8.1 MODES OF OPERATION

B8.1.1 Mode selection

Mode selection of the electrically actuated equipment will be effected by means of an AUTOMATIC/ OFF/ MANUAL selector switch, located on the cubicle door of the starter circuit on the Motor Control Centre (MCC) to enable personnel to select equipment between manual and auto control.

B8.1.2 Auto control

While selected to auto, the Control System must control the starting and stopping of equipment automatically, provided that the protection and process interlocks are satisfied.

B8.1.3 Manual control

While selected to manual, the operator must be permitted to start and stop equipment at his/ her discretion, provided that the protection interlocks are satisfied.

B8.2 LOCAL CONTROL STATION

A 316SS local control station with start-stop controls and a push lock twist release red mushroom head emergency stop must be provided in close proximity to electrically actuated equipment.

The control station must be mounted on a 316 SS square tubing section on a footplate, bolted to the floor in close proximity of the equipment served.

The emergency stop must either be hardwired in a failsafe manner to stop the driven equipment or alternatively the emergency stop circuit shall provide a minimum Safety Integrity Level (SIL) of SIL2.

B8.3 INTERLOCKS

Any interlock violation must remove power from the appropriate output signals required to return the actuator or apparatus to the de-energised state.

All interlocks as well as their status for each device must be available for display on request to the central control room operator.

A distinction is made between the following types of interlocks:

B8.3.1 Process interlocks

Process interlocks are implemented to:

- ensure the correct sequential operation of equipment; and/or
- maintain process variables within normal operating limits.

Process interlock violations must stop/ close associated equipment.

Process interlock violations must be event logged.

Process interlocks may be bypassed for testing purposes as long as the manual/ off/ auto selector switch is selected to manual.

B8.3.2 Protection interlocks

Protection interlocks are implemented to prevent:

- damage to equipment; and
- injury to personnel.

Protection interlock violations must trip associated equipment.

Protection interlock violations must be alarmed.

Following the violation of a protection interlock, deliberate operator action shall be required (e.g. reset) to return the device to normal operation.

Protection interlocks must not be bypassed in any mode of operation.

B8.4 LOW FLOW MONITORING

Low flow switches of the thermal dispersion type must be installed on the discharge line of centrifugal pumps as well as downstream of the main feed water valve to protect under low flow conditions, dry run or dead head protection.

The low-flow switches must be by-passed for a time period while the pump is starting, or valve opened in order to establish flow.

The starting time required to establish flow must be adjustable and determined during commissioning.

The low-flow tripped status must be monitored by the MCC control circuit, configured as a protection interlock of the associated pump and alarmed by the MCC alarm circuit.

B8.5 PAC DOSING SYSTEM

PAC is dosed as a PAC/water slurry mixture into the raw water inlet channel. There are two PAC trains which operate in a duty/standby configuration, the functional requirements and operating sequence described below will be applicable to both PAC trains and all the drives shall be clearly marked to distinguish between the two trains. The duty PAC dosing system shall be selected by the operator on the HMI.

PAC will be supplied in powder form (250kg) bags and shall be fed manually into the PAC stainless steel bulk bag discharge system. The bulk bag discharge system can be of the Flexicon BFH Bulk Bag Discharger Half Frame series or equivalent and shall be retro fitted onto the existing discharging shoot structure on the top section of the hopper. The bulk bag system shall have a spout connecting to the existing discharge shoot, where the bulk bag fit into or connect to for discharge purposes. A manually operated existing chain hoist (block and tackle) is used to transport the bags from the storage location to the stainless steel bulk bag discharge system. The bulk bag discharge system may be fitted with shakers or engineered in such away as to provide a means for the pac in the bag to be moved towards the spoutTwo vibrators, fitted on opposing sides at the bottom of each hopper, prevents the PAC from compacting or clogging. The vibrators shall be operated on a time basis and the vibration intensity shall be mechanically adjusted on each vibrator.

The top of the storage hopper shall be fitted with a reverse jet filter fan. The reverse jet fan pulls the suspended PAC particles from the storage hopper through the filter. The hopper access lid shall be fitted with a proximity switch which starts the extraction fan automatically as the PAC storage hopper lid is opened and stops as the lid is closed. The pulsation air inlet line to the filter

shall be fitted with two solenoid-controlled valves. The solenoid valves shall be opened/closed on a cyclic basis allowing blasts of high-pressure air to purge the filters.

PAC shall be fed from the hopper via a variable speed screw feeder into the slurry mixing bowl where the product will be wetted and converted into a slurry. The operator shall calculate the number of 250kg PAC bags to be added to the hopper over a 24-hour period in order to achieve the desired dosing rate, thereafter the operator shall select the quantity of PAC bags added on the MCC operator interface. The screw feeder speed shall be automatically adjusted in proportion to the quantity of bags selected on the operator interface in order to maintain a relatively consistent slurry concentration in the mixing bowl over a 24 hour period. Feed water shall be introduced into the mixing bowl via a lower jet nozzle and a top spray bar to ensure that the PAC is wetted and kept in suspension. The dust created in the mixing bowl shall be removed via a ventilation duct to the reverse jet filter fan on top of the storage hopper. A booster pump shall be used to ensure that the carbon is wetted and kept in suspension by introducing feed water into the mixing bowl via a lower jet nozzle and a top spray bar.

Feed water shall be supplied via a main isolation pneumatically actuated solenoid-controlled valve and a mixing bowl hydraulically actuated solenoid-controlled valve. Both valves shall be normally closed and automatically controlled in accordance with the various control sequences as described below. A by-pass for the mixing bowl valve shall be provided for operation in manual mode.

The PAC slurry shall be administered into the raw water inlet channel by a variable speed dosing pump. An ultrasonic level transducer mounted on the side of the mixing bowl controls the level in the mixing bowl at 50% and will indicate a high- or low-level condition. The dosing pump will increase pumping rate if the level in the mixing bowl rises, and decrease the pumping rate if the level drops. At the low and high level setpoints an alarm will sound and at the low low and high high level setpoint the PAC system will shut down.

B8.5.1 Duty selection

Duty selection must be provided via HMI by means of an on screen duty selector switch, with switch positions for PAC TRAIN 1 / PAC TRAIN 2

B8.5.2 Mode selection

Each drive shall be operated both automatically and manually, by means of a three position selector switch on the MCC for each pump, labelled AUTO/OFF/MANUAL. It shall not be possible to start the pump in the OFF position, and a running pump shall STOP when switched to OFF.

Note: Each individual system component is process interlocked during automatic mode to ensure the correct sequence of operation. Manual mode bypasses the process interlocks and is therefore intended for testing purposes only.

MANUAL mode

Each of the *Reverse Jet Filter Fans, Silo Vibrators, PAC Screw Feeders, Dosing Pumps and Booster Pumps* shall be started and stopped by means of START and STOP pushbuttons on the relevant MCC cubicle and local control station at the relevant equipment.

Note the requirements of B8.5.5 below, with regards to the protection interlocks.

AUTOMATIC mode

The PAC system shall operate automatically as described below.

Hopper filling:

The plant operator shall select the duty PAC train on the HMI situated at the PAC system MCC. The control sequence below shall be initiated by the operator opening or closing the hopper lid of

the duty PAC train. The open and closed signals are derived from a proximity switch positioned on the hopper lid, provided under section B9 below, and wired to the PLC.

- Reverse jet filter fan shall start automatically when the proximity switch detects an open hopper lid.
- Filters to be purged periodically (set by adjustable timer 1 to 24 hours) by opening one of two pulsation air inlet line solenoid-controlled valves for an adjustable duration (50 to 500 milliseconds). After purging the first set of filters the second set of filters shall be purged after an adjustable delay (1 to 10 minutes). All timers shall be adjustable on the HMI.
- Operator will manually discharge the calculated number of 250kg PAC bags into the hopper.
- When the desired number of 250kg PAC bags had been discharged into the hopper the operator will close the hopper lid.
- Reverse jet filter fan shall stop automatically when proximity switch detects a closed hopper lid.

PAC Dosing: Automatic start-up operation

- The operator shall select the number of 250kg PAC bags discharged into the hopper on the HMI.
- The operator shall select to START the duty PAC train on the HMI.
- The PLC shall open the main feed water pneumatically actuated solenoid-controlled isolation valve.
- The PLC shall open the relevant mixing bowl hydraulically actuated solenoid-controlled valve in conjunction with the starting of the booster pumps.
- Once the mixing bowl level reaches a level of 50% the reverse jet filter fan with periodic filter purging, PAC screw feeder and dosing pump must START, the level signal is derived from the ultrasonic level sensor mounted on the side of the mixing bowl provided under section B9 below, and wired to the PLC. The dosing pump speed shall be variable frequency controlled in order to maintain the level in the mixing bowl at 50%. The minimum and maximum dosing pump speed shall be governed in accordance with the manufacturers requirements by configuring the applicable VFC parameters.
- The two vibrators on the duty silo shall be enabled to START when the level inside the hopper exceeds 20%, the level signal is derived from the radar level sensor in the silo provided under section B9 below, and wired to the PLC. The silo vibrators shall switch on and off on a cyclic basis and the intervals shall be adjustable on the HMI. The silo vibrators shall further be process interlocked with the PAC screw feeders and shall only be permitted to start whilst the PAC screw feeder is running.

PAC Dosing: Automatic shut-down operation

- The operator shall set the runtime of the flushing sequence on the HMI, the runtime shall be adjustable on the HMI from 0 to 60 minutes.

Note: The timer will be configured to allow the PAC slurry mixture inside the mixing bowl to be diluted to a point where the liquid at the dosing point is clear.

- Once the silo reaches a level of 0% for a predetermined but adjustable period (HMI configurable 0 to 10 minutes) the PAC screw feeder and reverse jet filter fan shall stop, the level signal is derived from the radar level sensor in the silo provided under section B9 below, and wired to the PLC.
- The PLC must stop the dosing pump, booster pump and close the mixing bowl solenoid-controlled valve as well as the main feed water solenoid-controlled isolation valve.

B8.5.3 Emergency control

Any trip condition or emergency stop push button shall stop all drives and de-energise all solenoid-controlled valves, both in manual and auto mode of operation.

Manual intervention by an operator shall be required to reset an alarm condition in order to return the system back into operation.

Note: After every dosing cycle the hopper should be empty and the PAC system should undergo a flushing sequence. Measures should therefore be taken by the operator to ensure that alarm conditions or E-stops are cleared timeously in order to allow the system to complete the operating sequence without incurring damages or necessitating manual intervention before re-starting the system again.

In addition to the above, please note the requirements as listed below for both PAC trains:

Note the requirements of B8.5.4 below; and

Note the requirements of B8.5.5 below, with regards to the protection interlocks.

B8.5.4 Level alarm

Mixing bowl

LOW LEVEL (30%) and HIGH LEVEL (70%) alarms indicating that the mixing bowl is beyond its control limits must be provided in the mixing bowl, with audible and visual alarms. The alarms must automatically be reset when the level returns to a level within the control limits.

LOW LOW LEVEL (10%) and HIGH HIGH LEVEL (95%) alarms indicating that the mixing bowl is beyond its safe operating limits must be provided in the mixing bowl. The audible and visual alarm must remain active until reset manually.

The low low level and high high level alarms must STOP all the drives and de-energise all the solenoid-controlled valves associated with the PAC train, both in manual and auto mode of operation.

The level signals must be derived from an ultrasonic level sensor in the mixing bowl, provided under section B9, and wired to the PLC

B8.5.5 Protection interlocks

The pump sets must be protected, in all control modes against damage for the conditions described below.

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

B8.5.5.1 Motor Protection

Reverse Jet Filter Fan (2 No)

- Thermal overload

Silo Vibrator (2 Sets of 2 No)

- Thermal overload

PAC Screw Feeder (2 No)

- Motor comprehensive protection by means of the VFC integral protection

Dosing Pump (2 No)

- Motor comprehensive protection by means of the VFC integral protection

Booster Pump (2 No)

- Thermal overload

B8.5.5.2 Pump Protection

Dosing Pump (2 No)

- Pump running dry by means of flow switches.
- Pump running dry by means of low level ultrasonic level sensor in the mixing bowl.

Booster Pump (2 No)

- Pump running dry by means of flow switches.

