Johannesburg Water SOC Ltd

CONTRACT NO: JW14466

OLIFANTSVLEI WASTEWATER TREATMENT WORKS INFRASTRUCTURE RENEWAL PLAN REFURBISHMENT OF VAN WYKSRUST PUMP STATION

VOLUME 2

PART 3: SCOPE OF WORK

C3 PREAMBLE TO SCOPE OF WORK

GENERAL

This section specifies and describes the supplies, services and Employer's Agent and construction works which are to be provided and any other requirements and constraints relating to the manner in which the contract work is to be performed.

SCOPE

Volume 2A is set out in five portions:

Portion 1: covers a general description of the project, the facilities available and the requirements to be met.
Portion 2: covers variations to the Civil standardised specifications, which are applicable to the contract.
Portion 3: covers particular Civil specifications, which are applicable to this contract.
Portion 4: covers Mechanical project specifications, which are applicable to this contract.
Portion 5: covers Electrical and Control project specifications, which are applicable to this contract.

Volume 2B contains Generic Specifications.

STATUS

The Project Specifications together with the drawings and Schedule of Quantity indicate the section of Standard Specification applicable to this Contract.

In the event of any discrepancy between parts of the Standard Specification and the Project Specifications, the latter shall take precedence and shall govern.

Should any requirement of the Particular Project Specification conflict with any requirement of the Project Specification or Variations and Additions to the Standardised Specifications, the requirements of the Particular Project Specifications shall prevail.

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PORTION 1: PROJECT DESCRIPTION AND GENERAL INFORMATION

PS 1 DESCRIPTION OF THE WORKS

PS 1.1 Employer's Objectives

Johannesburg Water's Infrastructure Renewal Plan (IRP) is a project wherein equipment and infrastructure within the Olifantsvlei Wastewater Treatment works (WWTW) have been identified as having reached the end of its expected useful life and require replacement or refurbishment. Scope related to the Van Wyksrust pump station was escalated due to acts of vandalism rendering the pump station non-operational.

The objective of the project is to ensure that the refurbishment and replacement of electromechanical and civil infrastructure is done at the WWTW with a focus on bringing the pump station back into operation.

Royal HaskoningDHV has been appointed by the Employer (Johannesburg Water), to produce the tender design and act as Employer's Agent for the implementation of this project.

PS 1.2 Overview of the Works Objectives

The work largely involves repairing and replacing of existing infrastructure and equipment which are either damaged, missing or have reached the end of their service life, related to the existing Van Wyksrust pump station.

This pump station is responsible for delivering influent to the main head of works for treatment thereof.

The existing feed/splitter chamber to Van Wyksrust pump station will be extended to accommodate the new bypass facility. Alterations and repairs to the existing feed channels, sump and pump station are to be undertaken. Refurbishment and replacement of portions of the existing rising mains from the pump station to the head of works are necessary. Provision for an upgraded screenings slab and improved security measures forms part of this project.

All mechanical equipment at the pump station has been stripped and thus will need to be replaced with new equipment to suit the revised configuration of the pump station.

All electrical and control equipment at the pump station has been stripped and thus will need to be replaced with new equipment.

The associated Substation will also be refurbished to include building work, security measures and electrical equipment to enable power supply to the pumpstation.

Certain upfront investigations are also included to enable designs for future projects.

PS 1.3 Extent of the Works

The primary activities of the project entail the following:

- Site clearance
- Traffic control and temporary signage during construction
- Location, exposing and protection of existing services
- Demolition of part of existing security fences and the reinstatement of security walls, complete with electric fencing
- Excavation, trench preparation, bedding and compaction
- Supply, unloading and laying of pipes
- Trenchless pipe replacement
- Backfilling of trenches and testing of installation
- Provision and installation of valves and chambers
- Reinstatement of surfaces to original condition
- Connections into existing pipes
- Connections into existing pump station and other infrastructure
- Supply and installation of new mechanical screens and wash compactors
- Construction of a new bypass facility
- Replacement of the Van Wyksrust pump station pump sets
- Replacement of medium voltage (MV) cables and switchgear
- Repairs to the pump station existing building structure
- General civil services (Terracing, finishing, stormwater, etc)
- Installation of a new guardhouse at the pump station
- Supply and installation of a new security camera system

Necessary site investigations are required at the start of the construction stage. Further inspection and exploration, to be completed by the Contractor include ground penetrating radar (GPR) and topographical surveys at all areas of work, pipe condition assessments and specialised cathodic protection surveys for the 2 x DN700 rising mains and the additional DN1400 pipe in close proximity.

Topographical and GPR survey investigations for a future contract will also be carried out during construction.

The Contractor's obligations shall also include strict compliance with any Environmental requirements and/or reports deemed to form part of this Contract as well as any Occupational Health and Safety requirements.

This description of the works is not necessarily complete and shall not limit the work to be carried out by the Contractor under the Contract. Approximate quantities of each type of work are given in the Schedule of Quantities.

PS 1.3.1 Refurbishment of Van Wyksrust Pump Station

a. Background

The Van Wyksrust pump station has been rendered non-operational due to severe vandalism and looting of the mechanical, electrical and civil infrastructure. The existing channels and pump well are currently flooded.

Return to service of this pump station is essential as its primary function is to screen and lift raw wastewater to the Olifantsvlei WWTW Head of Works.

There are two (2) DN700 existing rising main pipes, approximately 1 700 m long, each with its' own dedicated set of pumps. One of the two pipes had been refurbished about 20 years ago. The buried portion (say 1105 m) had been re-lined with HDPE previously. The rest of that steel pipe section, mostly above ground, traversing the wetland on existing concrete plinths, was replaced (say 595 m in length) with a DN700 steel pipe of 8 mm wall thickness.

The pump station is remote from the works and is vulnerable to vandalism therefore implementation of security fortification must be programmed as upfront work early in the contract.

b. Scope of work

<u>The scope of Civil work includes:</u>

Temporary subsoil drains, isolation, diversion and pumping of groundwater, etc to allow for drier working conditions within the pumpstation, during construction of the bypass facility and other deep excavations. This arrangement may be converted into a more permanent resource.

PS 1.3.1.1 Bypass Facility

- The new bypass facility, makes use of a portion of open channel that the new screen will be installed in but for the most part, is made up of a SANS 677, DN1050, 50D, spigot and socket concrete pipe.
- The internal surfaces of the channel will be finished with a corrosion resistant coating.
- The new concrete bypass pipe will require a precast manhole for change in direction.
- The tie-in points for the start and end of the bypass will require changes to some existing infrastructure.

  At the start of the bypass, an extension to the existing splitter chamber is required, to accommodate the new weir and bypass pipe.

  At the bypass end or return, the existing sump will be extended to include the new pipe.

PS 1.3.1.2 Rising Mains

- A repair similar to the first pipe repair described above, will be done on the second pipe.

- Slip-lining would be the most appropriate form of repairs for the buried portion of pipe; say 1105 m long, with HDPE, DN630, PN16 pipe.
- Replacement of the above ground section; say 595 m long, with same as existing, steel pipe, 8 mm thick walls, on existing plinths, lined and coated as per specification.
- Isolating, draining, and cleaning of the pipe would be necessary prior to investigation (both pipes).
- Pipe condition investigation consisting of multiple types of tests to determine the overall condition, remaining lifespan of the pipe, recommendations, and design of future repairs necessary (both pipes).
- Additional limited repairs as may be found necessary during the construction stage.
- New air valve installations.
- Provision for some minor repairs and maintenance of existing concrete plinths.

PS 1.3.1.3 Screenings facility

- The bunded area for the screenings' facility will include the extent of the skips trolley and rails, as well as the screens compactors, to contain any spills.
- The bunded area will drain back to the existing channel (the closest one) by gravity, upstream of the secondary screen.
- These concrete surfaces will be treated with a corrosion resistant coating.
- A new wash water storage tank and booster pumps, on plinths, will be contained within the new bunded area.

PS 1.3.1.4 Structural, Building Work and General

- Drain the pump station basement and influent channels before cleaning the surfaces for proper inspection.
- Repairs to concrete defects in existing structures (cracks, holes, leaks, reinforcement, etc).
- Provision for new pipe box-outs and making good previous box-outs for revised pump station pipework.
- Installation of new reinforced concrete slabs to replace the previously installed paving blocks.
- Missing stainless steel handrailing will be replaced with GRP handrailing, including additional sections.
- Other miscellaneous minor items, such as missing manhole covers, etc, to be better defined and addressed during construction.

PS 1.3.1.5 Security Measures

- A 2,7 m high brick wall, without footholds or handholds, to be constructed, with an anti-climb topping.
- Existing doors, louvres and windows are to be replaced with concrete type doors and ventilation panels.
- Supply and installation complete, of a prefabricated guard house made from armoured material including bullet resistant glass windows.

PS 1.3.1.6 Generator

- A new concrete slab with a concrete bund wall and sump for the self-bunded generator.

The Scope of Mechanical Work includes:

Mechanical works include equipping the pump station with pumps, capable of meeting current and future demands as well as equipping the station with screens and screenings handling suitable for ensuring reliable and efficient operation of the pump station.

Pumps

- Supply and installation of 6 off solid handling horizontal spindle centrifugal pumps sized at delivering 358 ℓ/s @ 21.3 m.

Valves

All valves for pumps are to be replaced. These consists of:

- 6 off DN450 PN16 knife gate valves (suction)
- 6 off DN400 PN16 knife gate valves (delivery)
- 6 off DN400 PN16 swing check valves

The following valves at the discharge of the pump station are to be replaced:

- 2 off DN600 PN16 knife gate valves
- 1 off DN700 PN16 knife gate valves

The following valves on the rising mains are to be replaced:

- 2 off DN700 PN16 knife gate valves
- 6 off DN350 PN16 knife gate valves

Pipework

- Allowance is made for new pipework and fittings within the pump station to cater for both deteriorated pipework as well as the new sizes of pumps and valves.

Pump Station Mechanical Ancillaries.

Provision for the new pump station ancillary equipment, as follows:

- 2 off pump station sump drainage pumps rated at 1.5 kW and 40 m3/hr at 6 m.
- Building ventilation fan rated at 0.37 kW, and ducting.
- Building hoists including 3 ton overhead electric hoist and crawl trolley.
- Pump station sump wall mounted penstocks, 3 off 650 x 650 mm, with 4 m spindles.
- New pump station steel staircase.