B8.5.6 Alarm and status indication facilities

Alarm and status indication facilities must be provided in accordance with C3.4.2 – Standard specification for electrical works for the following:

B8.5.6.1 Hopper Filling (2 No)

a) Reverse Jet Filter Fan Panel (2 No)

- START DEMAND
- RUN
- TRIP
- E-STOP ACTIVATED

b) Silo Vibrators Panel (2 No)

- VIBRATORS ENABLED
- RUN
- TRIP
- E-STOP ACTIVATED

c) HMI

- As for (a) and (b) above
- Silo continuous level

- PAC TRAIN 1 DUTY SELECTED
- PAC TRAIN 2 DUTY SELECTED
- FILTER 1 PURGING
- FILTER 2 PURGING

B8.5.6.2 PAC Slurry Make-up and Dosing System (2 No)

a) PAC Screw Feeder Panel (2 No)

- START DEMAND
- RUN
- TRIP
- E-STOP ACTIVATED

b) Dosing Pump Panel (2 No)

- START DEMAND
- RUN
- TRIP
- NO FLOW
- SUCTION LOW LEVEL
- E-STOP ACTIVATED

c) Booster Pump Panel (2 No)

- START DEMAND
- RUN
- TRIP
- NO FLOW
- E-STOP ACTIVATED

d) HMI

- As for (a), (b) and (c) above
- Mixing bowl continuous level
- PAC TRAIN 1 START DEMAND
- PAC TRAIN 2 START DEMAND
- MAIN FEED VALVE OPEN
- MAIN FEED WATER NO FLOW
- MIXING BOWL 1 VALVE OPEN
- MIXING BOWL 2 VALVE OPEN
- MIXING BOWL 1 LOW LOW LEVEL ALARM

- MIXING BOWL 1 LOW LEVEL ALARM
- MIXING BOWL 1 HIGH LEVEL ALARM
- MIXING BOWL 1 HIGH HIGH LEVEL ALARM
- MIXING BOWL 2 LOW LOW LEVEL ALARM
- MIXING BOWL 2 LOW LEVEL ALARM
- MIXING BOWL 2 HIGH LEVEL ALARM
- MIXING BOWL 2 HIGH HIGH LEVEL ALARM

B8.5.7 Remote monitoring and control

All signals must be run via the plc to allow for remote monitoring by the SCADA. Signals shall be wired via a marshalling cubicle allocated for in the MCC where the plc is hosted.

Control Signals

- PAC train duty selection switch
- PAC train 1 start
- PAC train 2 start
- Silo level
- Mixing bowl level
- Mixing bowl level alarm reset

Status monitoring

- As per B8.5.6
- Auto selected (For each drive)

B9. CONTROL EQUIPMENT AND INSTRUMENTATION

Control equipment and instrumentation must comply with the corresponding sections of C3.4.2 – Standard specification for electrical works.

B9.1 POSITION INDICATION

B9.1.1 Proximity Switches

The assembly configuration must comprise of induction magnetic type source and a separate non-contact sensor. The switching part will be electronic, comprising a transistor in NPN (open collector/current sink) or PNP (current source) configuration.

Proximity switches must be provided as follows:

- PAC train 1 hopper lid
- PAC train 2 hopper lid

The proximity switch installations must comply with the requirements as set out in SANS 10108 and SANS 60079-10-2 for combustible dust atmospheres.

B9.2 FLOW SENSING

B9.2.1 Flow switches

Flow switches of the calorimetric intrusive type must be provided as follows:

- Main water supply line (1 No)
- Booster pumps (2 No)
- Dosing pumps (2 No)

The flow switch installations must comply with the requirements as set out in SANS 10108 and SANS 60079-10-2 for combustable dust atmospheres.

B9.3 LEVEL SENSING

B9.3.1 Ultrasonic Level Sensors

Ultrasonic level sensors must be of the Mobrey, Endress & Hauser or similar and equal manufacture and must be supplied and installed as follows:

- Mixing bowl 1
One (1) ultrasonic unit must be provided for the primary control and emergency control as per section B8.5 above.
- Mixing bowl 2
One (1) ultrasonic unit must be provided for the primary control and emergency control as per section B8.5 above.

The ultrasonic level sensor installations must comply with the requirements as set out in SANS 10108 and SANS 60079-10-2 for combustable dust atmospheres.

B9.3.2 Radar Level Sensors

Radar level sensors must be of the Mobrey, Endress & Hauser, Vega or similar and equal manufacture, shall utilise a radar (microwave) time-of-flight transmitter for level sensing and must be supplied and installed as follows:

- Radar level sensors must be equipped 4-20 mA analogue output proportional to level and four programmable level switching relays.
- Beam angle of 4° (Max) at 79 GHz
- Swivel flanged mounting (manually focusing beam angle), flange to be 316L
- Mounting bracket must have an integrated air purge facility for periodic cleaning of heavy buildup
- The control unit must be installed within a separately mounted polycarbonate enclosure with clear lid.
- The above mentioned installation must comply with the requirements as set out in SANS 10108 and SANS 60079-10-2 for combustable dust atmospheres.

The sensor must be mounted on a sturdy stainless steel bracket of not less than 3 mm thickness, fitted higher than the structure overflow level. The bracket must be fixed to the holding structure soffit with stainless steel or brass fasteners, to suit the structure, in an easily accessible position

but not where it can be damaged by removal of equipment or interference (echo) from nearby equipment and/or structures.

Radar level sensors must be provided as follows:

- Silo No.1
One (1) radar unit must be provided for the primary control of PAC screw feeder, reverse jet filter, vibrators and purging of filters.
- Silo No.2
One (1) radar unit must be provided for the primary control of PAC screw feeder, reverse jet filter, vibrators and purging of filters.

B10. GENERAL ELECTRICAL INSTALLATION

The general electrical installation covers the supply, installation and connection of electrical equipment, as applicable, provided under this contract. The work must be done in accordance with C3.4.2 – Standard specification for electrical works. The contractor shall allow for labelling of all electrical related equipment. Labelling of equipment shall be done in line with City equipment identity coding (coding to be confirmed by Employer's representative / Engineer before labelling)

B10.1 CABLES AND ACCESSORIES

Tenderers must allow for the supply and installation of all necessary cables of appropriate size to all the electrical equipment specified in accordance with C3.4.2 – Standard specification for electrical works and cable schedule attached in section 3.4.9 – Tender drawings and schedules.

B10.2 CABLE CONNECTIONS

Note the requirements of C3.4.2 – Standard specification for electrical works.

B10.3 STRUCTURAL OPENING FOR LEVEL SENSING EQUIPMENT

All openings for level sensing equipment will be provided under this contract and provision shall be made in the tendered rates for drilling into the structures.

The instrument cables must be terminated within a cable termination box on the respective structure and extended by means of fixed cable to the MCC. Costs must be included under sundries.

25mm Ø Conduit shall be provided from the instrument cable termination box, to exit points outside the structure. The conduit shall be surface mounted hot dip galvanised steel.

B10.4 EARTHING

Earthing of equipment shall be done strictly in accordance with C3.4.2 – Standard specification for electrical works. Cable rack and the pumps bases and pipe work must all be bonded to earth.

Bare copper earth conductor must be installed in accordance with the cable schedules.

The earthing must be tested by the Contractor, under this contract, to determine whether it complies with SANS 10142-1. These values must be presented to the Engineer, after which, in conjunction with the Client, a decision will be made whether additional earthing is required.

Should the earth resistance test not yield a result better than 2 ohm additional earth spikes must be installed to obtain an earthing resistance of less than 2 ohms.

B10.5 BUILDING ELECTRICAL INSTALLATION

Design, supply, delivery, installation, testing and commissioning of small power and lighting must be done under this contract. Provision for luminaires, light switches and cable termination boxes has been made in the pricing schedule, the contractor shall be responsible for the design to meet the performance requirements as set out in this section. The design shall take into account that the additional lighting requirements will form part and need to tie into existing small power DBs.

The plant areas associated with this project must be provided with dedicated lighting compliant with SANS 10114-1 with minimum average values of maintained illuminance in accordance with the Environmental Regulations for Workplaces, promulgated under the Occupational Health and Safety Act (Act 85 of 1993).

Luminaires:

The Luminaires shall conform to the "Type B" performance requirements as set out in C3.4.2 – Standard specification for electrical works. Where the specified luminaire performance requirements can not be met, in terms of fluorescent tubes, the luminaires shall make use of Light Emitting Diode (LED) technology with a colour temperature of 4000K, minimum rated lumen output of at least 7500lm and a useful lifetime of at least 60 000 hrs at L70.

The luminaire shall be certified to operate in a Hazardous Area, classified Zone 21, with a minimum IP rating of IP66, with a polycarbonate LED protector having a minimum impact resistance of IK08.

Light fittings and illuminance in combustible dust atmospheres:

- PAC storage area, 50 Lux
- PAC make-up and slurry dosing area (only where rotating machines are present), 100 Lux

Light fittings and illuminance in non-combustible dust atmospheres:

- New MCC room, 200 Lux

Light Switches:

The light switches shall be surface mounted and its contacts shall be rated to make or break 10A at 240V AC.

The light switches shall be certified to operate in a Hazardous Area, classified Zone 21, with a minimum IP rating of IP66.

The switch enclosure shall prevent any possible arcing from igniting the hazardous atmosphere external to the enclosure.

Cable connection boxes:

Cable connection boxes shall be certified to operate in a Hazardous Area, classified Zone 21, with a minimum IP rating of IP66.

The cable connection boxes shall be surface mounted and have a minimum of four (4) cable entry points with a removable lid similar or equal to CCG or Pratley.

B10.6 REMOVAL AND DECOMMISSIONING OF EXISTING EQUIPMENT

After the installation and commissioning of the new PAC system MCC, all extra or existing equipment must be decommissioned and delivered to the treatment plant stores. It must be documented and signed for as the contractor will remain responsible until such time as the equipment is logged into stock. The Contractor must provide the Engineer with a proof of delivery receipt and photographs for the delivered equipment.

The existing items to be removed and decommissioned shall include but not limited to the following:

- Existing PAC system MCC
- PAC storage area small power and lighting
- PAC make-up and slurry dosing area small power and lighting
- Reverse jet filtration systems (2 No)
- Vibrator assemblies (4 No)
- PAC screw feeder motors (2 No)
- Dosing pump motors (2 No)
- Booster pump motors (2 No)
- Sump Pump (1 No)
- Valves
- Various instrumentation types
- Luminaires and light switches

B11. MANAGEMENT, DESIGN AND TESTING PROCESSES

B11.1 FACTORY TESTS, COMMISSIONING AND TAKING OVER

Tenderers' attention is specifically drawn to the requirements of C3.4.2 – Standard specification for electrical works.

A full system simulation test will be required at the premises of the MCC manufacturer to fully demonstrate the functionality and communication of the comprehensive system.

Taking over inspection will only be arranged after total completion and successful commissioning by the Contractor and subsequent one hundred percent trouble free operation of the comprehensive system for fourteen consecutive days and submission of the Operation and Maintenance Manuals. Completion (taking over) will not be given without the manuals.

No remedial work will be entertained concurrent with the taking over inspection. I.e. after any remedial work before taking over, the system must operate for fourteen consecutive day's trouble free, before the Engineer is called out for taking over inspection.

B11.2 TRAINING

Provision shall be made for a minimum period of five (5) days where the Contractor shall operate the equipment in conjunction with the plant, to ensure proper start up procedures, skills transfer and fine tuning. The contractor shall further allow for a minimum of one (1) day for training of maintenance staff, where the technical details, working principle and control philosophy of the equipment and related programs/software will be demonstrated. The coding of the programmable logic controllers in specific will be compared to the control philosophy and discussed accordingly. Training shall be accompanied by a certificate of attendance. Training shall at least allow for 6 candidates per session.

B12. MANUALS

B12.1 SUBMISSION OF MANUALS

Two draft copies of the Manual shall be submitted to the Engineer prior to commissioning the Works. One copy will be returned to the Contractor with comments. The second copy will be used by the operational staff on Site.

Six copies of the final version of the Manual, as accepted by the Engineer, shall be provided prior to the start of the Defects Notification Period.

B12.2 GENERAL REQUIREMENTS

The Manual shall comply with the following:

- (a) The Manual shall be for the complete Works and shall be of a standard acceptable to the Engineer. It shall be in English and shall be practically and neatly presented.
- (b) One Manual shall contain original documents and this set shall be marked "Original". The other 5 Manuals shall contain all the information in the original and shall be marked "Copy 2" to "Copy 6".
- (c) Binders shall have hard, plastic protected covers utilising four-ring, spring-clip holders. Binders shall not be overloaded. One spare, empty binder shall be provided for every three used. A title label shall be affixed to the spine of all binders. This shall indicate Contract number, title, Contractor's name, Site/Plant name, volume number and contents.
- (d) Sections and sub-sections shall be titled, uniquely numbered and provided with separator sheets.
- (e) Printed matter which is inserted in the Manual shall be arrowed (indelibly) to indicate the equipment installed.
- (f) Drawings shall be to a scale which makes details clear. Large drawings shall be held in plastic envelopes in the Manual. A4 and A3 drawings may be bound as normal pages. Drawings shall also be provided on electronic data storage in Autocad, or equivalent, format.
- (g) Location map, street address as well as GPS co-ordinates to be provided.
- (h) Cross-referencing within the Manual is acceptable where duplication occurs.

B12.3 FORMAT AND CONTENTS

The Manual shall be in accordance with the following (the Contractor shall modify, elaborate and repeat this format as required):

B12.3.1 Electronic Format

All information in the hard copy O&M manuals to be provided in soft copy on a USB flash discs (x6) with separate folders for each section including all material related to the particular section. Each section shall be saved as a separate PDF file, with a hyperlinked index sheet for sub-sections. This shall include drawings and maintenance schedules as separate files. In addition, the

“Summary equipment and maintenance template” shall be saved in Excel format under Section 1. Contractor to ensure the latest Excel template is requested, used and completed.

All necessary software programs and passwords to be provided.

| No. | HEADING | CONTENT |
|----------|-------------------------------|--|
| 1 | GENERAL | |
| 1.1 | Contents List | Contents List for complete Manual. |
| 1.2 | Description of the Works | The description of the Works shall include a description of; firstly, the process; secondly, the design parameters and; thirdly, a detailed description of the equipment installation supported by drawings and process flow diagrams. |
| 1.3 | Equipment List | Equipment list containing each item of mechanical, electrical, instrumentation and control equipment. The equipment list shall include the make, model, serial number, description, size, range, performance data, motor and drive details, supplier's name, address and phone numbers, all as applicable. The design duty, the position of each unit's installation and its purpose in the system shall be given. Additional information which shall be provided for instruments includes the normal operating reading, maximum or minimum permissible readings, set-points (activation, warning and trip), etc. A separate list of all spares provided in terms of this Contract shall also be provided. |
| 1.4 | Drawing List | Drawing list of all the Contractor's drawings and the Tender drawings. |
| 1.5 | Cable Schedule | Cable schedule for power, data, control and instrumentation cables. This shall include the cable construction, conductor material, insulation, protection, voltage rating, start and finish points, route length, duty, load, voltage drop, core area, no. of cores, no. of cores used and gland size. For cable voltages above 400 Volts, the schedule shall also include the purchase details, specification and date of manufacture. |
| 1.6 | Documents | As-built system, layout and GA drawings. Plant circuit, flow diagrams and/or P&IDs. Control panel layouts. I/O list, program listing, loop and logic diagrams for each PLC. Colour prints of SCADA mimic screens, control faceplates and sequences. System control diagram and logic sequence chart. Copy of certificate of electrical compliance. |
| 2 | OPERATION | |
| 2.1 | Control System | Description of control system; including all manual and automatic controls. This shall include controls, instruments, protection list, settings, indications, alarms, trips, etc. |
| 2.2 | Commissioning | Commissioning Instructions. Commissioning report. |
| 2.3 | Operating and Training Manual | Operating and training manual. This shall include normal start-up, adjustment, operating and shut-down procedures and any emergency operating procedures. All specific safety aspects as |

| No. | HEADING | CONTENT |
|------------|---|---|
| | | well as settings, adjustments, observation, etc. shall be provided. |
| 3 | MAINTENANCE SCHEDULES | |
| | Maintenance and Lubrication | Schedule of routine maintenance, by time period, for all electrical, instrumentation and control equipment. This shall be all-inclusive but reference to manufacturer's standard manuals in other parts of the Manual is acceptable. |
| 4 | MECHANICAL EQUIPMENT <i>(This section shall be repeated for each item of equipment)</i> | |
| 4.1 | Identifying Information | Identifying information for the item; copied from the Equipment List. |
| 4.2 | Nameplate | A photograph of the nameplate or a table containing the unit's nameplate information. |
| 4.3 | Design and Operation | Details of operating principles, construction and operating instructions. |
| 4.4 | Maintenance Information | Technical and maintenance information including instructions for installation, assembly, disassembly, lubrication, adjustment, calibration, reconditioning, repair, etc. |
| 4.5 | Spares | A spares list giving the item number, part number, description, quantity and materials. A list of spares recommended to be held on Site. |
| 4.6 | Test Results | Factory and Site test results. |
| 4.7 | Corrosion Protection | Corrosion protection systems used, coating supplier's data sheets and coating repair procedures. |
| 4.8 | Documents | Performance curves. Large scale, dimensioned, cross sectional and arrangement drawings of the item for assembly and spares recognition purposes, cross-referenced to the spares list. Dimensioned drawings of fabricated equipment. Circuit layout of any auxiliary systems |
| 5 | ELECTRICAL/MCC EQUIPMENT <i>(This section shall be repeated for each item of equipment)</i> | |
| 5.1 to 5.6 | As for 4.1 to 4.6 for Mechanical Equipment (see above). | |
| 5.7 | Control Details | Control and electrical details, including logic sequence, circuit diagrams and software, as applicable. |
| 5.8 | Documents | Electrical reticulation drawings. Equipment overall dimensions. Wiring diagrams. Switchboard layout drawings and SLDs. Electrical panel construction drawings. |
| 6 | INSTRUMENTATION EQUIP. <i>(This section shall be repeated for each item of equipment)</i> | |
| 6.1 to 6.6 | As for 4.1 to 4.6 for Mechanical Equipment (see above). | |

| No. | HEADING | CONTENT |
|------------|-------------------------------------|---|
| 6.7 | Documents | Circuit diagrams of instrumentation systems and of individual instruments. Installation arrangement. |
| 7 | CONTROL/NETWORK EQUIP.; ETC. | |
| 7.1 | Identifying Information | Identifying information for RTUs, transmitters, HMIs, computers, etc.; copied from the Equipment List. |
| 7.2 | I/O List | Cross-referenced listing of all I/Os used. |
| 7.3 | SCADA | Colour prints of SCADA mimic screens, control faceplates, sequences and trend screens. Schedule of alarm messages and TAG lists. File structures, lists and naming conventions. |
| 7.4 | Program | Flash disk containing all software. An annotated program listing. |
| 7.5 | Documents | Schedule of cable terminals. Copy of SCADA hardware diagnostic mimic. |
| 8 | DRAWINGS | |
| | Drawings | All drawings not filed elsewhere shall be filed in this section. |

CITY OF CAPE TOWN

WATER AND WASTE: WATER AND SANITATION

CONTRACT NO. 143Q/2020/21

**DESIGN AND BUILD OF THE ELECTRICAL LOW VOLTAGE AND MECHANICAL EQUIPMENT
ASSOCIATED WITH THE POWDER ACTIVATED CARBON DOSING AT VOELVLEI WATER
TREATMENT PLANT**

C3.4 CONSTRUCTION: 3.4.2

DETAILED ELECTRONIC SPECIFICATION

(Not applicable to this tender)

CITY OF CAPE TOWN

WATER AND WASTE: WATER AND SANITATION

CONTRACT NO. 143Q/2020/21

DESIGN AND BUILD OF THE ELECTRICAL LOW VOLTAGE AND MECHANICAL EQUIPMENT ASSOCIATED WITH THE POWDER ACTIVATED CARBON DOSING AT VOELVLEI WATER TREATMENT PLANT

SECTION G

HEALTH AND SAFETY SPECIFICATION

For use with the General Conditions of Contract as described in C1.2: Contract Data Part 1.

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G1 DEFINITIONS

For the purposes of this Specification, the definitions given in the Occupational Health and Safety Act, 85 of 1993 and the Construction Regulations, 2014, and the following definitions, shall apply:

- a) "Construction Regulations, 2014" means the Construction Regulations (GNR. 84 of 7 February 2014) published in terms of the OHS Act.
- b) "Contractor" means the Principal Contractor as defined in the Construction Regulations, 2014.
- c) "Employer" means the Client or his agent as defined in the Construction Regulations, 2014.
- d) "Engineer" means the person/firm so named in the Contract Data whose function is to administer the Contract as agent of the Employer, acting through, if appointed, a Health and Safety Agent.
- e) "OHS Act" means the Occupational Health and Safety Act, 85 of 1993.
- f) "subcontractor" means any contractor employed by the Contractor to perform construction work.

G2 SCOPE

In terms of the OHS Act and the Construction Regulations, 2014 the Employer must provide the Contractor with a Health and Safety Specification, to which the Contractor must respond with a Health and Safety Plan for approval by the Employer.

The purpose of this Specification is to ensure that a contractor entering into a contract with the Employer maintains an acceptable level of compliance with regard to health and safety issues during the performance of the Contract. In this regard the Health and Safety Specification forms an integral part of the Contract and the Contractor shall ensure that his subcontractors and/or suppliers comply with the requirements of this Specification.

G3 INTERPRETATION

The OHS Act and its associated regulations shall have precedence in the interpretation of any ambiguity or inconsistency between it and this Specification.

Responsibility for health and safety relating to the Works lies with the Contractor as described in this Specification. Nothing stated in or omitted from this Specification shall in any way limit the Contractor's obligations and liabilities in terms of the OHS Act.

G4 GENERAL REQUIREMENTS

The Contractor shall:

- a) create and maintain a safe and healthy work environment;
- b) execute the Works in a manner that complies with all the requirements of the OHS Act and all its associated regulations, and in so doing, minimize the risk of incidents occurring; and
- c) respond to the instructions issued by the Engineer through the Engineer's Representative, except in the case of a health and safety issue which requires the Contractor's immediate attention, in which case the Employer's Health and Safety Agent can issue an instruction directly to the Contractor.

G5 ADMINISTRATION

G5.1 Application for construction work permit

The requirement for a construction work permit is not foreseen on this contract due to the tender value not exceeding R40 000 000.

G5.2 Notification of intention to commence construction work

The Contractor shall notify the Provincial Director of the Department of Labour in writing using the pro forma contained in Annexure 2 of the Construction Regulations, 2014 before construction work commences, and retain a copy of such notification in the health and safety file, if such work will:

- a) include excavation work;

- b) include working at a height where there is a risk of falling;
- c) include the demolition of a structure; or
- d) include the use of explosives to perform construction work.

The Contractor shall ensure that no work commences on an electrical installation which requires a new supply or an increase in electricity supply before the person who supplies or contracts or agrees to supply electricity to that electrical installation has been notified of such work.

The Contractor shall ensure that no asbestos work is carried out before the Provincial Director of the Department of Labour has been notified in writing.

G5.3 Occupational Health and Safety Agreement

The Contractor shall enter into an Agreement with the Employer before the commencement of the Works on Site.

G5.4 Good standing with the Compensation Fund or a licensed compensation insurer

The Contractor shall provide the Engineer with a letter of good standing from the Compensation Commissioner or a licensed compensation insurer before the commencement of the Works on Site.

G5.5 Emergency procedures

The Contractor shall submit for acceptance to the Engineer a health and safety emergency procedure, which includes but is not limited to fire, spills, accidents and exposure to hazardous substances, which:

- a) identifies the key personnel who are to be notified of any emergency;
- b) sets out details of available emergency services, including contact particulars; and
- c) the actions or steps which are to be taken during an emergency.

The Contractor shall within 24 hours of an emergency taking place notify the Engineer in writing of the emergency and briefly outline what happened and how it was dealt with.

G5.6 Health and safety file

The Contractor shall ensure that a Health and Safety file, which shall include all documentation required in terms of the provisions of the OHS Act, the Construction Regulations, 2014 and this Health and Safety Specification, is open and kept on Site at all times.

The Health and Safety file shall be made available for inspection by any inspector, subcontractor, the Employer, the Engineer, the Employer's Health and Safety Agent, or employee of the Contractor, upon the request of such persons.

The Contractor shall hand over the Health and Safety file to the Engineer upon Works completion of the Contract and a certificate of compliance accompanied by a test report for the electrical installation in accordance with the provisions of the Electrical Installation Regulations, 1992.

G5.7 Health and safety committee

Where applicable, the Contractor shall establish a health and safety committee, and shall convene health and safety meetings as provided for in the OHS Act.

The Engineer or the Employer's Health and Safety Agent shall be invited to attend such meetings as an observer.

The Contractor shall ensure that minutes of the health and safety committee meetings are

kept.

G5.8 Inspections, formal enquires and incidents

The Contractor shall inform the Engineer:

- a) beforehand of inspections, investigations or formal inquiries of which he has been notified by an inspector; and
- b) as soon as reasonably practicable of the occurrence of an incident (as defined in the OHS Act) on the Site.

The Contractor shall record all incidents and notify the Engineer of any incident, except in the case of a traffic accident on a public road, as soon as possible after it has occurred and report such incident to an inspector as designated in terms of the OHS Act.

The Contractor shall investigate all incidents and issue the Engineer with copies of such investigations.

G5.9 Personal protective equipment and clothing

The Contractor shall ensure that all workers are issued with the necessary personal protective clothing.

G6 APPOINTMENTS

G6.1 Appointment of construction manager

The Contractor shall, prior to commencing the Works on Site, appoint a full-time competent person as the construction manager, with the duty of managing all construction work on a single site, including the duty of ensuring occupational health and safety compliance. In the absence of the construction manager an alternative must be appointed by the Contractor.

The Contractor may, having considered the size of the project, appoint, in writing, one or more assistant construction managers for different sections thereof.

No construction manager may manage any construction work on or in any construction site other than the Site in respect of which he or she has been appointed.