Screening equipment

- Primary screens – 3 off automatic front rake screens (50 mm bar spacing) with belt conveyor to transport screenings to out loading skip area.
- Secondary screens – 2 off Automatic front rake screens (25 mm bar spacing) with screw conveyor to transport screenings to wash compactors.
    - 2 wash compactors (1 duty, 1 standby)
    - Belt conveyor to transport compacted screenings to skips
    - Associated duty/standby wash water booster pumps and storage tank for pressurised wash water supply to the wash compactors.
- Skips on manually operated trolley and rail system
- Screen upstream penstocks – 2 off 1 x 2 m (width x height) channel mounted penstocks.
- Screen downstream penstocks – 2 off 1 x 2 m (width x height) channel mounted penstocks.
- Bypass channel penstocks – 1 off 1 x 2 m (width x height) wall mounted penstocks.

Wash Water (Final Effluent) Supply

- An interim measure: final effluent be pumped from the Final Effluent PS to Van Wyksrust PS with a temporary pump installation.
- Provision is made for 2 pumps, 1 duty and 1 standby, mounted on a skid arrangement located adjacent to the final effluent inlet channel to the pump station. The pumps will be self-priming rated at 7.5 ℓ/s and 25 m head and 7.5Kw, delivering final effluent through a temporary GMS pipes (110 mm) to Van Wyksrust PS, approximately 1.6 km long.

The scope of Electrical work includes:

- Permanent security lighting measures are required because the pump station is located away from the main treatment plant and has experienced security breaches, including high-mast area lighting and perimeter fence flood lighting.
- Complete reestablishment of electrical systems for the Van Wyksrust Pump Station is required, as follows:
    - Supply, delivery, installation, testing and commissioning of a new MCC for the pump station.
    - Supply, delivery, installation, testing and commissioning of a new 630kVA 11/0.4kV ONAN transformer for the pump station.
    - Supply, delivery, installation, testing and commissioning of a new 500kVA 400V emergency power diesel generator including change over switch.
    - Supply, delivery, installation and testing of the earthing and lightning protection system for the pump station and building.
    - Supply, delivery, installation and testing of the LV cabling for the pump station.
    - Supply, delivery, installation, testing and commissioning of twenty (20) local control panels, for the pump station drives
    - Supply, delivery and installation of the required cabling support systems and accessories.
    - Supply, delivery, installation, testing and commissioning of the pump station small power and lighting requirements.
    - Trenching of approximately 400 m for cables, including backfill and compaction.
    - Testing and commissioning of the complete electrical installation.
    - Supply owner and maintenance manuals for all new equipment.

Electronic Control and Instrumentation

The automation scope of work to be carried out for the Van Wyksrust pump station refurbishment comprises in general, the following:

- Supply, delivery, installation, testing and commissioning of a new complete automation system, based on the Modicon M580 PLC for the pump station
- Supply, delivery, installation, testing and commissioning of a new UPS, including battery backup for the pump station control system.
- Supply, delivery and installation of the required cabling support systems and accessories.
- Supply, delivery, installation, testing and commissioning of the new field instrumentation for the pump station.
- Supply, delivery, installation and testing of the new field instrumentation junction boxes for the pump station.
- Supply, delivery, installation and testing of the instrument and control cabling for the pump station.

- Supply, delivery, installation and testing of the perimeter intrusion detection system for the perimeter wall of the pump station. The system will consist of wall mounted and buried fibre optic system picking up seismic and acoustic energies, with a control unit located in the pump station, connecting to the main site security control system.
- Trenching of approximately 200m for cables, including backfill and compaction.
- PLC and SCADA software development for the pump station
- Testing and commissioning of the complete automation installation.
- Supply owner and maintenance manuals for all new equipment.

PS 1.3.1.7 Alternative design

- An alternative design for installation of the Van Wyksrust pumpstation pumps at a higher level may be considered during construction. Based on investigations and findings at the start of the construction stage, the current arrangement to replace the pumps in the basement of the building may not be deemed feasible.

    - Construction and installation of a new steel platform at a higher level in the pump station may be required where ground conditions and structural integrity of the current building are found to be poor. This may also be necessary where other unforeseen circumstances arise.

    - Draining, cleaning and refurbishment of the basement will still be necessary, even if the pumps are to be installed at the higher level.

    - Pumps capable of dry-priming would be required where installation of such is on a higher level and not on the basement floor.

    - Pipework and the valve chamber details may be revised where this alternative arrangement is implemented.

    - Provision for the additional costs related to this alternative has been included in the schedule of quantities as a single provisional sum item and is considered to be all inclusive.

PS 1.3.2 Upgrade of the Medium Voltage (MV) Reticulation

a) Background

The MV reticulation at Olifantsvlei WWTW has reached the end of its useful service life, with multiple breakdowns and failures being experienced by the works. In addition, vandalism and theft have rendered many substations inoperable. The MV reticulation required to supply the Van Wyksrust pump station will be restored.

b) Scope of work

<u>The Scope of Civil work includes:</u>

<u>Substation C</u>

- Security measures include installing more durable doors, windows (concrete type doors and ventilation panels)
- A new 2.7 m high brick wall, without footholds or handholds, will be built around the substation making provision for both vehicular and pedestrian access gates.
- An anti-climb topping, be installed along the new perimeter wall.
- A Perimeter Intruder Detection Systems (PIDS), such as a non-lethal electrical fence shall be installed on the wall, to be linked and monitored in the main security control room).
- New concrete paving slabs will be constructed around the building that extends from the existing building wall to the new perimeter wall, and inclusive of a driveway tying into the existing road network.
- Other miscellaneous minor items may be identified and addressed during construction.

The Scope of Electrical work includes:

Reestablishment of the portion of the 11kV ring feed system supplying the Van Wyksrust pump station.

Installation of a new feeder cable from the main substation to Substation C, the reequipping of Substation C with an 11kV ring main unit, the construction of an overhead line from Substation C to the Van Wyksrust pump station and the reequipping of the Van Wyksrust MV substation.

The electrical work to be carried comprises in general, the following:

- Supply, delivery, installation, testing and commissioning of Substation C MV equipment: – 3-way 11kV ring main unit, 2 x 630A isolators, 1 x 200A circuit breaker.
- Supply, delivery, installation, testing and commissioning of Van Wyksrust Substation MV equipment: – Metal clad MV switchgear, 2 x incomer panels, 1 x transformer feeder circuit breakers and 1 x BTU.
- Civil works – Substation building modification required for the installation of the above listed MV switchgear.
- Supply, delivery, installation and testing of MV Reticulation.
- Supply, delivery, installation and testing of the earthing and lightning protection system for the substations.
- Supply, delivery and installation of the required cabling support systems and accessories.
- Cable trenching required to install the new MV cabling. The work will include excavation, backfill, compaction, supply and installation of cable protection tiles and the supply and installation of cable route markers for the new cabling installed.

PS 1.3.3 Network Reestablishment and Communication Systems

a) Background

Reestablishment of the fibre network is required.

On site security utilises a UHF/VHF radio system for two-way communication. Booster repeater equipment will be installed in this area to ensure that continuous radio coverage is provided.

b) Scope of work

The scope of Electrical work includes:

The electrical work to be done comprises in general, the following:

- Supply, delivery and installation of 12 core single-mode fibre optic cabling as follows:
  - Substation F to Substation G. Fibre-optic cables will be 9/125 µm single-mode (SM) cable with wire armouring, for use with 1000BASE-SX gigabit Ethernet.
  - Substation G to Substation C.
  - Substation C to Van Wyks Substation. Aerial self-supporting type to be installed on the 11kV overhead line supplying the substation.
- Supply, delivery, installation of 12 core single-mode fibre optic cable terminations, including all hardware required for a complete installation.
- OTDR testing of the installed fibre cables and terminations.
- Cable trenching required to install the new fibre cabling detailed above. The work will include excavation, backfill, compaction, supply and installation of cable protection tiles and the supply and installation of cable route markers, manholes and sleeves for the new cabling installed.
- Supply, delivery, installation and commissioning of an IP telephone system, with base stations to be provided at the main control room, security control room and the Van Wyks pump station and the emergency dam pump station.
- Suitable repeater stations and antennas will be provided to ensure full site signal coverage.

PS 1.3.4 Security Camera System

a) Background

A security camera system is required to enable monitoring of the site perimeter, entrance gate, exposed pipeline as well as for detection of movement in the monitored area. Communication between cameras and monitoring stations shall be through the existing site fibre network.

b) Scope of work

The scope of Electrical work includes:

The security camera system installation shall comprise of:

- 28 off bullet type cameras with 4MP resolution, range 100 m.
- Camera to be mounted on 4 m high 100 mm square tubing posts
- All cameras to be supplied with 24 Amp hour battery (2 days backup)
- All cameras to be connected via new fibre cables to the treatment work's existing fibre network.
- New fibre cables to be installed.
- Monitoring station will be located in a designated room, or existing control room, at the Administration building of the main WWTW.
- An additional monitoring station will be installed at the pump station guard house.

PS 1.3.5 Investigations

a) Background

Some investigations have been undertaken and the results used in the detail design, this is limited to a basic geotechnical testing and topographical survey of the Van Wyksrust pump station area.

b) Scope of work

Further inspection and exploration, to be completed by the contractor include, ground penetrating radar and topographical surveys, geotechnical investigation, pipe condition assessments and cathodic protection surveys for all areas of work related to this Contract 1 and for design considerations in the future Contract 2 project.

PS 1.4 Locations of the Works

The construction activities and equipment called for under this Contract will be installed at the Olifantsvlei Wastewater Treatment Works. The Treatment Works is located South of the N12 highway and West of the R553 Golden Highway, approximately 3km Southwest of the Moroka Bypass. The GPS coordinates of the entrance to the Works are 26° 19' 05.16" S, 27° 54' 12.31" E.

PS 1.5 Temporary Works

The Contractor shall, as relevant:

a) Provide temporary drainage works, temporary pumps, shoring, isolation, etc and other equipment as might be necessary for the protection, draining and dewatering of the works; and

b) Construct and maintain haulage, temporary access and construction roads, subject to the approval of the Employer, and permit the Employer, other Contractors, statutory bodies or any other person who might require legitimate access to or through the site for the purpose of executing legitimate business, free and unhindered usage of such roads.

c) Temporary water connections, Contractor's offices, storage sheds, latrines, barricading of Works shall be located in an approved position and subject to approval of all authorities concerned. The Contractor must arrange for access to the entire project site. The Contractor must arrange for the establishment of a Contractor's camp on site.

d) Safety and security of the Contractors' temporary works shall be at the Contractors' discretion, but always in accordance with stipulated Occupational Health and Safety requirements.

e) The camp shall be adequately guarded during or outside working hours.

f) The costs for all above activities shall be deemed to be included in the rates.

g) No equipment intended for permanent installation shall be operated for temporary purpose without the written permission of and in complete agreement with stipulations as set forth by the Employer.

PS 2 EMPLOYER'S AGENT DESIGN

PS 2.1 Employer's Design

The Employer's design has been completed by Royal HaskoningDHV (Pty) Ltd (the Employer's Agent) on behalf of the Employer.

When and where specific reference is made or preference shall be given to specified equipment, the Tenderer shall include such as his main offer in the Tender. Should the Tenderer fail to comply with these requirements, this may lead to the disqualification of the tender submitted.

Tenderers are free to propose alternative equipment to that proposed in the specifications and, provided that drawings with details of each alternative proposal are submitted with the Tender, such alternative proposals shall be considered in the adjudication of a Tender. Full details of any changes must be included with the tender. The cost of any changes to the Employer's design shall be for the Contractor's account where full details of the changes were not submitted with the tender.

The Contractor undertakes only construction on the basis of designs issued by the Employer's Agent. The Contractor is to follow the specifications, the design and construction drawings as laid out by the Employer's Agent. Tenderers must satisfy themselves that the layouts as provided in the tender documentation suit in all respects the equipment proposed by the Employer or by the Tenderer as the case may be. Where equipment other than that proposed by the Employer's Agent is accepted, it will be the sole responsibility of the Contractor to ensure that the associated equipment including pipe work is compatible with the accepted material and proposed structures.

In the case of the Employer's Agent's acceptance of an alternative proposal, the Contractor shall submit in triplicate to the Employer's Agent for his approval, detailed working drawings of the Contractor's alternative design proposal before any related work is executed.

An extension of time for Practical Completion of the Contract due to time spent on the alteration of the tender drawings to suit the Contractor's alternative proposals or, due to time spent in obtaining the Employer's Agent's approval of such alternatives, shall not be considered.

Acceptance of an alternative proposal or offer shall not relieve the Contractor of any of his obligations in terms of the Contract. The Contractor's cost of preparation and submission of an alternative proposal shall be deemed to be included in the rates tendered for the execution of the Works.

PS 2.2 Drawings

Drawings are included in Volume 4 of this Contract Document based on current available information. Sufficient drawings to enable the Contractor to start with work will be issued to the Contractor at commencement of the Works and further drawings will be issued to the Contractor from time to time as the work progresses. Such drawings may be updated (based on actual site situation uncovered during carrying out the Works) and re-issued during the Contract Period as required.

The as-built records to be submitted by the Contractor to the Employers agent must include:

a) Hard copy drawings indicating mark-ups of amendments, as updated on site

b) Updated electronic/soft copy drawings (in Revit and/or autocad compatible type files), at no additional cost to the Employer. Original may be provided by the Employers' Agent, on request, where available.

PS 2.2.1 Civil, Building and Structural

Construction drawings will be issued to the successful tenderer, prior to commencement of the Works.

Drawings include:

a) Locality plans.

b) Layout drawings.

c) Pipework drawings,

d) Concrete drawings and

e) Typical construction details.

Upon receiving the instruction to commence with the Works, the Contractor shall receive 3 sets of construction drawings, of which 1 set shall be designated for as-built records and updated by the Contractor on a daily basis.

The drawings shall be submitted to the Employer's Agent with the Contractor's request for issue of the Certificate of Practical Completion.

The Contractor shall keep and maintain a drawing register on the Site which shall be made available to the Employer and the Employer's Agent. The register shall reflect the drawing number, title, revision number and for what purpose the drawing was issued, e.g. construction.

PS 2.2.2 Mechanical, Electrical & C&I

Reduced drawings have been prepared and are included in Volume 3. Some drawings are scanned from previous as-built drawings and therefore have no drawing package intelligence. The drawings show the general plan and sectional dimensions of the civil structures into which the mechanical, electrical, control and instrumentation equipment is to be installed.

The design drawings supplied by the Employer's Agent under this Contract will have omissions in terms of equipment detail (such as circuit breaker types, surge arrestor types & ratings, instrument types and details, etc.) because these would not be known at the time of tender. It is therefore an explicit requirement of this Contract that the successful Contractor keep ONE SET of these drawings updated. Updates can be handwritten, provided that it is clearly legible. After commissioning, this updated set must be submitted to the Employers' Agent to enable updating of all design drawings to "As-Built" status.

Notwithstanding anything provided for in the Contract, the Contractor shall provide fully dimensioned detailed drawings as well as details of imposed loads by the equipment which will enable the Employers' Agent to finalise the civil drawings and details. Co-operation between the Contractor and the Employers' Agent is essential.

The Contractor shall allow a period of four weeks for the Employers' Agent to finalise the civil drawings if necessary.

PS 3 PROCUREMENT

PS 3.1 Preferential Procurement Procedures

The Contractor's attention is drawn to the following returnable schedules contained in Part T2:

a) Empowerment and Preferential Procurement (MBD 6.1); and

b) Enterprise Declaration Affidavit (to be endorsed by a Commissioner of Oaths) (JW11).

These schedules contain all requirements with regard to preferential procurement.

PS 3.2 Subcontracting

PS 3.2.1 Definitions

Unless inconsistent with the context in these specifications, the following terms, words or expressions shall have the meanings hereby assigned to them:

1. Start-up Enterprises

   An enterprise that has been in existence and operating for less than two years.

2. Small Enterprises

   An enterprise that has a CIDB grading designation of 1 or 2.

3. Micro Enterprises

   An enterprise that has a CIDB grading designation of 3.

4. Locally based SMMEs

   Enterprises that have their operational base in the ward in which the project is to be executed or, alternatively, the members of the enterprise are resident in the particular ward. Should a suitable locally based SMME as defined above not be available in the particular ward, then they shall be sourced from adjacent wards.

5. Contract Participation

   Contract Participation in terms of this contract is a process by which the Employer implements Government's objectives by setting a target relating to small Contractor development which the Contractor shall achieve as a minimum.

6. Contract Participation Goal (CPG)

   Contract Participation Goal is the monetary value of the target set by the Employer in the Contract Participation process.

7. Contract Participation Performance (CPP)

   Contract Participation Performance is the measure of the Contractor's progress in achieving the CPG.

The commitment of the Employer to Government Policy concerning the empowerment of the SMMEs shall be noted and adhered to by the Contractor. It is against this background that Johannesburg Water has made provisions under this contract to ensure that the Contractor impart skills to the SMME within the project area during the project implementation.

The onus is upon the Contractor to handle and manage the procurement process of the Sub-Contractors and once appointed, should be dealt with in accordance with the provisions of Clause 4.4 of the General Conditions of Contract 2015 (3rd Edition).

The Contractor shall obtain the written approval of the Employer's Agent before appointing any Sub-Contractor. The Contractor shall be solely responsible for the supervision of and payments to such a Sub-Contractor(s) and the approval of a Sub-Contractor by the Employer's Agent shall not indemnify the Contractor from any of his liabilities in terms of the Contract.

PS 3.2.2 Applicable Legislation

The following Acts, as amended from time to time, are predominant amongst those which apply to the construction industry and are listed here for reference purposes only:

- The Constitution of South Africa;
- Preferential Procurement Policy Framework Act No. 5 of 2000;
- Construction Industry Development Board Act No. 38 of 2000;
- Broad-Based Black Economic Empowerment Act No. 53 of 2003.

PS 3.2.3 Scope of Work

The City of Johannesburg has identified job creation and access to procurement opportunities by Start-ups, Small and Micro enterprises (SMMEs) as an essential requirement towards building an economically viable City.

This tender is subject to the sub-contracting condition as described in item C1.2.1.2.14 of the Tendering Procedures and must be adhered to by the main contractor. It is also the obligation of the main contractor to impart skills to the subcontractor/s on the project during implementation. Although a minimum subcontracting percentage of the contract value is indicated in the Contract Data, the contractor may increase this percentage at his discretion.

NB: all sub-contractors appointed on this contract must comply with the Central Supplier Database (CSD) requirements, i.e. they must be registered on the CSD.

It is a condition of this contract that the Contractor is required to sub-contract a minimum value of work to **SMMEs** equal to the subcontracting percentage of the Contract Sum indicated on the Contract Data.

The minimum requirements of the sub-contractors are as follows:

1. Valid CK registration
2. SA ID copies of owners
3. Active CIDB membership
4. Valid Tax clearance certificate
5. Valid BBBEE certificate
6. COID certificate
7. Company Profile including similar experience and skilled personnel CVs
8. Health and Safety Plan

The Contractor is to allow for fortnightly certificates from the SMMEs and for payment to the SMMEs to be effected within 7 days of certification. In order to achieve the goals of this policy and to ensure that the SMMEs are treated fairly and given every opportunity to advance their business whilst delivering a successful project, the Contractor is to note the following and provide for any cost that may be associated therewith.

1. The Contractor shall subcontract local SMME works to be determined, as feasible and in consultation with the Employers' Agent.
2. The Contractor will be expected to have clearly specified the programme dates to the SMME and these dates are to be included in the contractual agreement between the two parties. The Contractor is to monitor the SMME's progress against the programme and hold progress meetings with the SMME contractors where minutes are to be kept and signed off by both parties.
3. Before site establishment, the Contractor will provide each appointment letter and contractual agreement that the Contractor engages with for each SMME on this Project. The Agreement must include agreed work values agreed upon with the Contractor and SMME.
4. Before site establishment, the Contractor will provide the following for all SMMEs:
    a) SMME company registration
    b) SMME CIDB proof of registration.
5. The Contractor is to assess the skills of the SMME and provide the relevant support and training for the SMME to complete the works to programme, budget and specification. The Contractor will be expected to provide training to the SMME that will ensure that the SMME's staff is suitably trained to execute the works and that they receive sufficient relevant experience on the project.
6. The Contractor is responsible for safety compliance on the project and will assist the SMME Contractors in all aspects to achieve safety compliance, that will include:
    a) Assisting the SMME with developing their safety files, legal appointments, etc.
    b) Assisting the SMME with achieving safety on site.
    c) Having toolbox talks with the SMME Contractor's employees on a daily basis.
    d) Providing all safety equipment and signage.
    e) Providing safety training where necessary.
7. The Contractor is to provide all the necessary equipment for the timeous monitoring and the checking of the quality of works as carried out by the SMME. The Contractor will be expected to monitor the SMME's works for quality compliance and provide all the necessary support to the SMME in order to achieve quality requirements. The Contractor is to ensure that if the SMME's quality of works does not achieve specification, the Contractor will assist the SMME to achieve specification and not allow the works to continue until the quality requirements are achieved.