G6.2 Appointment of construction supervisor, and health and safety officers

The construction manager shall appoint a competent employee(s) in writing as the construction supervisor(s) for the Site, who will be responsible for construction activities and ensuring occupational health and safety compliance on the construction site. The Contractor may, having considered the size of the project, appoint, in writing, one or more competent employees to assist the appointed construction supervisor(s).

The Contractor may, having considered the size of the project, the degree of danger likely to be encountered or the accumulation of hazards or risks on the Site, appoint a full-time or part-time construction health and safety officer in writing, who has in the Contractor's opinion the necessary competencies and resources, to assist the Contractor in the control of all health and safety related aspects on the Site.

The Contractor shall compile and maintain an organogram which outlines the roles and responsibilities of the construction supervisor's assistants, and health and safety officers.

G6.3 Other competent persons

The Contractor shall appoint in writing competent persons to supervise or inspect, as relevant, any of the following:

- a) temporary works operations;

- b) excavation work;
- c) demolition work;
- d) scaffolding work operations;
- e) suspended platform work operations;
- f) rope access work;
- g) material hoists;
- h) operation of bulk mixing plant;
- i) explosive activated fastening device;
- j) cranes;
- k) construction vehicles and mobile plant (equipment);
- l) the stacking and storage of articles on the Site; and
- m) fire equipment.

The Contractor shall appoint in writing competent persons to:

- a) induct employees in health and safety; and
- b) prepare a fall protection plan.

G6.4 Health and safety representative(s)

The Contractor shall appoint in writing, if necessary in terms of the OHS Act, a health and safety employee representative(s), whose duties shall be as described in the OHS Act.

G7 EMPLOYER'S HEALTH AND SAFETY AGENT

The Employer's Health and Safety Agent shall:

- a) audit the Contractor's compliance with the requirements of this Specification prior to the commencement of any physical construction activities on the Site;
- b) accept or reject all safety plans, giving reasons for rejecting such plans;
- c) monitor the effective implementation of all safety plans;
- d) conduct periodic and random audits on the health and safety file to establish compliance with the requirements of this Specification and the Contractor's health and safety plan; and
- e) visit the site at regular intervals to conduct site inspections, and based upon such visits issue, wherever necessary, any notices and/or instructions to the Contractor or any of the Contractor's subcontractors with a copy to the Engineer and, where relevant, to the Contractor.

The Contractor shall invite the Employer's Health and Safety Agent to audit compliance with the requirements of this Specification before commencing with any new construction activity on the Site.

The Contractor shall permit the Employer's Health and Safety Agent to audit the Contractor's compliance with the approved Health and Safety Plan, and shall provide any assistance and/or documentation as may be required in this regard.

G8 CREATING AND MAINTAINING A SAFE AND HEALTHY WORK ENVIRONMENT

G8.1 General

The Contractor shall with respect to the Site and the construction works that are contemplated:

- a) cause a preliminary hazard identification to be performed by a competent person before commencing any physical construction activity;
- b) evaluate the risks associated with such work constituting a hazard to the health and safety of such employees and the steps that need to be taken to comply with the OHS Act; and
- c) as far as is reasonably practicable, prevent the exposure of such employees to the hazards concerned or, where prevention is not reasonably practicable, minimize such exposure.

The Contractor shall ensure that:

- a) all reasonably practicable steps are taken to prevent the uncontrolled collapse of any new or existing structure or any part thereof, which may become unstable or is in a temporary state of weakness or instability due to the carrying out of construction work;
- b) no structure or part of a structure is loaded in a manner which would render it unsafe;
- c) relevant information, if any, provided by the designer of the structure is taken into account in the risk assessment; and
- d) the designer of any temporary works complies with the requirements of regulation 6(2) of Construction Regulations, 2014.

The Contractor shall carry out regular inspections and audits to ensure that the Works are being performed in accordance with the requirements of this Specification and the Contractor's health and safety plan

G8.2 Risk assessment

The Contractor shall before the commencement of any construction work on Site and during such construction work, cause risk assessment(s) to be performed by a competent person appointed in writing. Such assessment(s) shall as a minimum:

- a) identify the risks and hazards to which persons may be exposed to;
- b) analyse and evaluate the identified risks and hazards based on a documented method;
- c) document a plan of safe work procedures, including the use of any personal protective equipment or clothing and the undertaking of periodic "toolbox talks" or inductions before undertaking hazardous work, in order to mitigate, reduce or control the risks and hazards that have been identified;
- d) provide a monitoring plan; and
- e) provide a review plan.

The Contractor shall ensure that as far as is reasonably practicable, ergonomic related hazards are analysed, evaluated and addressed in the risk assessment.

The Contractor must review the relevant risk assessment -

- a) where changes are effected to the design and or construction that result in a change to the risk profile; or
- b) when an incident has occurred.

G8.3 Health and safety plans

The Contractor shall prior to commencing the Works to which this Specification applies, submit to the Employer's Health and Safety Agent for approval a suitable and sufficiently documented health and safety plan, based on this Specification and the risk assessment that is conducted.

The health and safety plan shall include, but not be limited to, the following:

- a) The safety management structure, including the names of all designated persons such as the construction supervisor and any other competent persons;
- b) Safety method statements and procedures to be adopted to ensure compliance with the OHS Act; Construction Regulations, 2014 and this Health and Safety Specification;
- c) The provision and use of temporary services;
- d) Personal protective equipment, devices and clothing required;
- e) Emergency procedures;
- f) Provision of workers' welfare facilities;
- g) Induction and training;

- h) Arrangements for monitoring and control to ensure compliance with the safety plan; and
- i) Provision and maintenance of the health and safety file and all other relevant documentation.

The Contractor shall provide each subcontractor with the sections of this Health and Safety Specification pertaining to the construction work to be performed by that subcontractor. The subcontractor shall provide the Contractor with a health and safety plan pertaining to his work, for incorporation into the Contractor's health and safety plan.

The Contractor shall discuss the submitted health and safety plan with the Employer's Health and Safety Agent, modify such plan in the light of the discussions and resubmit the modified plan for approval.

The Contractor shall apply the approved health and safety plan from the date of its approval and for the duration of the Works to which this Specification applies.

The Contractor shall conduct periodic audits for compliance with the approved health and safety plan at intervals agreed upon with the Employer's Health and Safety Agent, but at least once every month.

The Contractor shall update the health and safety plan whenever changes to the Works are brought about.

G8.4 Responsibilities towards employees and visitors

The Contractor shall, as far as is reasonably practicable, cause every employee to be made conversant with the hazards to his health and safety attached to any work which he has to perform, any article or substance which he has to produce, process, use, handle, store or transport and any plant or machinery which he is required or permitted to use, as well as with the precautionary measures which should be taken and observed with respect to those hazards or safe work procedures.

The Contractor shall ensure that all employees under his control are informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment.

The Contractor shall cause a record of all induction training to be kept, which indicates the names, identity numbers and job description of all those who attended such training.

The Contractor shall not allow or permit any employee to enter the Site, unless such person has undergone health and safety induction training pertaining to the hazards prevalent on the Site at the time of entry.

The Contractor shall ensure that all of his employees have a valid medical certificate of fitness specific to the construction work to be performed and issued by an occupational health practitioner on the prescribed form.

The Contractor shall ensure that each visitor to the Site, save where such visitor only visits the site office and is not in direct contact with the construction work activities:

- a) undergoes health and safety instruction pertaining to the hazards prevalent on the Site; and
- b) is in possession of and using the necessary personal protective equipment.

The Contractor shall cause a record of all induction training to be kept in the Health and Safety file.

The Contractor shall provide suitable on-site signage to alert workers and visitors to health and safety hazards and requirements. Such signage shall include but not be limited to:

- a) prohibited unauthorized entrance;
- b) signage to indicate what personal protective equipment is to be worn; and
- c) activity related signs.

The Contractor shall not permit any person who is or who appears to be under the influence of intoxicating liquor or drugs, to enter or remain at a workplace.

G8.5 Subcontractors

The Contractor may only subcontract work in terms of a written subcontract and shall only appoint a subcontractor should he be reasonably satisfied that such a subcontractor has the necessary competencies and resources to safely perform the work falling within the scope of the subcontract.

The Contractor shall ensure that all of his obligations in respect of subcontractors in terms of the Construction Regulations, 2014 are adhered to.

G8.6 Work permits and wayleaves

The Contractor shall be responsible for obtaining all the wayleaves, permissions or permits applicable to working near any existing services or other infrastructure on Site, and shall abide by the safety conditions imposed by such wayleaves, permissions or permits.

G8.7 Access to the Site

The Contractor shall ensure that access to the Site is strictly controlled and that, where possible, only authorised persons are permitted onto the Site.

The Contractor shall control the access to Site of his own personnel and equipment, and that of his subcontractors and suppliers, in such a way so as to ensure that the safety of all public pedestrian and vehicular traffic is not compromised.

G8.8 First aid and emergency procedures

The Contractor shall, where more than five employees are employed at a workplace, provide a first aid box or boxes at or near the workplace, which shall be available and accessible for the treatment of injured persons at that workplace. Such first aid boxes shall contain suitable first aid equipment.

The Contractor shall ensure, where there are more than 10 employees employed on the Site, that for every group of up to 50 employees at that workplace at least one person is readily available during normal working hours who is in possession of a valid certificate of competency in first aid.

The following information shall be conspicuously posted in the offices of the Contractor for the duration of the Contract:

- a) Telephone numbers of emergency services;
- b) The names of all safety representatives and safety officers; and
- c) The name(s) of the competent first aider(s).

The Contractor shall post, in prominent places, notices indicating where the first aid box(es) is/are kept, as well as the name of the person in charge of the first aid box.

G8.9 Housekeeping

The Contractor shall ensure, *inter alia*, that suitable housekeeping is continuously

implemented on the Site, including provision for the:

- a) removal of scrap, waste and debris, and materials which are no longer required for use, at appropriate intervals (in accordance with Construction Regulation 27); and
- b) proper stacking and storage of materials and equipment (in accordance with Construction Regulations 27 and 28).

G8.10 Fire precautions

The Contractor shall ensure that all appropriate measures are taken to minimise the risk of fire and that appropriate procedures and equipment are in place to deal with the event of a fire, all in accordance with Construction Regulation 29 and the Environmental Management Specification in Section C3.4.8 of the Scope of Work.

G8.11 Facilities for workers

The Contractor shall provide ablution facilities and eating areas all as specified in the Environmental Management Specification in Section C3.4.8 of the Scope of Work.

G9 GENERAL HAZARDS AND RISKS APPLICABLE TO WORK REQUIRED IN TERMS OF THIS TERM TENDER

G9.1 Existing Site conditions

In order to mitigate the risk associated with a working in a combustible dust atmosphere. The current PAC storage, slurry make-up and dosing areas will be cleaned by the operating and maintenance personnel before the commencement of construction work.

G9.2 Information provided by the designer (CR 6(1))

Anticipated or known dangers or hazards (known at this stage) relating to the construction work, foreseen by the Designer, including the relevant information required for the safe execution of the work. This must also include health & safety information about the design which could have an influence on the pricing of the work.

Dangerous substances/materials foreseen which cannot be avoided during this particular type of construction.

Dangerous procedures foreseen which cannot be avoided.

Hazards and risks relating to the subsequent maintenance of the structure/building foreseen and resulting safe work procedures advised.

Site inspections to verify whether construction of the relevant work is being carried in accordance with the designs and procedures. How will this be dealt with on the project?

The stoppage of contractors where required (by the Designer) - the envisaged protocol to be followed to stop an activity or process on site. How will this be dealt with on the project?

The application of ergonomic principles during design - how has and will this be implemented by the respective Designers?

The loading that a structure can withstand (in this case the lateral support structure) and/or is designed to withstand - details on this must be included. Please pay special attention to the definition of 'structure' in Construction Regulation 1.

G9.3 Environmental hazards

Conduct detailed risk assessment (follow classification process) in terms of SANS 10108 on the entire PAC system. The combustible dust atmospheres associated with the PAC storage, slurry make-up and dosing areas are deemed hazardous locations. The inspector

shall be a competent person (Master Installation Electrician) with proof of registration at the department of labour.

G9.4 Fall protection (working at heights) (CR 10)

Working at heights includes any work that takes place in a fall risk position. The Principal Contractor must submit a risk-specific fall protection plan in accordance with the Construction Regulations before this work is undertaken. The appointed fall protection planner must be qualified in terms of SAQA unit standard 229994.

All scaffolding must comply with the requirements of SANS 10085-2004. Scaffolding must be declared safe for use by a competent scaffold inspector who must complete the scaffold register and tag the scaffold accordingly. All scaffolds must be tagged either 'safe' or 'unsafe'. Inspections must then be carried out weekly, after bad weather, after any alterations, after an incident, and before dismantling. The Principal Contractor must keep all scaffold inspection registers on site. The Principal Contractor must also appoint one or more of its own supervisory members to supervise/co-ordinate scaffolding on site (scaffold supervisor).