8. The Contractor is to generate monthly reports for the Johannesburg Water SOC. which includes the following:
    a) Per SMME: resources on the site, i.e. supervisors, labour, plant tools and equipment
    b) Per SMME: progress of works on site.
    c) Per SMME: quality control on site.
    d) SMME expenditure on the project versus target expenditure including payment progress
    e) Copies of minutes of the SMME and Contractor progress meetings.
    f) Concerns and improvements to be made.
    g) Items listed in PS 5.10
9. In the execution of the Subcontract Work, the Contractor shall ensure that the Sub-Contractor(s) comply with all relevant legislation and regulations including, but not confined to, the Occupational Health and Safety Act. The Contractor hereby indemnifies the Employer against any loss, damage, or claim for Subcontract Works arising out of the former's failure to comply with instructions issued to him in regard to these requirements.
10. The Contractor shall be required to adopt labour intense construction techniques where feasible to do so and in consultation with the Employers' Agent, with the proviso that the Employer's specific objectives regarding time and quality are not compromised. Maximisation of employment shall be the aim on this contract.
11. Together with their tenders, all Contractors are required to submit a comprehensive implementation plan clearly stating the labour content and number of jobs that shall be created. The employment of labour shall be reflected in a programme in sufficient details to enable the Employers' Agent to monitor and compare it with the implementation plan.
12. The Contractor shall be required to submit employment data on a monthly basis to the Employer's Agent.
13. Contractors are to also note that it is an explicit condition of this Contract that all unskilled labourers on the project are to be employed from the local community. The Contractor shall, in general, maximise the involvement of the local community.

PS 3.2.4 Retention Monies

The Employer will deduct Retention money for the overall works including the Subcontract Work at the percentage stated in the Contract Data.

PS 3.2.5 Resolution of Disputes

Should any dispute between the Contractor and the Subcontractor arise out of the provisions of the Subcontract, or the execution of the Subcontract Work, every effort shall be made by the Parties to resolve the matter themselves without the intervention of the Employer. The agreement signed between the contractor and sub-contractor should state dispute resolution procedure and address late payment issues should it arise.

PS 3.2.6 **Measurement and Payment**

Payment for the Contractor's obligations in respect of socio-economic requirements shall be made through the fixed charges, time related charges and provisional sum items. The payment shall include full compensation for local SMME mentoring, training, legislation compliance assistance, auditing in respect of compliance with and attainment of the socio-economic objective.

PS 3.3 Supply and Delivery of Equipment

A delivery period of 24 weeks, within which all materials and equipment must be delivered to the Site, is envisaged. If the Tenderer considers the delivery time of 24 weeks inadequate for particular items, he must specify the delivery period required for each item in the covering letter to this Contract Document.

The term "supply and deliver" of materials and equipment includes the purchase thereof from commercial sources, manufacturing thereof, factory corrosion protection, factory testing, provision of test certificates certifying compliance of the goods in accordance the Specifications, provision of drawings and details, provision of special tools and keys, the handling thereof and delivery to Site.

Tender rates must provide for all the costs by the Contractor to "supply and deliver".

No other payment for materials and equipment shall be considered other than that under the "supply and deliver" items in the Schedule of Quantities.

*PS 3.3.1 **Purchasing of Equipment***

The Contractor is required to purchase the materials and equipment necessary for the Contract at the earliest possible date thus limiting the effect of inflation. The Contractor must strive to keep the number of suppliers to a minimum.

Payment for materials and equipment shall only be effected if the Contractor can prove ownership of the items.

In the case that off-site storage is agreed by the Project Manager and the Employer then payment shall only be effected if the Contractor can prove ownership and that cession of ownership from the Contractor to the Employer takes place.

NOTE: It shall be the Contractors responsibility to ensure that the necessary warranties from the equipment suppliers is negotiated such that it only comes into effect once the Employer takes over the portion of the works relevant to that equipment which may only take place any time up to 15 months after delivery of the equipment.

PS 3.3.2 Guarantee of Equipment

It is an express condition of this Contract that the guarantee period on all equipment given by the suppliers to the Contractor shall only commence once the Employer takes over the works or a portion thereof.

PS 3.3.3 Particulars of Equipment Offered

Upon start of the Contract, the Contractor shall submit full details of all equipment to be supplied under the Contract, for acceptance by the Project Manager and prior to placing orders for the equipment. The Project Manager shall be able to determine, without reference to the suppliers, any information regarding delivery, drive, power consumption, efficiency, accuracy, etc. applicable under the specified range of operation conditions. The Project Manager may refuse acceptance of the equipment if it does not comply to the contract specifications or the Tender offer. Approval of equipment by the Project Manager does not relieve the Contractor from ensuring that the equipment comply with the requirements of the specifications or accepted Tender offer.

Technical information regarding medium voltage switchgear, motor control centres, busbar trunking, transformers, flow meters, valves, dimensions, etc. shall also be supplied.

Failure to comply with the above requirement may lead to the disqualification of the Tender submitted.

PS 4 CONSTRUCTION

PS 4.1 General Conditions and Applicable Standards

PS 4.1.1 General Conditions

The “Special Condition of Contract” to be read in conjunction with the “General Conditions of Contract for use Civil Engineering Works (GCC 2015, Third Edition).

PS 4.1.2 Applicable Standardized Specifications

The Standard Specifications for all associated civil work applicable to this Contract shall be:

SANS 1200AA	:	GENERAL (SMALL WORKS)
SANS 1200AB	:	EMPLOYER’S AGENT ’S OFFICE
SANS 1200C	:	SITE CLEARANCE
SANS 1200DA	:	EARTHWORKS (SMALL WORKS)
SANS 1200DB	:	EARTHWORKS (PIPE TRENCHES)
SANS 1200GA	:	CONCRETE (SMALL WORKS)
SANS 1200GE	:	PRECAST CONCRETE (STRUCTURAL)
SANS 1200H	:	STRUCTURAL STEELWORK
SANS 1200HA	:	STRUCTURAL STEELWORK (SUNDRY ITEMS)
SANS 1200L	:	MEDIUM PRESSURE PIPELINES
SANS 1200 LB	:	BEDDING (PIPES)

SANS 1200 LD : SEWERS
SANS 1200 LE : STORMWATER DRAINAGE
SANS 1200 MJ : SEGMENTED PAVING
SANS 1200 MK : KERBING AND CHANNELLING

Unless and to the extent that it is otherwise stated in the Contract Data, the scope of work or the specifications, the Contractor shall carry out the actions and arrange for the facilities as described in part 1 of SANS 1921..

Reference is made to certain provisions of:

SANS 1921-5 Construction and management requirements for works contracts: Earthworks activities which are to be performed by hand

SANS 1914-5 Targeted construction procurement: Participation of targeted labour

All the above specifications are not issued with this volume but are available at the Contractor's expense from: Standards South Africa,

Office Address:	Postal Address:	Telephone:	Telefax	Email:
1 Dr Lategan Road Groenkloof Pretoria	Private Bag X191 Pretoria 0001	(012) 428-6883	(012) 428-6928	sales@sabs.co.za

PS 4.1.3 Particular Specifications

The following Project and Particular Specifications forming part of the Contract have been written to cover phases or items of work involving a specialist type of operations or material to be encountered on this Contract and that are not adequately covered by the general specifications.

General	
G01	Colour Coding of Equipment
G02	Corrosion Specification

Civil	
PSAA	General (Small works)
PSAB	Employer's Agent 's Office
PSC	Site Clearance
PSDA	Earthworks (Small works)
PSDB	Earthworks (Pipe trenches)
PSGA	Concrete (Small works)
PSLB	Bedding (Pipes)
PSMJ	Segmented Paving
PQA	Brickwork, Blockwork and Plastering
PQB	Floor Finishes and Wall Tiling
PQF	Plumbing
PQH	Painting
PZA	Cleaning of Sewers
PZC	Closed Circuit Television (CCTV) Inspection of sewers
PZE	Trenchless Replacement of Existing Pipes

Mechanical Works	
PSX1.1	Screening channel equipment
PSX1.2	Wash water supply system
PSX1.3	Pumps, Valves and Pipework
PSX1.4	Pump station mechanical ancillaries
PSX2	General mechanical engineering
PSX3	Operation and maintenance manuals
PSX4	Machine mounts
PSX5	Grid floors, guard rails and ladders
PSX6	Nuts, bolts and fastening sets
G01	Colour Coding
G02	Corrosion protection specification
M01	Mechanical Screens
M08	Gearboxes
M16	Conveyor Equipment
M18	Mechanical Centrifugal pumps
M20	Mechanical Valves
M21	Mechanical pressure pipework
M34	Mechanical Sluice/Channel Gates, Adjustable weirs, Hand stops and Stop logs

Electrical Works	
PSY1	Particulars of required Electrical and Control work
PSY2	Project Specification: Van Wyksrust Pump Station MCC Installation
PSY3	Project Specification: Supply, Delivery, Installation, Testing and Commissioning of 630kVa 11/0.4kV ONAN Transformer
PSY4	Project Specification: Supply, Delivery, Installation, Testing and Commissioning of 11kV Switchgear
PSY5	Project Specification: Supply, Delivery, Installation, Testing and Commissioning of 11kv Ring Main Unit
PSY6	Project Specification: MV Cabling
PSY7	Project Specification: Medium Voltage Cable Installation
PSY8	Project Specification: 11kV Overhead Line Design and Installation head Of Works Plc
PSY9	Project Specification: LV Cabling
PSY10	Project Specification: Low Voltage Cable Installation
PSY11	Project Specification: Local Start/Stop Isolator Pushbutton Stations
PSY12	Project Specification: Earthing and Earth Bonding
PSY13	Project Specification: Supply, Delivery, Installation, Testing and Commissioning of 500kVa 400V Standby Generator
PSY14	Project Specification: Electrical/Automation Interface
PSY15	Project Specification: Supply of Battery Tripping Unit
PSY16	Project Specification: Supply of Motors
PSY17	Project Specification: Building Small Power and Lighting for the Van Wyksrust Pump Station
PSY18	Project Specification: Van Wyksrust Pump Station PLC
PSY19	Project Specification: Instrumentation
PSY20	Project Specification: Van Wyksrust Pump Station PLC Uninterruptible Power Supply (UPS)
PSY21	Project Specification: Field Junction Boxes for Instruments
PSY22	Project Specification: Instrumentation Cabling
PSY23	Project Specification: Data Communication and Networking
PSY24	Project Specification: Perimeter Intrusion Detection System
PSY25	Project Specification: Security Radio System Booster
PSY26	Project Specification: Documentation
PSY27	Project Specification: Training
E01	Electrical Motors
E02	Electrical Cable Racking
E03	Electrical Isolator Pushbutton station (Local Start/Stop) Equipment
E04	Electrical Low Voltage Switchboards and Motor Control Centres
E05	Electrical Low Voltage Power & Control Cables
E06	Electrical Medium and Low Voltage Cable Installation
E08	Electrical Wiring
E09	Electrical Building Installation
E11	General Electrical Earthing and Lightning Protection

Electrical Works	
E12	Electrical Medium Voltage Cables
E13	Electrical Medium Voltage Switchgear
E14	Electrical Supply and Installation of a Generator
E15	Electrical Transformers
E16	Electrical Uninterruptible Power Supply Unit
E17	Variable Speed Drive (VSD) Units
E19	Electrical 11kV Ring Main Unit
E20	Electrical Overhead Lines up to 22kV
E21	Electrical Lighting and Illumination
E23	Electrical Power Factor Correction
E24	Electrical Battery Tripping Unit
E26	Colour Coding of Equipment

Automation and Control Works	
Volume 3	Programmable Logic Controllers (PLC) Panels
Volume 5	Clean Power and Surge Protection
Volume 6	Cabling
Volume 7	Networking
Volume 8	Flow Measurement
Volume 9	Level Measurement
Volume 19	Field Junction Boxes and Panels
Volume 23	Pressure Measurement
Volume 25	Labelling

PS 4.2 Plant, Equipment and Materials

Where any of the operations or the movement of any of the construction vehicles or mobile construction equipment, or any combination of these activities, causes damage to the surface of an area normally open to the public, such surface shall be repaired as a matter of urgency.

Construction equipment shall be suitable for the production of the end result required under the conditions applicable to the site and shall conform to all relevant safety aspects required by the OHS Act.

Unless otherwise indicated in the Contract Documents, the Contractor shall provide all such plant and equipment complete with operating personnel, fuel and power as required.

If the Contractor fails, in the opinion of the Employer's Agent due to his own negligence, to enable the plant or equipment to be efficiently or fully utilised, the costs of under-utilisation of plant or equipment shall be borne by the Contractor to the extent determined by the Employer's Agent.

If a vehicle or item of construction equipment is required to operate on any public highway, road or street or on any private road or parking area that has been surfaced, it shall comply with the requirements of the applicable road traffic ordinance.

The Employer or the Employer's Agent shall have the right to refuse acceptance of any material or workmanship which is found to be unsound, damaged or contrary to the specification, or which is found to be defective or in any way contrary to the specification due to causes within the Contractor's control or responsibility. All material or construction rejected by the Employer's Agent shall be replaced or repaired by the Contractor at his own expense to the satisfaction of the Employer's Agent, whose decision with regard to this matter shall be binding on the Contractor.

All materials used shall be the best of their respective kinds and shall be suitable for working at the pressures and temperatures involved under all working conditions, without distortion or deterioration or the setting up of undue stresses in any part and without impairing the efficiency or reliability of the plant and the strength of its component parts. No welding, burning, filling or plugging of defective castings shall be permitted without the Employer's Agent approval in writing.

PS 4.3 Engagement of Labour

*PS 4.3.1 **Provision of a Temporary Workforce for the Contract***

The Contractor shall have regard for the stipulation laid down for all Labour-Intensive projects that he employs labour from the local community through the Labour Desk and/or CLO that has been established for this purpose.

The Labour Desk shall assist in identifying available local labour and, where available, semi-skilled labour as well as local sub-Contractors. The Labour Desk and/or CLO shall also assist and advise regarding conditions of employment, minimum wages, disputes and disciplinary procedures.

The workforce that is employed on Site shall consist of local labour where applicable, except for approved key staff, to the extent that is compatible with the requirements of Clause 4.11 of the General Conditions of Contract 2015 (3rd Edition).

The Occupational Health and Safety Act must be adhered to with reference to the safety of any employee irrespective of whether such employee is employed by the Contractor or by a local sub-contractor. Furthermore, a contract of employment must be signed between the Contractor and each of his employees and sub-contractors and between such sub-Contractors, and each of the sub-contractor's employees with clear reference to the following conditions:

- The minimum agreed wage rate per hour in respect of labourers;
- The agreed pay rate per unit of production where applicable;
- UIF and WCA payments;
- Minimum working hours per day;
- Start and end times of a daily shift;
- Lunch break times;

Company Policy regarding the following:

- Rain time
- No work no pay - sick, absent
- Disciplinary policy
- Grievance policy
- Method of payment
- Workers' clothing and safety equipment to be issued.
- The Contractor is required to show these items to the Employer's representative for approval before construction commences.

PS 4.3.2 Transportation of labourers

The labour employed on this contract shall be local labour from the nearest local community, where possible. Transportation should be arranged from their homes to the site.

PS 4.4 Existing Services

The Contractor shall make himself acquainted with all existing services such as stormwater drains, water mains, power lines, cables, gas pipelines, telephone and lighting poles, water meters, stopcock boxes, valve boxes, hydrants, air mains, trees, sewers, etc. before any excavation commences. Special care and due diligence shall be exercised when working adjacent to the abovementioned existing services. **Under no circumstance is the Contractor to alter or in any way interfere with existing works or underground services unless authorised by the Employer's Agent.**

Where, in the opinion of the Employer's Agent and if ordered by him, there is sufficient uncertainty as to the existence of, or the position or depth of any underground services, the Contractor shall first make use of specialist equipment such as ground penetrating radar before carrying out exploratory excavations using hand tools, in order to obtain the required information without causing damage. Exploratory excavations shall be carried out, refilled and reinstated in an approved manner as expeditiously as possible. Where existing works are of such a nature that the Employer's Agent may require them to be moved by the Contractor, the cost of such work will be paid for at scheduled rates or on a Day works basis.

The Contractor shall take adequate measures approved by the Employer's Agent to protect and prevent damage to existing works and services. The Contractor shall immediately notify the Works Manager as well as the Employer's Agent, of any damage caused to existing works and services. All cables and pipes shall be considered "live" unless confirmed otherwise by the relevant service authority. Any damages caused by the Contractor shall be repaired at the cost of the Contractor.

The existing treatment works must remain in operation during the execution of the contract. The Employer must have access to the treatment works at all times. If the work to be done requires the treatment works to be out of operation for a short period, prior arrangements must be made at least two weeks in advance with the Employer's Agent.

There are a number of points of connection to the existing structures, channels, pipelines, as well as electrical and control networks with the new works that should be regarded by

the Contractor as being tie-ins to live systems. The Contractor must give the Employer's Agent and the treatments works manager ten days written notice of any disruption to the normal plant operations and shall comply with all requirements of the treatment works manager in arranging the required connection.

PS 4.5 Site Establishment, Facilities Available and Required

The Contractor shall be required to establish all facilities, including, as necessary, construction camps, offices, stores, workshops and testing facilities required for the due and proper performance of the contract in the vicinity of the Works.

The Contractor shall supply and maintain adequate and suitable sheds for the storage of materials that might deteriorate if exposed to the weather. The Employer has no storage facilities available for use by the Contractor.

The Contractor shall, as specified in the specification data, provide, maintain and keep clean

a) office accommodation and equipment for use by the Employer and his agents,
b) air-conditioned boardroom for site meetings, and
c) all other facilities for all persons engaged in the works.

The Contractor shall provide and maintain all first-aid facilities required by law.

The Contractor shall provide, maintain, move to positions required and finally remove, proper latrines in compliance with the relevant Municipal Sanitation General By-laws. Ablution facilities must be properly screened and secluded from public view and their use shall be strictly enforced. The Contractor shall provide chemical toilets (minimum acceptable standard or other approved toilets). Soak-aways and septic tanks will not be allowed on the site. Temporary latrines must be sited so that they are within reasonable distance of the working place. Sufficient latrines must be provided having regard to the number of persons employed on the Works. All latrines shall be adequately ventilated, properly disinfected and kept in a clean and sanitary condition.

At the time of erecting the sheds and offices, the Contractor shall erect on or adjacent to the site, in a conspicuous place to be agreed upon by the Employer's Agent, contract name board as detailed in PSAB 3.1

On completion of the works, or when the facilities provided by the Contractor are no longer required, the Contractor shall remove them and clear away all surface indications of their presence.

The Contractor shall maintain the site in a clean, orderly and sanitary condition and shall take all the necessary steps and precautions to prevent the pollution on the surrounding area by his employees in any way. These steps and precautions shall be to the satisfaction of the Employer's Agent and Employers H&S and Environmental officers.

The Contractor will be required to obtain a cellular telephone for his own and Employer's Agent 's representative's use on the site.

PS 4.5.1 Water Supply for Construction Purposes

The Contractor shall make his own arrangements for the supply and storage of all water required for this contract. Only sources approved by the Employer's Agent shall be used. No direct payment will be made in respect of the procurement, transporting and distributing of water, however these costs shall be deemed to be covered by the Contractor's rates for the various other items of work in this contract requiring the use of water.

The Contractor shall make a connection to the existing potable water pipeline (at the existing Unit two Ferric tanks) within approximately 150 metres from the area available for the erection of site offices and stores. Any use of this connection shall be measured and the Contractor shall be held responsible for payment of the water measured at the current municipal rates. The connection to the existing network shall include an approved water meter (supplied by the Contractor), that will be used to measure the quantity of the water used by the Contractor. The Contractor shall also provide, at his own cost, all connections fittings, pipework, temporary plumbing and pumps necessary to distribute the water on Site.

Delivery pressures at the take-off points on the water main cannot be guaranteed.

The Employer does not guarantee continuity of supply and in such cases the Contractor shall make his own provision for standby supplies to maintain continuity. The variation of pressure in the water supply and or breakdown in the supply shall not be grounds for a Compensation Event.

Treated effluent for carrying out any water test will be made available by the Employer. Used effluent water must be returned and discharged as required by the Employer.

PS 4.5.2 Power Supply for Construction Purposes

The Contractor must make his own arrangements for any power he considers necessary. Should the Contractor utilise a portable power source, all electrical installations connected thereto shall comply with the provisions of the Mines, Works and Machinery Regulations and the Standard Regulations for the Wiring of Premises. No direct payment will be made to the Contractor. All costs in this respect shall be deemed to be covered by the various other items of work included under this contract.