Working in fall risk positions requires the preparation of a fall protection plan (FPP). Contractor FPP's must be compiled and submitted to the P/Contractor for assessment and final approval well before any elevated work may be undertaken by such contractor. The plan must include all relevant fall related risk assessments and safe work procedures. All persons working in elevated positions must be evaluated for physical fitness – such evaluation may only be performed by a certified occupational health practitioner. All persons working in fall risk positions must be informed of the risks and safety measures (in other words all workers must be trained on the fall protection plan, in the form of a toolbox safety talk) and records of this training/information session must be kept on site.

Baseline HIRA and Health & Safety Specifications: VOELVLEI PAC SYSTEM UPGRADE.

Work from fall risk positions may only be conducted as if it were being conducted from a safe ladder or safe scaffold. All openings, edges, and the like must be adequately guarded (see 'edge protection and penetrations' above).

Where fall prevention or fall arrest devices are being used, the correct devices must be used for the intended purpose and they must be properly inspected and maintained. Workers must be trained in the use and maintenance of the fall prevention and arrest equipment/devices. Safety belts as a method of fall arrest are prohibited. Full body harnesses must be worn. Where lifelines or other devices are required, such devices must be detailed in the fall protection plan of the Contractor concerned and approved by the P/Contractor before such work begins. Workers must have the opportunity to be secured from falling at all times, ensuring 100% fall protection on this project is a minimum requirement.

All scaffolding platforms above 2m from the ground must be complete with guardrails and toe boards and must be fully boarded as per the requirements of general-purpose scaffold platforms (5-board platforms). Mobile scaffolds may not exceed 3 x their minimum base width in height and must be adequately boarded as per their loading requirement. Mobile scaffolds and static frame towers must be erected as per the manufacturers' requirements (copies of these erection specifications/data sheets must be available to the scaffold erectors and scaffold supervisor on site). A copy of the scaffold code of practise must be available on site (SANS 10085-2004).

Temporary gangways/elevated access walkways must comprise of at least three scaffold boards (675mm wide) with guardrails on either side when such walkways are above 2m from the ground. Such gangways and other platforms must be supported from below, preventing excessive loading and platform collapse. Loading of scaffolds with materials, personnel and equipment must be in accordance with the maximum loadings as specified by the consulting engineers. The P/Contractor and contractors must be clear on the maximum loadings before carrying out any activities where maximum loadings are in question. Special scaffolds must

be designed by an engineer/temporary works designer and erected in accordance with a drawing. Such special scaffolds must be inspected and signed off before use.

G9.5 Electrical installations and machinery (CR 24)

The consulting engineers will ensure as far as possible that the P/Contractor is made aware of the positions of all electrical installations and other services. The Principal Contractor must notify the engineer concerned should it not be sure of the location of any particular service.

The Principal Contractor and contractors must comply with the Electrical Installation Regulations, the Electrical Machinery Regulations and the Construction Regulations.

The Principal Contractor must keep a copy of the Certificate of Compliance (CoC) for its temporary electrical power supply and installation. A revised CoC is required whenever the installation is altered or changed in any way. All temporary electrical installations must be inspected at least weekly by a competent person appointed in writing with records kept.

The testing and commission of the permanent electrical installation must be done under the management of a written method statement and detailed set of safety requirements and must only be put into use after a CoC has been issued to the P/Contractor for that section/area. Also included must be a lock out procedure for work on electrical installations.

Portable electrical tools and equipment must be visually inspected daily by a competent person (trained by an electrician or suitable person to carry out visual inspections on electrical tools and extension leads) before use, with records kept as proof.

G10 COVID 19 SPECIAL CONDITIONS

The Tenderer is to take into consideration all health and safety requirements in relation to COVID-19 as detailed in Government Gazette Volume 658 of 29 April 2020 (No. 43257), Guidelines for Symptom Monitoring and Management of Essential Workers for COVID-19 Related Infection, Construction Covid-19 Rapid Response Task Team dated 26 April 2020, including the following:

Screening

Contractors shall ensure that staff are screened daily in accordance with the guidelines for symptom monitoring and management of essential workers for COVID-19 related infection.

Management plan

Contractors shall have a management plan in place to deal with COVID-19 cases in accordance the guidelines for symptom monitoring and management of essential workers for COVID-19 related infection.

PPE

The contractor shall ensure all PPE for COVID-19 related mitigation are in accordance with requirements.

Sanitisers

The contractor shall ensure that workers are equipped with hand sanitiser at all times.

Government Gazette Volume 658 of 29 April 2020 (No. 43257), Guidelines for Symptom Monitoring and Management of Essential Workers for COVID-19 Related Infection, Construction Covid-19 Rapid Response Task Team dated 26 April 2020 documents are issued in an Electronic Version (USB) attached to Volume 3A.

CITY OF CAPE TOWN

WATER AND WASTE: WATER AND SANITATION

CONTRACT NO. 143Q/2020/21

**DESIGN AND BUILD OF THE ELECTRICAL LOW VOLTAGE AND MECHANICAL EQUIPMENT
ASSOCIATED WITH THE POWDER ACTIVATED CARBON DOSING AT VOELVLEI WATER TREATMENT
PLANT**

SECTION H

ENVIRONMENTAL MANAGEMENT SPECIFICATION

For use with the General Conditions of Contract as described in C1.2: Contract Data Part 1

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H1 SCOPE

The Environmental Management Programme (EMP) for the project is comprised of this Environmental Management (EM) Specification and its Annexures, including the "Additional environmental issues deemed to form part of the Environmental Management Specification" attached as Annexure D hereto, which together cover the requirements for controlling the impact on the environment of construction activities.

H2 INTERPRETATIONS

H2.1 Supporting specifications

The following standardised specification shall, *inter alia*, apply to this Contract:

- a) SANS 1200A, as may be varied or added to in the Scope of Work

H2.2 Application

This EM Specification contains clauses that are generally applicable to the undertaking of construction works in areas where it is necessary to impose pro-active controls on the extent to which the construction activities impact on the environment.

In the event of any difference or discrepancy between the provisions of the Standardised Specifications and the provisions of the EM Specification, the latter shall prevail.

H2.3 Definitions and abbreviations

For the purposes of this EM Specification the following definitions and abbreviations shall apply:

Environment

The surroundings within which humans exist and that are made up of -

- a) the land, water and atmosphere of the earth;
- b) micro-organisms, plant and animal life;
- c) any part or combination of i) and ii) and the interrelationships among and between them; and
- d) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

H2.3.1 Potentially hazardous substance

A substance which, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment.

H2.3.2 Method Statement

A written submission by the Contractor to the Engineer in response to the EM Specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Scope of Work and/or will produce results in accordance with the EM Specification.

H2.3.3 Reasonable

Unless the context indicates otherwise, means reasonable in the opinion of the Engineer after he has consulted with a person suitably experienced in "environmental implementation plans" and "environmental management plans" (both as defined in the National Environmental Management Act, 107 of 1998).

H2.3.4 Solid waste

All solid waste, including construction debris, chemical waste, excess cement/ concrete, wrapping materials, timber, tins and cans, drums, wire, nails, domestic waste, dead vegetation, asphalt products, etc.

H2.3.5 Contaminated water

Water contaminated by the Contractor's activities containing cements, concrete, lime, paint products, thinners, turpentine, chemicals, fuels, oils washing detergents, etc.

H2.3.6 Working area

Any area within the boundaries of the Site where construction is taking place.

H2.3.7 Contractor's camp or construction camp

The area designated for all temporary site offices, storage areas, construction plant parking areas, staff welfare facilities, etc.

H2.3.8 Engineer

The person/firm so named in the Contract Data, whose function is to administer the Contract as agent of the Employer.

H2.3.9 Engineer's Representative (ER)

The natural person appointed by the Engineer in terms of the Contract, who shall observe the execution of the Works, examine and test materials and workmanship, and deliver and receive communications to/from the Contractor.

H2.3.10 Environmental Officer (EO)

Appointed by the Engineer as his environmental representative on Site, with the mandate to enforce compliance with the EMP. The duties of the EO are stipulated in the City's guideline document for the EO and ER.

H2.3.11 Environmental Control Officer (ECO)

An independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisations (EAs), and the EMP for the project.

H2.3.12 Environmental Site Officer (ESO)

Employed by the Contractor as his environmental representative to monitor, review and verify compliance with the EMP by the Contractor. The ESO must ensure that he is involved at all phases of the construction (from site clearance to rehabilitation).

H2.3.13 Abbreviations

The following abbreviations occur in this EM Specification:

EMP - Environmental Management Programme
EM Specification – Environmental Management Specification
EO - Environmental Officer
ECO – Environmental Control Officer
ESO – Environmental Site Officer
ER – Engineer's Representative
MSDS - Material Safety Data Sheets

H2.4 **Engineer's authority to delegate**

In terms of Sub-Clause 3.2 in the FIDIC General Conditions of Contract, 1999 (Yellow Book), the Engineer may assign duties and delegate authority to assistants who may include a resident engineer. For the purposes of this EM Specification a resident engineer is synonymous with the Engineer's Representative (ER). Other than the ER, another assistant to the Engineer can be in the form of an Environmental Officer (EO), who shall be responsible for monitoring compliance with the EMP. All instructions given by the EO shall go through the ER, who will then convey these to the Contractor, except in the case of an environmental emergency, in which case the EO can issue an instruction directly to the Contractor. An environmental emergency is one which, in the opinion of the EO, would cause serious environmental harm if not addressed immediately.

Depending on the nature/environmental sensitivity of the Contract the following variations in the organisational structure are possible:

- a) The ER may work together with an EO; or
- b) There may be an ER only (for construction projects with low potential for causing significant environmental impacts). In this case the ER has responsibility for the EO's functions.
- c) There may be an independently appointed Environmental Control Officer (ECO) who will fulfil essentially the same functions as the EO. The ECO may work with just the ER (if there is no EO) or may work with both the ER and EO.

The term "Engineer" in this EM Specification refers to the Engineer as defined in Clause E2.3.8 acting through the ER/EO/ECO as delegated.

H3 **MATERIALS**

H3.1 **Materials handling, use and storage**

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the EM Specification. The Contractor shall ensure that these delivery drivers are supervised during offloading by someone with an adequate understanding of the requirements of the EM Specification.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads, including but not limited to, sand, stone chip, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

All manufactured and or imported materials shall, where reasonably possible, be stored within the Contractor's camp and, if so required by the Engineer, out of the rain. The location and method of protection of such materials stored outside of the Contractor's camp and the method of rehabilitation of these areas, shall be subject to the Engineer's approval.

Stockpile areas shall be approved by the Engineer before any stockpiling commences.

H3.2 **Hazardous substances**

Hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances in GN 1179 (25 August 1995)) stored on Site for use during construction shall be stored in secondary containers which are clearly and appropriately marked/signed. The relevant Material Safety Data Sheets (MSDS) shall be available on Site. Procedures detailed in the MSDSes shall be followed in the event of an emergency situation.

If potentially hazardous substances are to be stored on Site, the Contractor shall inform the Engineer of such substances and provide a Method Statement detailing the substances/ materials to be used, together with the storage, handling and disposal procedures of the materials. Hazardous substances shall be stored out of flood risk areas and disposal of these substances shall be at a licensed waste

disposal facility.

H4 PLANT (referring to “Contractor’s Equipment” as defined in the FIDIC General Condition of Contract, 1999 (Yellow Book), and the Contractor’s facilities as used in SANS 1200A)

H4.1 Fuel (petrol and diesel) and oil

H4.1.1 Storage

If fuel and oil is to be stored on Site, then the Contractor shall submit a Method Statement covering the procedures for dealing with accidental hydrocarbon spillage and leaks, and detailing how these liquids will be stored, handled and disposed of.

The Engineer shall approve the location of all fuel storage areas. All necessary approvals with respect to fuel storage and dispensing shall be obtained from the appropriate authorities. Symbolic safety signs depicting “**No Smoking**”, “**No Naked Lights**” and “**Danger**” conforming to the requirement of SANS 1186 are to be prominently displayed in and around the fuel storage area. There shall be adequate fire-fighting equipment at the fuel storage area.

The Contractor shall ensure that all liquid fuels and oils are stored in tanks with lids, which are kept firmly shut and adequately secured. The capacity of the tank shall be clearly displayed and the product contained within the tank clearly identified using the emergency information system detailed in SANS 0232 part 1. Fuel storage tanks shall have a capacity not exceeding 9000 litres and shall be kept on site only for as long as fuel is needed for construction activities, on completion of which they shall be removed.

The tanks shall be situated on a smooth impermeable base with an earth bund. The volume inside the bund shall be 110% of the total capacity of the largest storage tank. The base may be constructed of concrete, or of plastic sheeting with impermeable joints, covered by a layer of compacted earth to protect the sheeting. The impermeable lining shall extend to the crest of the bund. The floor of the storage area shall be sloped to enable any spilled fuel and/or fuel-contaminated water to be removed easily.