PS 4.5.2.1 Supply of Electricity

The Contractor shall make a connection to an existing power distribution point (from the existing Unit 3 Thickened raw sludge MCC room) within approximately 300 metres from the area available for the erection of site offices and stores. Any use of this connection shall be measured and the Contractor shall be held responsible for payment of the amount measured at the current municipal rates. The connection to the existing network shall include an approved meter (supplied by the Contractor), that will be used to measure the power used by the Contractor. The Contractor shall also provide, at his own cost, all transformers, HT and LT cables required to distribute the power on site.

PS 4.5.2.1 Conditions of Supply

All installations connected to a supply of electricity provided by the Employer shall comply with the regulations. Failure to comply with the safety requirements may lead to immediate disconnection.

No connection shall be made to the permanent installation without the prior approval of the Employer's Agent 's and the treatments works manager.

No guarantees of power supply quality are given and power supply breaks of some duration may occur without warning. The Contractor shall make arrangements at his own expense to maintain continuity and quality of power. Any breakdown in power supply or reduction of power supply shall not be grounds for an extension of time or compensation.

PS 4.5.2.1 Application for Supply

A request for power shall be submitted to the treatment works manager via the Employer's Agent at least two weeks before a power supply is required.

PS 4.5.3 Lifting Equipment

Lifting equipment is not available on the site.

PS 4.5.4 Site Office, Store and Housing

The Employer shall make available a suitable area for the Contractor's site offices, workshops and stores. The area available may be shown on the construction drawings.

Although the security of the treatment works is outsourced by the Employer to a security firm, the Contractor shall make his own arrangements to secure the site facilities provided and the Contract works.

No employees, apart from a security guard, may be housed on the site of the treatment works.

Upon completion of the work in terms of this Contract, the Site must be cleared of all structures, concrete slabs and waste and excavations must be backfilled.

The Contractor must make the necessary arrangements with the Employer to obtain access for the vehicles and personnel he intends to employ on Site.

PS 4.5.5 ***Telephone Facilities***

The Contractor shall be responsible for arranging his own telephone facilities and shall be responsible for all costs relating thereto.

PS 4.6 Waste Disposal Site

The Contractor shall make his own arrangements for solid and liquid waste disposal. Disposal shall take place at an approved site/s.

PS 4.7 Site Usage

The Employer may make available, as part of or by reference in the Tender Documents, site data relating to hydrological and subsurface conditions relevant to the construction of the Works. The Employer does not guarantee that such site data is fully representative of

a) all information (as far as practicable) as to risks, contingencies and all other circumstances which may influence or affect the Tender

b) all conditions that may be encountered by the Contractor during the execution of the Works.

The Tenderer shall visit the Site of the Works and shall satisfy himself as to the means of access and all matters affecting the Works, including the extent to which mechanical plant can be used for executing the Works.

Visits to the site shall be at the sole risk of the Tenderer and the Employer shall not be liable for any loss or damage to persons or property as a result of or arising from the site inspection.

Access to the Site is by means of existing tarred and gravel roads through the main access gate, which is controlled by a security company appointed by Johannesburg Water. No restriction on access to the site of works shall be placed on persons or vehicles involved with the execution of the works. All traffic must be restricted to the maximum speed of 40 km/h and vehicles must be driven with extreme caution. The Contractor shall only make use of the site area as indicated on the drawings or as directed by the Employer's Agent.

The Contractor shall be required to report daily to management personnel of the treatment works.

The Contractor's staff shall be identified by either clothing or an identification tag, which shall be displayed when entering the Site of works.

Movement within the Site of works is restricted so as to avoid damage to the existing services, structures, trees and, where practical, to the gardens. The making good of any damage caused by non-observance of such restrictions shall be for the Contractor's account.

Access is to be made available to the Employer's employees to any portion of the Site whenever required.

PS 4.8 Permits and Wayleaves

Work permits shall be completed and shall be area specific.

As the Contract shall require the removal of equipment from the treatment works, the Contractor shall acquire permits as required by the Employer.

No wayleaves are envisaged under the Contract. The works called for under this Contract shall be executed within the works site boundaries.

Whatever import, transport, equipment certification permits etc. are necessary for the completion of the works to be carried out under this contract shall be the Contractor's responsibility to obtain.

PS 4.9 Alterations, Additions, Extensions and Modifications to Existing Works

The Contractor shall, within 20 working days or 10 % of the construction period after taking possession of the site (whichever is the lesser), satisfy himself that the dimensional accuracy, alignment, levels and setting out of existing structures or components thereof are compatible with the proposed works, and notify the Employer of any areas of dissatisfaction.

The Contractor shall, on becoming aware of a defect in existing works which will have an impact on the current works, notify the Employer of such a defect without delay.

The Contractor must ensure necessary resources and equipment and safety procedures are included in the tender price to carry out this work under the limitations and shall include the provision of temporary works.

All proposed interruptions and tie-ins to the existing treatment process shall be discussed and agreed with the Employer's Agent and the treatment works operational staff. Where necessary, detailed method statements will be required to be provided. Allow four weeks for approval of method statements.

PS 4.10 Inspection of Adjoining Structures, Services, Buildings and Properties

The Contractor shall, before commencing with works which have the potential to damage surrounding structures, services, buildings or property, arrange an inspection with the owners of such structures, services, buildings and property and representatives of local or controlling authorities, as appropriate, to determine the condition of buildings, structures, services, paved surfaces, roads, kerbs, perimeter walls, channels and the like, that the works could affect, and document their current condition in sufficient detail to enable disturbances or damage which might be caused by the works to be evaluated. The Contractor shall furnish the Employer with copies of all such documentation and shall be held responsible for any disturbance and damage to such structures, services, buildings and property arising from the performance of the contract.

It is envisaged that the Contract does not require the Contractor to perform inspections of adjoining properties.

PS 4.11 Survey Control and Setting Out of the Works

The methods of setting out employed by the Contractor shall be such that they ensure positive control.

The Contractor shall set out the works strictly according to the Employer's Agent construction drawings and/or site instructions and where relevant, prior to the ordering of equipment.

The Contractor shall provide permanent beacons marking the main setting out grid lines for all construction works and permanent level benchmarks. An item for this work has been provided in the Schedule of Quantities. The Employer shall not be held responsible if any of the beacons are removed as long as there are other beacons existing.

The Contractor shall take reasonable steps to preserve beacons and benchmarks they have provided.

All necessary pegs, profiles, site rails and other devices required for the setting out of works from the main beacons shall also be supplied and erected by the Contractor to the satisfaction of the Employer's Agent. The cost of these secondary setting out points shall be borne by the Contractor and shall be deemed to be included in his rates and prices.

The Contractor shall be responsible for the setting up, marking and executing the necessary activities for the construction and installation of relevant components of the work.

PS 5 MANAGEMENT OF THE WORKS

PS 5.1 Planning and Programming

PS 5.1.1 General

The preparation of a preliminary programme (with tender submission), an initial programme prior to commencement of works and up-to-date programmes during construction, at intervals as required is an essential requirement for the proper planning and management of the Contract. Programmes shall include supporting reports, resource levels (supervision, labour and Contractor's equipment) and method statements all in accordance with the Contract, and shall reflect, correctly and in the required detail, the progression of the Contract.

Such programmes, supporting reports and method statements shall be used by the Contractor to plan, execute and control the works, inter-alia:

- To monitor and record progress relative to Completion and Key Dates and for the preparation of schedules and graphs for progress meetings and reports;
- As the basis for scheduling the issuing by the Employer's Agent of construction drawings;
- As the basis for scheduling submissions by the Contractor to the Employer's Agent of his various plans, method statements, designs, drawings and other Contractor's documents;

- As the basis for scheduling quality inspections, monitoring at hold points and tests by the Employer's Agent and/or his designated Approved Inspection Authority as covered in more detail in the Specification;
- As a basis for planning and monitoring resource allocations;
- To assess interaction and co-ordination with subcontractors from various disciplines;
- As the basis for planning, scheduling and coordinating dry season construction activities;
- As the basis for planning and scheduling testing on the pipelines;
- As the basis for scheduling tests and inspections;
- To assess the need for formal revised programme as described the Conditions of Contract;
- To generate input to cost flow and cash flow forecasts/actuals; and
- As an indication of the timing of key events such as resources mobilisation and delivery to Site of plant and materials.

PS 5.1.2 Planning

The works under this project will be on a live, operational site and the proposed tenders must therefore take cognisance of project interface with operational activities, the alterations, additions, extensions and modifications to existing plant and tie-ins are to be considered in the detailed programme.

PS 5.1.3 Programmes

Preliminary Contract Programme

The Contractor shall have submitted a programme with his Tender to define the duration of the construction activities in connection with the various portions of the works. Such programme shall have been designated the "Preliminary Contract Programme", and in accordance with this clause and shall form the basis of the first programme pursuant to the Conditions of Contract.

The Preliminary Contract Programme shall be based on the Tenderer's own comprehensive plan, programme and resource usage. The Tenderer shall ensure that the Preliminary Contract Programme meets the requirements of the Contract. The Preliminary Programme shall be based on network logic diagrams showing all construction activities and logic relationships between activities.

The programme shall be computerised using planning software. Tenderers shall note that it will be a requirement that planning software be used in the Contract for all programme submissions to the Employer's Agent and the Employer.

The entire programme shall be suitable for future expansion for the development of the first programme required by the Conditions of Contract, inter alia through the addition of more detailed programme activities for construction of the works, for monitoring progress and changes therein, planning of critical activities and generation of progress and planning reports related to the execution of the works.

It is expected that this Contract will be awarded prior to April 2025 and the works must be operational by September 2026.

The Preliminary Contract Programme submission shall further include as a minimum:

- Activity listing.
- Logic linked bar chart (Gantt chart).
- A clearly defined critical path.

In relation to each activity the following minimum information shall be presented:

- Identification number (ID).
- Description.
- Duration in working days for each activity.
- Calendar.
- Bar indicating early start date, early finish date and duration.
- Linkages to and constraints by other activities.
- Activities shall include:
  - As separate activities: mobilisation, design, procurement, fabrication, delivery, installation, testing and ancillary works.
  - Construction of all structures and related facilities.
  - Work carried out by Subcontractors divided into separate activities.
- The programme shall include the following key dates:
  - Letter of Acceptance.
  - Starting date.
  - Submission of securities and Contractor's insurances.
  - Completion Date.
- The programme shall include the following significant dates:
  - Order and delivery of key plant and long lead items for the permanent works.
  - Mechanical and electrical installations.
  - Other relevant dates.

Initial Programme

An Initial programme in terms of the Conditions of Contract, complete with a cash flow budget for the execution of the works must be made available to the Employer's Agent for approval within 21 days after the receipt of the letter of acceptance. Aspects that shall require co-ordination with the Employer must be indicated clearly and provision must be made for it in the programme.

No work of a permanent nature may be executed before the programme has been approved by the Employer's Agent.

The Employer's Agent retains the right to alter, as circumstances may require, the sequence in which installation is to be executed. Such alterations shall only be made after consultation with all parties concerned.

In drawing up the programme, reference shall be made to clauses PS 3.2, PS 4.5, PS 5.3 and PS 5.7. Also allow for the stipulation that the new works as a whole must be fully operational for an uninterrupted period of 14 days before the equipment shall be considered as being successfully installed and commissioned (PS 5.7).

There may be numerous subcontractors at work on the same site. The Contractor will be required to adjust his programme to accommodate the access and working needs of subcontractors. The Contractor will be required to interface his programme with the programmes of the subcontractors in consultation with the Employer's Agent during the construction period.

The Contractor shall submit his first programme for approval by the Employer's Agent. Thereafter, the Contractor may not deviate from his proposed sequence of construction without the prior approval of the Employer's Agent. The programme submitted shall show the manner and order of all proposed work fronts. The Contract programme shall take account of the following:

- The Contractor shall appoint a project programmer/planner for liaison during the Contract.
- No deviation from the approved sequence of construction shall be accepted without prior written approval.
- The programme shall not be in the form of a bar chart only but shall be in MS project format complete with resources for each activity and show clearly the anticipated quantities of work to be performed each month, together with the anticipated cashflow for each month of the project.
- If, during the progress of the work, the quantities of work performed per month fall below those shown on the programme or if the sequence of operations is altered, or if the programme is deviated from in any other way, the Contractor shall, within one week after being notified by the Employer's Agent, submit a revised programme.
- If the programme is to be revised by reason of the Contractor falling behind his programme, he shall produce a revised programme showing the modifications to the original programme necessary to ensure completion of the works or any part thereof by the Completion Date.

PS 5.1.4 Programming

The Contractor shall provide and regularly (maximum monthly) update a Contract Programme. The programme shall at minimum contain:

PS 5.1.4.1 Time Scale (minimum):

i. Days, where the period does not exceed three months.

ii. Weeks, where the project period exceeds three months.

iii. Months, where the period does not exceed one year.

iv. Years, where the project period exceeds one year

PS 5.1.4.2 Tasks:

Where phases or stages are anticipated, this shall be the highest level of division and all tasks related to the successful accomplishment of that phase of the area shall be grouped. Resources allocation and task dependency shall be indicated.

PS 5.1.4.3 Start and Finish Dates:

All tasks shall have specific start and finish dates.

PS 5.1.4.4 Critical Path:

All tasks forming the programme line that will establish any delays in the overall Contract Period shall be clearly indicated and an indication of their sensitivity characteristics shall be provided.

PS 5.1.4.5 Progress Tracking:

The Contractor shall be required to periodically indicate progress per task graphically and on a percentage basis.

PS 5.1.4.6 Non-working Time:

South African public holidays, weekends and the local traditional annual builder's break shall be incorporated in the programme.

The Contractor shall submit to the Employer's Agent for his approval a detailed programme within the period stated in the Contract Data showing the order of procedure and method in which he proposes to carry out the work, his method of measurement of progress as well as the resources that will be allocated to each item or phase of the works. On a fortnightly basis throughout the contract, the Contractor shall submit the accepted programme marked to show actual progress. Quantities proposed for execution during each month must be shown. In addition, the anticipated cash-flow for the Contract, based upon these quantities, shall be shown as per prescribed format as provided by the Employer's Agent. The Contractor must include in his programme all necessary details pertaining to the lead-time required for the supply of materials.

The Contractor shall, whenever required by the Employer's Agent, furnish for his information particulars in writing of the Contractor's arrangements for the carrying out of the works and of the plant and temporary works, which the Contractor intends to supply, use or construct as the case may be. The submission to and approval by the Employer's Agent of such programme, or the furnishing of such particulars will not relieve the Contractor of any duties or responsibilities under the contract.

The Contractor will be expected to progress with the Works in accordance with the approved programme and shall not deviate from the order of execution shown in the programme without the prior approval of the Employer's Agent or his Representative. Should such approval be given, an adjusted programme shall be produced within seven (7) days and submitted to the Employer's Agent for evaluation.

The Contractor must carry out the work at a rate not less than that stated in his programme. Should the work not be executed with the diligence and labour specified, meant and intended in and by the terms of the contract, then the Employer shall institute the remedies under Clause 9.2 of the General Conditions of Contract 2015(3rd Edition).

PS 5.2 Sequences of the Works

The Contractor shall submit for approval to the Employer's Agent, within the time stated in the Contract Data, a detailed programme showing the order of, procedure and method in which he proposes to carry out the works and as well as his method of measurement of progress.

Details of certain mechanical equipment will have an influence on the final design of certain components and drawings thereof of some of the civil works to be constructed under this contract. The Contractor will, therefore, be required to take this into account in drawing up his programme.

The Contractor shall, whenever required by the Employer's Agent, furnish for his information particulars in writing of the Contractor's arrangements for the carrying out of the works and of the plant and temporary works that the Contractor intends to supply, use or construct as the case may be. The submission to and approval by the Employer's Agent of such programme, or the furnishing of such particulars will not relieve the Contractor of any of his duties or obligations under the contract.

The Tenderer shall submit with his tender separate management and supervisory organisation charts and supervisory and labour histograms as well as an estimated cash flow for the project.

Points for consideration, specific to the works are:

- Conducting the ground penetrating radar and topographical surveys to provide feedback for design finalisation. This work must be scheduled early in the programme to avoid design delaying the construction activities.

- Carrying out of certain construction activities outside of the rainy season where higher river flows may impact replacement of that portion of the existing pipes or investigations thereof, as well as ground water that may affect excavations and work within the pump station pump well.

- Security measures implementation (temporary and permanent) prior to commencement of construction activities to ensure safe and secure working conditions.
- Dealing with water (including groundwater diversion, drainage, etc) that may impact certain construction activities.
- Operational interruptions as a result of construction activities can be scheduled to coincide with each other, to minimise such.
- Where flow accommodation is required at the incoming sewer manhole feeding the pump station, these operations should be scheduled during low flow periods.
- See Part 4 - Site Information for additional information.

The Contractor shall obtain approval from the Employer's Agent at each stage to proceed with subsequent stages.

PS 5.3 Software Applications for Programming

The Contractor shall table an updated copy of the approved programme at each site meeting clearly indicating the actual progress versus the scheduled progress. It is recommended that MS Projects (considered acceptable software), MS Excel be used to prepare the construction programme schedule.

PS 5.4 Methods and Procedures

The Contractor is to supply detailed method statements during construction, complete with resources as to how he intends to complete the work on the project.

PS 5.4.1 Specific Construction Method Statement for Tender Evaluation

The following construction method statements, must form part of the tenderer's submission as it will be used during the technical evaluation process.

All pertinent information contained in the tender document is to be considered in developing such method statements.

In the event that a Tenderer is awarded this Contract, the Employer retains sole discretion as to whether the proposed methodology will be implemented during construction. The Employer may require that the Contractor change the methodology proposed, depending on the Employer's requirements.

The costs associated with the various installations, repairs, etc are deemed to be included in the Contractor's rates in the BoQ.

PS 5.4.1.1 Dealing with water; Installation of equipment within the existing Van Wyksrust channels and pump station.

- Given the incoming raw sewage to this facility, that cannot be stopped as well as the high water table in the vicinity, flow accommodation and dewatering will play a vital role.
- Some existing infrastructure is flooded or may contain a degree of sewage. Draining, disposing and cleaning operations are to be considered carefully.
- Provision for various required Inspections (such as for the Contractor, Subcontractor and Structural engineer) is to be planned for.
- Existing infrastructure status, properties, etc will require verification prior to certain activities taking place, and possible site limitations are to be accounted for.

PS 5.4.1.2 Dealing with water; Construction of the new Bypass facility.

- Given the incoming raw sewage to this facility, that cannot be stopped as well as the high water table in the vicinity, flow accommodation and dewatering will play a vital role.
- Some existing infrastructure is flooded or may contain a degree of sewage. Draining, disposing and cleaning operations are to be considered carefully.
- Provision for various required Inspections (such as for the Contractor, Subcontractor and Structural engineer) is to be planned for.
- Existing infrastructure status, properties, etc will require verification prior to certain activities taking place, and possible site limitations are to be accounted for.

PS 5.4.1.3 Refurbishment of the existing DN700 rising main

- In addition to the points raised above, it is important that all necessary Environmental requirements are adhered to, especially where work within the wetland and its' buffers are to be undertaken.

THE SITE-SPECIFIC METHOD STATEMENT MUST BE COMPLETED IN THE TEMPLATE LISTED BELOW. METHOD STATEMENTS THAT ARE PROVIDED IN ANY OTHER FORMAT WILL NOT BE CONSIDERED

A SITE-SPECIFIC METHOD STATEMENT	
1	**Approach Statement** (which illustrates an understanding of the project scope and addresses the major components listed below):
1.1	**Dealing with water; Installation of equipment within the existing Van Wyksrust channels and pump station.**
1.2	**Dealing with water; Construction of the new Bypass facility.**

1.3	**Refurbishment of the existing DN700 rising main**
1.4	**General (other items)**
2	**Quality Control Plan** (which includes all necessary standards to be used, resources available, and procedures to ensure quality; and addresses the major components listed below):
2.1	**Dealing with water; Installation of equipment within the existing Van Wyksrust channels and pump station.**

2.2	**Dealing with water; Construction of the new Bypass facility.**
2.3	**Refurbishment of the existing DN700 rising main**

2.4	**General (other items)**
3	**Health and Safety** (with respect to working at heights and confined spaces and addresses the major components listed below)
3.1	**Dealing with water; Installation of equipment within the existing Van Wyksrust channels and pump station.**
3.2	**Dealing with water; Construction of the new Bypass facility.**

3.3	**Refurbishment of the existing DN700 rising main**
3.4	**General (other items)**
4	**Project Programme/Schedule** (On ***MS Projects or any other Gantt Chart***, as an Annexure) outlining a critical path, durations of tasks/activities aligned to the scope of works, linkages of tasks, aligned to the contractual timelines, and including all contractual dates. See preliminary programme reference.

PS 5.5 Quality Plans and Control

The onus to produce work that conforms in quality and accuracy of detail to the requirements of the specifications and drawings rests with the Contractor, and the Contractor shall, at his own expense, institute a quality-control system and provide experienced personnel, together with all transport, instruments and equipment to ensure adequate supervision and positive control of the works at all times.