If any rainwater collects in the bunded areas, it shall be promptly removed and taken off Site to a disposal site approved by the Engineer.

Only empty and externally clean tanks may be stored on the bare ground. Empty and externally dirty tanks shall be sealed and stored on an area where the ground has been protected.

Adequate precautions shall be provided to prevent spillage during the filling of any tank and during the dispensing of the contents. If fuel is dispensed from 200 litre drums, the proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism for the fuel storage tanks shall be stored in a waterproof container when not in use.

H4.1.2 Refuelling

Plant shall be refuelled at a designated refuelling area approved by the Engineer. The surface under the temporary refuelling area shall be protected against pollution to the reasonable satisfaction of the Engineer prior to any refuelling activities. The Contractor shall ensure that there is always a supply of absorbent material (e.g. Spill Sorb or Enretech #1 powder or equivalent) readily available that is designed to absorb, break down and encapsulate minor hydrocarbon spillage. The quantity of such material shall be able to handle a minimum of 200 litres of hydrocarbon liquid spill.

Treatment and remediation

Treatment and remediation of hydrocarbon spill and leak areas shall be undertaken to the satisfaction of the Engineer. In the event of a hydrocarbon spill the source of the spillage shall be isolated and the spillage contained.

H4.2 Ablution and toilet facilities

Washing, whether of the person or of personal effects, defecating and urinating are strictly prohibited other than at the facilities provided.

The Contractor shall provide ablution facilities for all personnel employed on the Site, including shelter, toilets and washing facilities. The Contractor's personnel will not be permitted to use the City's ablution facilities.

Toilet facilities provided by the Contractor shall occur at a maximum rate of 1 toilet per 30 workers (1:15 is preferred). Toilet facilities shall be located within the Contractor's camp, but also at work areas remote from the camp, all to the satisfaction of the Engineer. All portable toilets shall be adequately secured to the ground to prevent them toppling over as a result of wind or any other cause.

The Contractor shall ensure that the entrances to these toilets are adequately screened from view, that they are maintained in a hygienic state, serviced regularly, that no spillage occurs when they are cleaned and that contents are removed from Site. Toilets shall also be emptied before any temporary site closure for a period exceeding one week. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited. The Contractor shall provide toilet paper at all times.

No ablution facilities shall be located closer than 50m to any water body

A Method Statement shall be provided by the Contractor detailing the provision, location, and maintenance of ablution facilities.

H4.3 Eating areas

The Contractor shall designate eating areas within the approved Contractor's camp. The feeding of, or leaving of food for, animals is strictly prohibited. Sufficient bins, as specified in Clause H4.3 below, shall be present in these areas.

Any cooking on Site shall be done on well-maintained gas cookers with fire extinguishers present. No open fires for cooking purposes shall be permitted, unless for occasional use in facilities specifically provided for this purpose and within the confines of the Contractor's camp.

H4.4 Solid waste management

H4.4.1 Litter and refuse

The site shall be kept neat and clean at all times, littering is prohibited.

No on-site burying or dumping of any waste materials, vegetation, litter or refuse shall occur. The Contractor shall provide scavenger and weatherproof bins with lids, of sufficient number and capacity to store the solid waste produced on a daily basis. The lids shall be kept firmly on the bins at all times. Bins shall not be allowed to become overfull and shall be emptied regularly, at least once a week. Waste from bins may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof, and which the Engineer has approved. Wherever possible refuse shall be recycled, and containers for glass, paper, metals and plastics shall be provided and the contents delivered to suitable recycling facilities when necessary.

All other litter and refuse shall be disposed of off Site at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal.

H4.4.2 Construction waste

Where possible all construction waste or spoil material shall be recycled, either on Site or elsewhere. As a last resort all construction waste shall be disposed of off Site at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal.

H4.5 **Contaminated water management**

Potential pollutants of any kind and in any form shall be kept, stored, and used in such a manner that any spill or escape can be contained and the water table and/or any adjacent water courses or bodies are not endangered. Spill kits which can be used to contain and/or mop up spills shall be available. Water containing such pollutants as cements, concrete, lime, chemicals, oils and fuels shall be discharged into a conservancy tank for removal from the Site to a licensed disposal facility. This particularly applies to water emanating from concrete batching plants and to runoff from fuel storage, refuelling or construction equipment washing areas. Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted.

No paint products, chemical additives and cleaners, such as thinners and turpentine, may be disposed of into the stormwater system or elsewhere on Site. Brush/roller wash facilities shall be established to the satisfaction of the Engineer.

A Method Statement shall be provided by the Contractor detailing the management of contaminated water.

Should contaminated water be released into the environment, specifically into a water course, monitoring thereof shall commence in accordance to the National Water Act, 36 of 1998, Section 21(f) – refer to GN 399 (26 March 2004). Contaminated water must not be released into the environment without authorisation from the relevant authority.

The Contractor shall notify the Engineer immediately of any pollution incidents on Site and, at his own cost, take all reasonable measures to contain and minimise the effects of the pollution.

Any rehabilitation of the environment required as a result of such pollution shall be carried out by the Contractor at his own cost in accordance with a Method Statement approved by the Engineer.

H4.6 **Site structures**

The type and colour of roofing and cladding materials to the Contractor's temporary structures shall be selected to reduce the visual impact.

H4.7 **Lights**

The Contractor shall ensure that any lighting installed on the Site for his activities does not cause a reasonably avoidable disturbance to other users of the surrounding area.

Lighting installed shall, as far as practically possible, be energy efficient. Lighting utilised on Site shall be turned off when not in use.

H4.8 **Workshop, equipment maintenance and storage**

No workshops or plant maintenance facilities shall be constructed on Site for performing major or routine maintenance of equipment and vehicles.

The Contractor shall ensure that in those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency or minor routine plant maintenance, there is no contamination of the soil, water sources or vegetation. Drip trays to collect waste oil and other lubricants shall be provided in any areas of the Site where such maintenance takes place. Drip trays must be emptied regularly and after rain, and the contents disposed of at a licensed disposal facility.

All vehicles and plant shall be kept in good working order. Leaking vehicles and plant shall be

repaired immediately or removed from the Site.

The washing of vehicles and plant on Site shall be restricted to emergency or minor routine maintenance requirements only. Washing may only be undertaken in areas designated by the Engineer.

H4.9 **Noise**

The Contractor shall limit noise levels (for example, by installing and maintaining silencers on plant). The provisions of SANS 1200A Clause 4.1 regarding "built-up areas" shall apply.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens.

No amplified music shall be allowed on Site. The use of audio equipment shall not be permitted, unless the volume is kept sufficiently low so as to be unobtrusive. The Contractor shall not use sound amplification equipment on Site, unless in emergency situations.

Construction activities generating output levels of 85 dB(A) or more in residential areas, shall be confined to the hours 08h00 to 17h00 Mondays to Fridays. Should the Contractor need to do this work outside of the above times, he shall do so only with the approval of the Engineer, and the surrounding communities shall be informed prior to the work taking place.

H5 **CONSTRUCTION**

H5.1 **Method Statements**

The Contractor shall submit the environmental method statements required within such reasonable time as the Engineer shall specify or as required by the EM Specification. The Contractor shall not commence any activity until the Method Statement in respect thereof has been approved and shall, except in the case of emergency activities, allow a period of two weeks for consideration of the Method Statement by the Engineer.

The Engineer may require changes to a Method Statement if the proposal does not comply with the specification or if, in the reasonable opinion of the Engineer, the proposal may result in, or carries a greater than reasonable risk of, damage to the environment in excess of that permitted by the EM Specification.

Approved Method Statements shall be readily available on the Site and shall be communicated to all relevant personnel. The Contractor shall carry out the Works in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract.

Changes to the way the Works are to be carried out must be reflected by amendments to the original approved Method Statements, and these amendments require the signature of both the Contractor and the Engineer.

Method Statements shall consider all environmental hazards and risks identified by the Contractor and/or Engineer and shall contain sufficient information and detail to enable the Engineer to assess the potential negative environmental impacts associated with the proposed activity and shall cover applicable details with regard to:

- a) construction procedures,
- b) materials and equipment to be used,
- c) getting the equipment to and from site,
- d) how the equipment/material will be moved while on site,
- e) how and where material will be stored,
- f) the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur,
- g) the control of fire,
- h) timing and location of activities,
- i) compliance/non-compliance with the EM Specification,

- j) any other information deemed necessary by the Engineer.

The format to be used for the required method statements is bound in Annexure A of this EM Specification. The Contractor (and, where relevant, any sub-contractors) must also sign the Method Statement, thereby indicating that the work will be carried out according to the methodology contained in the approved Method Statement.

H5.1.1 Method Statements to be provided within 14 days from the Commencement Date

- a) Layout and Preparation of Contractor's Camp (E2.3.7).
- b) Ablution Facilities: number of, location, cleaning, method of securing to the ground, etc. of portable toilets (H4.2).
- c) Solid Waste Management: number of, type, location, cleaning, method of securing to the ground, etc. of bins (H4.4).
- d) Environmental Awareness Training: logistics for the environmental awareness courses for all the Contractor's management staff, as well as other employees (H5.2).
- e) Emergency Procedures for Accidental Hydrocarbon Leaks and Spillages (H4.13.3 and H5.8).
- f) Asphalt and Bitumen: details of all methods and logistics associated with the use of bitumen and asphalt (H5.17).

H5.2 **Environmental Awareness Training**

It is a requirement of this Contract that environmental awareness training courses are run for all personnel on Site. Two types of courses shall be run: one for the Contractor's and subcontractors' management, and one for all site staff and labourers. Courses shall be run during normal working hours at a suitable venue provided by the Contractor. All attendees shall remain for the duration of the course and sign an attendance register that clearly indicates participants' names on completion, a copy of which shall be handed to the Engineer. The Contractor shall allow for sufficient sessions to train all personnel. Subsequent sessions shall be run for any new personnel coming onto Site. A Method Statement with respect to the organisation of these courses shall be submitted.

Notwithstanding the specific provisions of this clause, it is incumbent upon the Contractor to convey the spirit of the EM Specification to all personnel involved with the Works.

H5.2.1 Training Course for Management and Foremen

The environmental awareness training course for management shall include all management and foremen. The course, which shall be presented by the Engineer or his designated representative, shall be of approximately one-hour duration. The course shall be undertaken prior to the commencement of work on Site.

H5.2.2 Training Course for Site Staff and Labour

The environmental awareness training course for site staff and labour shall be presented by the Contractor from material provided by the Engineer. The course shall be approximately one-hour long. The course shall be undertaken not later than 3 working days after the commencement of work on Site, with sufficient sessions to accommodate all available personnel.

All the Contractor's employees, sub-contractors' employees and any suppliers' employees that spend more than 1 day a week or four days in a month on Site shall attend the Environmental Awareness Training Course for Site Staff and Labour

H5.3 **Contractor's Environmental Representative (ESO)**

The Contractor shall appoint an environmental representative, also called an Environmental Site

Officer (ESO), who shall be responsible for undertaking a daily site inspection to monitor compliance with this EM Specification. The Contractor shall forward the name of the environmental representative (ESO) to the Engineer for his approval. The environmental representative (ESO) shall complete Environmental Site Inspection Checklists (Annexure B attached hereto) and these shall be submitted to the Engineer once a week.

H5.4 Site division, demarcation and “no go” areas

The Contractor shall restrict all his activities, materials, plant and personnel to within the Site or any particular working areas specified or indicated on the drawings.

The Contractor shall erect and maintain permanent and/or temporary fences of the type and in the locations specified elsewhere in the Scope of Work or on the drawings. Such fences shall, if so specified, be erected before undertaking any construction activities.

Where environmentally sensitive areas are specified as "no go" areas, the Contractor shall ensure that, insofar as he has the authority, no person, plant or material shall enter the "no go" areas at any time.

A Method Statement detailing the layout and method of establishment of the Contractor's camp (including all offices, shelters, eating areas, storage areas, ablution facilities and other infrastructure required for the running of the project) shall be provided.

H5.5 Access routes/ haul roads

On the Site and, if so required, within such distance of the Site as may be stated by the Engineer, the Contractor shall control the movement of all vehicles and construction equipment, including that of his suppliers, so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic, and that all relevant laws are complied with. In addition, the movement of such vehicles and construction equipment shall be planned and operated so as to minimise disruption to regular users of the routes. As far as possible the Contractor shall use existing access and haul routes. Damage to existing access roads as a result of construction activities shall be repaired to the satisfaction of the Engineer, using material similar to that originally used. The cost of the repairs shall be borne by the Contractor. New temporary access or haul routes may only be established with the prior approval of the Engineer. The rehabilitation of such routes shall be to the Contractor's own cost and to the approval of the Engineer.

Any directional signage required by the Contractor for the purposes of directing the movement of his own vehicles and construction equipment (or that of his subcontractors or suppliers) must be of a design and in a location approved by the Engineer. Directional signage may not be erected in such a manner that it interferes with sight lines or pedestrian movement.

H5.6 Construction personnel information posters

The Contractor shall erect and maintain information posters for the information of his employees, depicting actions to be taken to ensure compliance with aspects of the EM Specification. A2 information posters, printed on white vinyl, shall be erected at the eating areas and any other locations specified by the Engineer.

The specification for the poster is presented in Annexure C of this EM Specification. The symbols shall be black and the circles shall be red lines. The Contractor shall ensure that the construction personnel information posters are not damaged in any way, and shall replace a poster if any part of it becomes illegible.

H5.7 Fire control

Other than for cooking purposes as specified in Clause E4.2, no fires may be lit on Site. Any fires which occur shall be reported to the Engineer immediately.

Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include fuel

storage and refueling areas, and any other areas where the vegetation or other materials are susceptible to the start and rapid spread of fire.

In terms of the National Environment Management: Air Quality Act, 39 of 2004 and Community Fire Safety By-law, burning is not permitted as a disposal method.

The Contractor shall appoint a Fire Officer (who may be the ESO) who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedure to be followed. The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall forward the name of the Fire Officer to the Engineer for his approval.

The Contractor shall comply with Clause 27 of the Construction Regulations, 2003 where applicable, and shall ensure that there is suitable and sufficient fire-fighting equipment available on Site at all times.

The Contractor shall be liable for any costs relating to the rehabilitation of burnt areas, should the fire be the result of the Contractor's activities on Site

The Contractor shall submit a Method Statement to the Engineer covering the procedure to be followed in the event of a fire.

H5.8 Emergency procedures

The Contractor's attention is drawn to the Method Statements required in terms of Clauses E5.1 and E5.7 above. Such Method Statements shall include procedures to be followed by the Contractor in the event of an emergency.

Furthermore, in the event of an emergency, the Contractor shall contact the City of Cape Town's Emergency Call Centre by telephoning 107 or 021 480 7700 (from a cell phone). Telephone numbers of emergency services, including the local firefighting service, shall be posted conspicuously in the Contractor's office near the telephone.

H5.9 Health and safety

The Contractor shall comply with requirements of the Occupational Health and Safety Act, 85 of 1993 and Construction Regulations, 2014, the Health and Safety Specification and relevant clauses of GCC 2010, insofar as health and safety is concerned.

H5.10 Community relations

If so required, the Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified in the Scope of Work or as directed by the Engineer. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer.

The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself.

H5.11 General protections in terms of the National Heritage Resources Act, 25 of 1999

The Contractor shall take cognisance of the provisions of the National Heritage Resources Act, 25 of 1999 in respect of, *inter alia*, structures older than 60 years; archaeology, paleontology and meteorites; burial grounds and graves; and public monuments and memorials.

H5.12 Protection of natural features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes, unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause shall be restored/

rehabilitated to the satisfaction of the Engineer. The cost of restoration/rehabilitation shall be borne by the Contractor.

The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

H5.13 **Protection of flora and fauna**

Except to the extent necessary for the carrying out of the Works, as specified by the Engineer, no vegetation shall be removed, damaged or disturbed.

The presence of any wild animals found on Site shall be reported to the Engineer, who shall issue an instruction with regard to their removal or relocation. If a wild animal needs removal from the Site the Cape Nature (Metro Region) Conservation Services Manager may be contacted for assistance (tel 021 955 9132/9121/3122/9130). Trapping poisoning, injuring or shooting animals is strictly forbidden. No domestic pets or livestock are permitted on Site, with the exception of controlled watchdogs approved by the Engineer.

Where the use of herbicides, pesticides and other poisonous substances has been specified, the Contractor shall submit a Method Statement to the Engineer for approval.

H5.14 **Erosion and sedimentation control**

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities and shall, in addition, comply with such detailed measures as may be required by the Scope of Work. Where erosion and/or sedimentation, whether on or off the Site, occurs, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer, at the Contractor's cost. In particular, the Contractor shall ensure that the City's storm water system is kept free from sediment arising from the Works.

Any runnels or erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted, and the areas restored to a proper condition. Stabilisation of cleared areas to prevent and control erosion shall be pro-actively managed by the Contractor. The method of stabilisation shall be determined in consultation with the Engineer.

H5.15 **Aesthetics**

The Contractor shall take any requisite measures to ensure that construction activities do not have an undue negative impact on the aesthetics of the area.

H5.16 **Temporary site closure**

In the event of temporary site closure (for a period exceeding one week), the Contractor's ESO shall carry out checks and ensure that, amongst others, the following conditions pertain and report on compliance with this clause:

- a) Fire extinguishers are serviced and accessible.
- b) There is adequate ventilation in enclosed spaces.
- c) All hazardous substance stores are securely locked.
- d) Fencing and barriers are in place.
- e) Emergency and management contact details are prominently displayed and available.
- f) Wind and dust mitigation measures, e.g. straw, brush packs, irrigation, etc. are in place.
- g) Excavated and filled slopes and stockpiles are at a stable angle and capable of accommodating normal expected water flows.
- h) There are sufficient detention ponds or channels in place.
- i) Cement and materials stores are secured.
- j) Toilets are empty and secured.
- k) Central waste area and all refuse bins are empty and secured.

- l) Contaminated water conservancy tank empty.
- m) Any bunded areas are clean and treated with an approved product where applicable (e.g. Spill Sorb or Enretech #1 powder or equivalent).
- n) Drip trays are empty and secure

H5.17 **Asphalt and bitumen**

Bitumen drums/products, if stored on Site, shall be stored in an area approved by the Engineer. This area shall be indicated on the Method Statement for the Layout and Preparation of the Contractor's Camp. The storage area shall be constructed with an appropriate base, bunding and sump to the satisfaction of the Engineer. A Method Statement shall be provided in this regard.

When heating bitumen products, the Contractor shall take cognisance of appropriate fire risk controls. Heating shall only be undertaken using LPG or similar zero emission fuels. Appropriate firefighting equipment shall be readily available on Site.

H5.18 **Dust**

The Contractors shall be solely responsible, at his cost, for the control of dust arising from his activities on Site, and for any costs involved in damages resulting from the dust. The Contractor shall take all reasonable measures to minimise the generation of dust

H5.19 **Contractor's advertising signage**

Any advertising on the Site or any part of the Works shall remain at the sole discretion of the Employer, who reserves the right to order, via the Engineer, its removal, covering or re-sizing, wherever placed, at no cost to the Employer.

Apart from at the Contractor's camp, no signage advertising the Contractor, or any of its subcontractors, manufacturers, suppliers or service providers shall be placed, fixed or erected anywhere on the Site or on the Works without the prior approval of the Engineer. No advertising signage will be permitted on any designated scenic route. Notwithstanding any prior approval given, the Engineer may instruct the Contractor to remove, cover or re-size any advertising signage at any time at no cost to the Employer.

Advertising signage at the Contractor's camp shall be appropriately designed and sized with due consideration to the surrounding environment, views and sight lines.

Branding or identification markings on the Contractor's and subcontractor's vehicles and equipment is generally permitted, although the Employer reserves the right to instruct, via the Engineer, the removal, covering or re-sizing of any branding, markings or signage, on any equipment (scaffolding, for example), which it considers inappropriate in the environment in which it is placed.

No third party advertising (that is, in respect of any person, business or product that is not associated with the Works) shall be permitted anywhere on the Site or Works.

H5.20 **Clearance of Site on completion**

On completion of the Works, and at final completion when all defects have been remedied or corrected, the Contractor shall, in addition to the requirements for clearance of the Site in terms of the Contract, ensure that he has complied with the following requirements in terms of this EM Specification:

H5.20.1 Clause H3.1

Clean-up of improperly secured transported materials, and rehabilitation of storage areas.

H5.20.2 Clause H.4.1.3

Remediation of hydrocarbon spill and leak areas.

H5.20.3 Clause H4.3

Disposal of litter, refuse and Contractor's waste.

H5.20.4 Clause H5.4

Removal of temporary fences and Contractor's camp.

H5.20.5 Clause H5.5

Repair of access roads damaged by the Contractor, and rehabilitation of temporary access routes.

H5.20.6 Clause H5.7

Rehabilitation of burnt areas should a fire be the result of Contractor's activities on Site.

H5.20.7 Clauses H5.11 to H5.13

Rehabilitation of heritage and natural features, including vegetation which is damaged or disturbed, which required protection in terms of these clauses.

H5.20.8 Clause H5.14

Rectification where erosion and/or sedimentation has occurred due to the fault of the Contractor .

H5.20.9 Clause H5.19

Removal of Contractor's advertising signage.

H6 TOLERANCES

H6.1 Fines

Environmental management is concerned not only with the final results of the Contractor's operations, but also with the control of how these operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product, but also to the standard of the day-to-day operations required to complete the Works.

It is thus required that the Contractor shall comply with the EM Specification on an on-going basis and any failure on his part to do so will entitle the Engineer to certify the imposition of a fine. Fines may be issued per incident at the discretion of the Engineer. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications. The Engineer will inform the Contractor of the contravention and the amount of the fine, and will deduct the amount from monies due in payment certificates issued under the Contract.

Maximum fines for the following transgressions by either the Contractor and/or his sub-contractors may be imposed by the Engineer, as follows:

| | Maximum fine per incident |
|--|--|
| a) Vehicles, plant or materials related to the Contractor's operations, parked or stored outside the demarcated boundaries of the Site. | R 2 000 |
| b) Persons, vehicles, plant or materials related to the Contractor's operations, found within the designated boundaries of a "no go" area. | R 4 000 |

- | | |
|---|---------|
| c) Persistent and unrepaired oil leaks from machinery/not using a drip tray to collect waste oil and other lubricants/not using specified absorbent material to encapsulate hydrocarbon spillage/using inappropriate methods of refueling (the use of a funnel rather than a pump). | R 3 000 |
| d) Refueling in areas not approved by the Engineer. | R 3 000 |
| e) Litter on Site. | R 1 000 |
| f) Deliberate lighting of fires on Site. | R 5 000 |
| g) Individual not making use of the Site ablution facilities. | R 1 000 |
| h) Damage to trees not specified to be removed. | R 5 000 |
| i) Dust or excessive noise emanating from the site | R 1 000 |
| j) Not containing water contaminated with pollutants such as cement, concrete, fuel, etc. | R 2 000 |

For each subsequent similar offence the fine shall be doubled in value to a maximum value of R50 000.

H7 TESTING

Not applicable to this tender.

H8 MEASUREMENT AND PAYMENT

H8.1 Basic principles

Except where separate pay items have been measured in the Schedules of Quantities, all costs in respect of complying with the EM Specification are deemed to be covered by the sum tendered for complying with the EM Specification.

ANNEXURE A: ENVIRONMENTAL METHOD STATEMENT

CONTRACT:.....

DATE:.....

PROPOSED ACTIVITY (give title of method statement and reference number from the EMP):

WHAT WORK IS TO BE UNDERTAKEN (give a brief description of the works - attach extra information to ensure accurate description given):

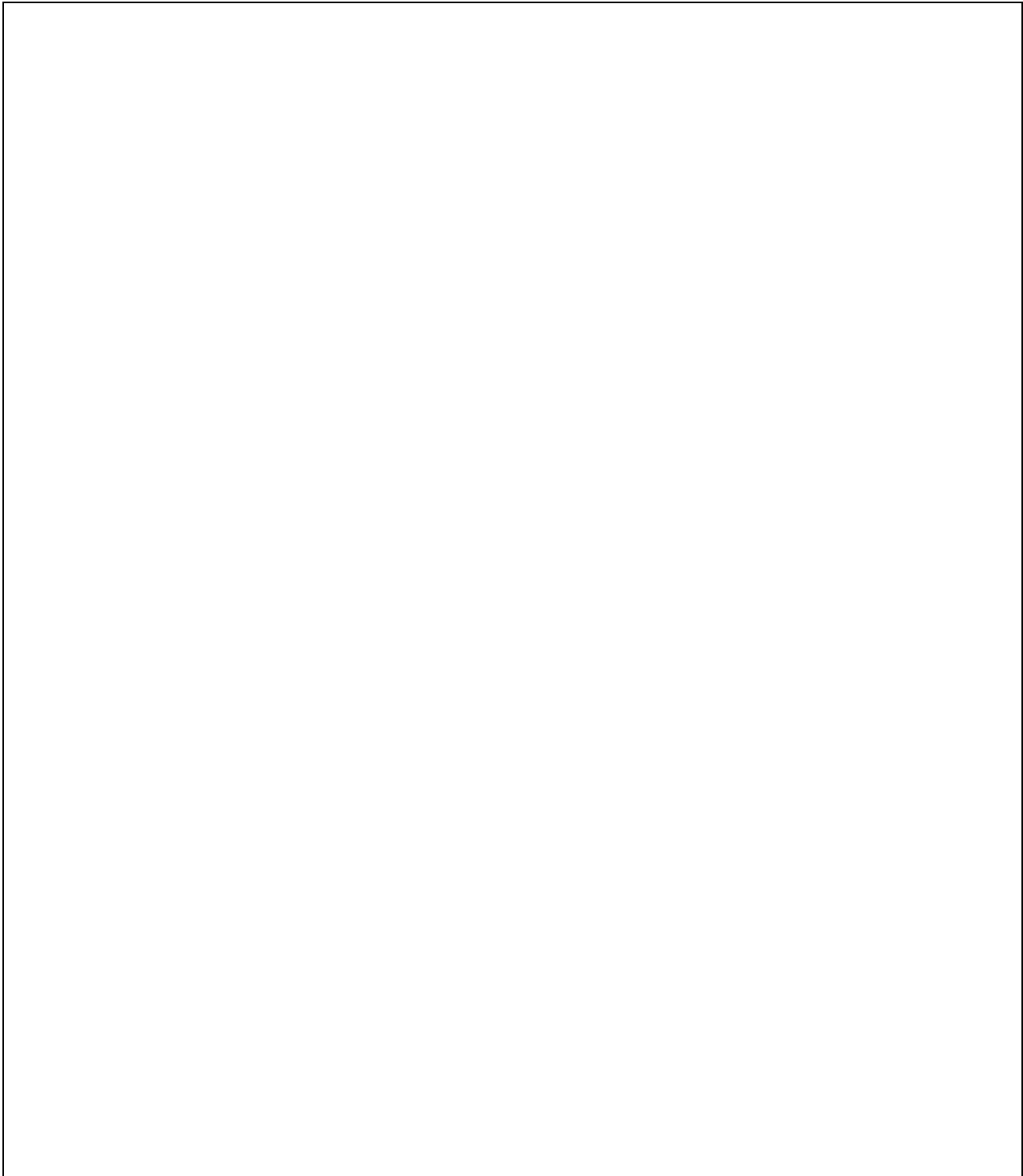
WHERE THE WORKS ARE TO BE UNDERTAKEN (where possible, provide an annotated plan and a full description of the extent of the works):

START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED:

Start Date:

End Date:

HOW THE WORKS ARE TO BE UNDERTAKEN (provide as much detail as possible, including annotated sketches and plans where possible):



Note: please give too much information rather than too little. Please ensure that issues such as emergency procedures, hydrocarbon management, wastewater management, access, individual responsibilities, materials, plant used, maintenance of plant, protection of natural features, etc. are covered where relevant

DECLARATIONS

1) ENGINEER’S REPRESENTATIVE/ENVIRONMENTAL OFFICER/ENVIRONMENTAL CONTROL OFFICER

The work described in this Method Statement, if carried out according to the methodology described, appears to be satisfactorily mitigated to prevent avoidable environmental harm:

(signed)

(print name)

Dated: _____

2) CONTRACTOR

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to other signatories and that the Engineer’s Representative/Environmental Officer/Environmental Control Officer will audit my compliance with the contents of this Method Statement. I understand that this method statement does not absolve me from any of my obligations or responsibilities in terms of the Contract.

(signed)

(print name)

Dated: _____

3) ENGINEER

The works described in this Method Statement are approved.

(signed)

(print name)

(designation)

Dated: _____

ANNEXURE B: ENVIRONMENTAL SITE INSPECTION CHECKLIST

To be submitted to the Engineer once a week

CONTRACT:.....

DATE:.....
















| ENVIRONMENTAL ASPECT | YES/ NO (✓ or X) | COMMENTS |
|--|---------------------|----------|
| • All new personnel on Site are aware of the contents of the EMP and have been through the environmental awareness course. | | |
| • Contractor's camp is neat and tidy and the labourers' facilities are of an acceptable standard. | | |
| • Sufficient and appropriate fire fighting equipment is visible and readily available in the appropriate places. | | |
| • Waste control and removal system is being maintained. | | |
| • Fences are being maintained. | | |
| • Drip trays are being utilised where there is a risk of spillage. | | |
| • Bunded areas/drip trays are being emptied on a regular basis (especially after rain). | | |
| • No leaks are visible from construction vehicles. | | |
| • Refuelling of vehicles and plant occurs within designated areas, and appropriate refuelling apparatus and drip trays are being used. | | |
| • "No go" areas, natural features, vegetation, etc. have not been damaged. | | |
| • Dust control measures (if necessary) are in place and are effectively controlling dust. | | |
| • Noise control measures (if necessary) are in place and are working effectively. | | |
| • Erosion and sedimentation control measures (if necessary) are in place and are controlling effectively. | | |
| • Material stockpiles are located within the boundary of the Site and are protected from erosion. | | |
| • Other | | |

Completed by:.....

Signed:.....

ANNEXURE C: CONSTRUCTION PERSONNEL INFORMATION POSTER

ENVIRONMENTAL MANAGEMENT DO'S AND DON'TS

| | | | |
|---|--|---|--|
|  | Workers & equipment must stay inside the site boundaries at all times |  | Use the toilets provided Report full or leaking toilets |
|  | Do not swim in or drink from streams Do not throw oil, petrol, diesel, concrete or rubbish in the stream Do not work in the stream without direct instruction Do not damage the banks or vegetation of the stream |  | Only eat in demarcated eating areas Never eat near a river or stream Put packaging & leftover food into rubbish bins |
|  | Protect animals on the site Ask your supervisor or Contract's Manager to remove animals found on site |  | Do not litter - put all rubbish (especially cement bags) into the bins provided Report full bins to your supervisor The responsible person should empty bins regularly |
|  | Do not damage or cut down any trees or plants without permission Do not pick flowers |  | Always keep to the speed limit Drivers - check & report leaks Ensure loads are secure & do not spill |
|  | Put cigarette butts in a rubbish bin Do not smoke near gas, paints or petrol Do not light any fires without permission Know the positions of fire fighting equipment Report all fires |  | Know all the emergency phone numbers |
|  | Do not burn rubbish or vegetation without permission Work with petrol, oil & diesel in areas marked for this Report any petrol, oil & diesel leaks or spills Use a drip tray under vehicles & machinery Empty drip trays after rain & do not throw this water into a river |  | Fines of between R1000 and R5000 Removal from site Construction may be stopped |
|  | Try to avoid producing dust - wet dry ground & soil |  | Report any breaks, floods, fires, leaks and injuries to your supervisor Ask questions! |
|  | Do not make loud noises around the site, especially near schools and homes Report or repair noisy vehicles | | |

ANNEXURE D: ADDITIONAL ENVIRONMENTAL ISSUES DEEMED TO FORM PART OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Listed below are issues pertaining to the environment that form part of the Contract Document. The Sub-Clause references relate to the **General Conditions of Contract for Plant and Design-Build for Electrical and Mechanical Works and for Building and Engineering Works Designed by the Contractor, First Edition, 1999 (Yellow Book) published by the International Federation of Consulting Engineers (FIDIC)**. They are listed here to emphasise that they form part of the environmental considerations and requirements for this project. They must be read together with any Particular Conditions referring thereto in Part C1.2 Contract Data.

1. Compliance with applicable Laws

Sub-Clause 1.13 requires that the Contractor comply with all applicable laws, regulations, etc. in fulfilling the Contract.

2. Health and safety

Sub-Clauses 1.13, 4.8 and 6.7 remind the Contractor of his obligations in terms of the Occupational Health and Safety Act, 85 of 1993 and Construction Regulations, 2014.

Clause 5.7 of SANS 1200A reinforces these requirements through the observation of proper and adequate safety arrangements.

3. Access to the Works

Sub-Clauses 2.1, 2.3, 3.2 and 7.3 make provision for the Engineer to authorise the Environmental Officer (EO) to have access to the Works and Site.

4. Monitoring

Sub-Clause 3.1 makes provision for the Engineer to exercise his authority as specified or implied in the Contract, including the monitoring of any environmental variables.

5. Engineer's authority to delegate

Sub-Clause 3.2 gives the Engineer the authority to appoint an assistant to act as the Environmental Officer (EO) for the Contract. The EO, who shall be responsible for monitoring compliance with the EMP, may be the Engineer's Representative or any other person accountable to the Engineer.

6. Engineer's instructions

Sub-Clause 3.3 requires that the Contractor comply with the Engineer's instructions on any matter relating to the Contract. Moreover, this Sub-Clause ensures that the Contractor only takes instructions from the Engineer, or from an assistant authorised by the Engineer in terms of Clause 3.

7. Pollution prevention and interferences

Sub-Clauses 4.14 and 4.18 require that the Contractor takes all reasonable steps to limit damage and nuisance caused by noise or pollution, and not interfere unnecessarily or improperly with the convenience of the public, or the access to, use and occupation of all public or private roads and footpaths.

Clause 5.6 of SANS 1200A further requires the Contractor to minimise dust nuisance and pollution of streams and inconvenience to or interference with the public.

8. Protection of existing environment

Sub-Clause 4.15 requires that the Contractor uses reasonable efforts, including proper use of appropriate vehicles and routes, to prevent any road or bridge to the Site being subjected to damage occasioned by his transport arrangements, and shall have satisfied himself as to the suitability of access routes to the Site.

9. Dust

Sub-Clause 4.18 requires that the Contractor takes all reasonable steps to limit damage and nuisance resulting from pollution caused by his operations, both on and off Site.

Clause 5.6 of SANS 1200A requires that the Contractor take all reasonable measures to minimise any dust nuisance.

10. Noise

Clause 4.18 requires that the Contractor takes all reasonable steps to limit nuisance resulting from noise caused by his operations, both on and off Site.

Clause 4.1 of SANS 1200A requires that when working in built-up areas, the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85dB.

11. Reporting accidents

Sub-Clause 4.21 (g) requires the Contractor to report to the Engineer details of hazardous incidents and activities relating to environmental aspects in his monthly progress reports.

12. Site clean-up

Sub-Clause 4.23 requires that, on completion of the Works, the Contractor shall clear away and remove from the Site all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works, and leave the Site and Works in a clean and safe condition. However, such Contractor's Equipment, material and Temporary Works as are required during the Defects Notification Period may be retained on Site.

Sub-Clause 11.11 requires that, upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site. If they have not been removed within 28 days after the Employer receives a copy of the Performance Certificate, the Employer may sell or otherwise dispose of the remaining items and shall be entitled to recover the costs for such disposal and restoring the Site from the Contractor.

13. Protection of fossils, etc.

Sub-Clause 4.24 requires the Contractor to take reasonable precautions to prevent any person from damaging, *inter alia*, anything of geological or archaeological interest, and requires that he inform the Engineer and follows any instructions issued in this regard.

14. Housing, food and transport

Sub-Clauses 6.1 and 6.6 require the Contractor to make his own arrangements for payment, housing, feeding and transport for his employees, and unless otherwise stated in the Scope of Work, provide all necessary accommodation and welfare facilities.

Clause 4.2 of SANS 1200A further requires that facilities provided comply with local authority regulations and are maintained in a clean and sanitary condition.

15. Hours of operation

Sub-Clause 6.5 restricts the Contractor's hours of operation to between sunrise and sunset on working days (Monday to Friday) (refer to Appendix to Tender and Particular Conditions), unless, *inter alia*, permitted by the Engineer.

Sub-Clause 6.5 further requires that in the event of an emergency the Engineer shall be immediately advised of work being carried out outside such times.

16. Competent employees

Sub-Clause 6.9 requires that all persons employed on Site are qualified, skilled and experienced. These attributes embrace knowledge of the environmental matters and issues dealt with in the EMP.

17. Removal from Site

Sub-Clause 6.9 makes provision for the Engineer to instruct the removal from the Works and Site of any person who persists in conduct prejudicial to protection of the environment.

18. Unacceptable documentation

Sub-Clause 8.1 in the Particular Conditions requires the Contractor to provide documentation required before being permitted to commence executing the Works. Such documentation includes the Protection of the Environment Declaration provided for in the Contract Document. Furthermore, the Contractor will not be given access to the Site until the required Environmental Method Statements have been submitted.

19. Programme and Method Statements

Sub-Clause 8.3 makes provision for the Engineer to request the programmes for carrying out the Works.

Sub-Clause 8.3 (d) makes provision for a supporting report including methods the Contractor intends to adopt. In the case of the environmental specifications, these would be submitted as Method Statements.

20. Suspension of Works

Sub-Clause 8.8 enables the Engineer to suspend the progress of the Works or any part thereof, which may be as a result of some default or breach of the Contract on the part of the Contractor.

Reinstatement

Sub-Clauses 17.1 and 17.2 make provision for the Contractor to rectify any loss or damage to the Works in his care (other than "Employer's Risks"), and bear any costs associated with such rectification.