The cost of supervision and process control will be deemed to be included in the rates tendered for the related items of work.

On completion and submission of every part of the Works to the Employer's Agent for examination, the Contractor shall furnish the Employer's Agent with proof of quality in the form of a data pack containing measurements, levels and all compaction and hydraulic test results to indicate compliance with the scope of work.

Quality plans and the control shall be in accordance with the requirements of the Particular Specifications as compiled and included herein after and forming part of the Contract document. These shall be completed and inserted in the data books after commissioning.

PS 5.6 Other Contractors on Site

This contract entails civil, mechanical, electrical and control and instrumentation works and shall be awarded to one main contractor. The Contractor shall be responsible to co-ordinate all works of a civil, mechanical, electrical and control and instrumentation nature.

It is expected of the Contractor to schedule his work in such a way to ensure optimal completion of the work as a whole. The Employer's Agent retains the right to intervene and prescribe where and when work must be executed in order to ensure a well-coordinated Completion of the works as a whole.

Access is to be made available to employees of Johannesburg Water to any portion of the works whenever required for normal operation and maintenance of the existing treatment works.

The Employer's Agent shall, prior to the commencement date of the contract, determine the scope of work and the amount of work that is to be carried out by the nominated sub-Contractor(s). If applicable, the Contractor shall be expected to enter into a contract with the nominated sub-Contractor(s) in accordance with the requirements of Clause 4.4 of the General Conditions of Contract 2015 (3rd Edition).

The Contractor shall provide the following general attendance on nominated and selected sub-Contractors executing the works:

a) access to the site and places where the subcontracted work shall be carried out, including the reasonable use of any temporary personnel, hoists erected by the Contractor;

b) the provision of water and lighting and of single phase electric power to a position within 50 m of the place where the subcontracted work shall take place;

c) the provision of an area for the sub-Contractor to establish temporary facilities;

d) the use of erected scaffolding that belongs to the Contractor, in common use with others, while it remains erected;

e) the use of ablution facilities and the like; and

f) access to telecommunication facilities.

PS 5.7 Testing, Completions, Commissioning and Correction of Defects

The onus is on the Contractor to produce work that will conform in quality and in accuracy of detail to the requirements hereinafter specified. The Contractor shall clearly understand that it is not a duty of the Employer's Agent or his representative to act as foreman or surveyor on the Works.

The Contractor shall, at his own expense, provide an experienced Site Agent, foremen and surveyors together with all transport, instruments and equipment for supervising, checking and controlling the work.

The Contractor shall allow in his general inspections and tests and for the supply of all necessary equipment that may be required for these tests and/or inspections by the Employer's Agent. The Contractor shall make good any defects prior to commissioning of the works.

The act of passing any completed work for payment by the Employer's Agent shall not be construed as signifying approval or acceptance thereof. Failure on the part of the Employer's Agent to reject any defective work or material shall not in any way relieve the Contractor of his obligations under the Contract, nor prevent later rejection when such work or material is discovered. In this regard, it is emphasised that notwithstanding anything contained in this document, any tests that may have been carried out, any consent that may have been given, either directly or implied, and anything that may be construed to the contrary, the Contractor shall remain fully and solely accountable for the Works and for compliance with the specifications and the drawings.

The Contractor shall, when submitting any work to the Employer's Agent for examination, satisfy himself by testing, measurement and otherwise as may be necessary that the work does in fact meet with the requirements of the Specifications. This information shall be submitted with the Contractor's request for examination and the Employer's Agent shall decide on the number and type of tests, measurements, etc. required to enable him to judge the quality of the work. The submission of this information shall in no way diminish the authority of the Employer's Agent to conduct such tests as he may consider necessary in order to determine the quality of the work performed by the Contractor, nor will he be bound to take account of the Contractor's tests, measurements, etc. should he consider these to be either incorrect or not representative.

Quality control and completion tests shall be in accordance with the relevant standard and amended specifications and additional specifications.

The tendered rates shall include the cost of all control testing, and no additional claims shall be entertained in this respect. This includes the supply of all necessary equipment required for these tests and/or inspections by the Employer's Agent.

Should the control testing performed or arranged by the Contractor not meet the requirements of the specification, the Employer's Agent shall have the right to conduct all such testing at the Contractor's expense.

In such a case, the Employer's Agent shall be given at least 72 hours' notice when testing is required. No claims, however, shall be considered in respect of delays resulting from such testing.

Whenever the Employer's Agent conducts control testing on behalf of the Contractor, charges shall be levied. The Employer's Agent may, from time to time, carry out his own check tests on the work performed by the Contractor. Should such check tests show the Contractor's control testing to be such that the quality of the Contractor's work can be called into question, then the Employer's Agent may order further check tests to be carried out on work already completed by the Contractor.

All costs associated with such check tests shall be for the Contractor's account as shall the costs of any other check test whose results do not comply with the specification.

Where the Employer's Agent is required to witness certain control tests, such as the pressure testing of pipelines, and the results of such tests do not comply with the specifications, then charges will be levied against payments to the Contractor in order to recover the costs of the Employer's Agent's presence at the test.

The requirements of the Local Authority, insofar as their witnessing of tests, shall be adhered to.

The Contractor shall carry out sufficient tests to ensure that the contract requirements for all materials incorporated in the works are complied with. The Employer is at liberty to carry out such tests as he deems necessary to determine compliance with the contract requirements and will make available the results of all tests to the Contractor. The Contractor shall keep systematic records of the test results and all worksheets relating thereto.

Installation and Commissioning

The Contractor shall be responsible for co-ordinating all works of a civil, mechanical and electrical and control & instrumentation nature, all to the approval of the Employer's Agent. The time for achieving Practical Completion in the Contract Data make's provision for statutory or other holidays which may occur during that time.

The Contractor shall be responsible for commissioning the equipment which shall comprise putting it into operation, testing, calibration, proper adjustment of the equipment, and thoroughly running it. After the entire installation has been completed and the individual installations have been tested, the Contractor shall commission the equipment supplied and installed by him as required by the Employer's Agent. After the works for each section, as agreed with the Employer's Agent, has been put into operation, the Contractor shall operate the equipment installed under this contract for a continuous period of 14 successive days and simultaneously train the Employer's plant supervisors in the correct operation and maintenance thereof. Completion shall only be certified if all the equipment within a section has passed the 14-day continuous test run and the Employer's plant supervisors have been sufficiently trained to continue with the operation of the plant.

A Partial Certificate of Completion refers to equipment within a section having passed the 14-day continuous test run and the Employer's plant supervisors have been sufficiently trained to continue with the operation of the plant.

The term "installation and commissioning" of material and equipment shall include the on-site handling, on-site transport, positioning, erection, connection, anchoring, installation and protection thereof, as well as the successful completion of all the specified tests on completion as defined under PS 5.8 and the successful completion of the commissioning period, including the training of the Employees plant supervisors. The tendered rates shall cover all costs for installation and commissioning by the Contractor, including all cost of consumables, labour, erection gear, testing equipment, attendance, additional site visits and profit.

Section payments against each item in accordance with the progress of the work shall be made on a pro rata basis for up to seventy-five (75) percent of the amount tendered against each item on completion of installation and site testing, but with the 14-day continuous plant test pending.

No other payment for installation and commissioning of materials and equipment shall be considered other than that under the "installation and commissioning" items in the Schedule of Quantities.

Testing

General

The Contractor shall be responsible for the completed installation passing any tests specified or required by the relevant Local Authority or ACT. The Employer's Agent shall be entitled to be present at such test and the Contractor shall give the Employer's Agent reasonable notice of the dates of the test. Where test certificates are required in terms of any clause of the Specifications or ACT, such certificates shall be submitted to the Employer's Agent immediately after the relevant test have been completed and before the tested equipment is delivered, installed or commissioned as the case may be.

Before handing over the plant the Contractor must carry out tests as specified in detail in the various Sections. The entire cost of testing, including supply of test equipment must be borne by the Contractor and an adequate allowance for such tests must be made in the tendered price. The results of all performance tests shall be fully documented and copies in triplicate submitted to the Employer's Agent prior to final acceptance of the equipment and/or infrastructure.

The Completion Date will be taken as the date on which the relevant portion of the plant as a complete unit is commissioned or when all the performance tests, have been completed to the satisfaction of the Employer's Agent, whichever date is the later. The Employer will accept the plant in question on the completion date as herein defined.

Factory Tests

The Contractor shall carry out tests in accordance with the requirements of the recognised SANS, IEC or BS standards. Comprehensive details of the standards used and to which equipment applicable shall be supplied. Such additional tests in the manufacturer's "Works", which in the opinion of the Employer's Agent are necessary to determine that the Contract work complies with the requirements of the Specification, whether under test conditions or in normal service, may be called for at no additional cost to the Employer.

Tests on Site

All Site tests shall normally be carried out in the presence of, but always to the satisfaction of the Employer's Agent and at such times as he may reasonably require. The Contractor shall provide all the relevant test equipment and bear the costs of all testing to be done. All equipment must be tested to ascertain whether it performs its intended duties in a manner as specified.

Accepted Laboratories

Unless otherwise stated in a specification that forms part of this Contract, only the testing laboratories of the South African Bureau of Standards, the Council of Scientific and Industrial Research, the relevant Government Departments and Local Authorities shall be accepted as approved laboratories in which tests or design work required in terms of a specification may be carried out.

Methods of Testing

Unless otherwise prescribed in a specification that forms part of this Contract, all testing shall be carried out and interpreted in strict accordance with the methods specified in relevant SANS, IE or BS Specification(s).

Servicing

Without limiting in any way, the obligations or responsibilities of the Contractor for maintenance, the Contractor shall make regular quarterly visits to the plant during the maintenance period to supervise the maintenance of the plant. During these visits, he shall make all adjustments and do everything necessary to ensure the proper running of the plant. After each supervising visit to the Site, the Contractor shall submit to the Employer's Agent a report on: -

(a) The condition of the equipment and the servicing work carried out, and

(b) Any adjustments which may have been made.

The last servicing visit shall be carried out during the last week of the maintenance period during which visit the Contractor's representative shall carry out full checks on the equipment to ensure that the alignment, clearances and any other setting are correct, and he shall carry out any adjustments necessary. The maintenance period shall not terminate until the Employer's Agent is satisfied that the Contractor has finally checked the adjusted equipment.

Servicing shall be measured as scheduled by the number of visits.

The tendered rate shall exclude the cost of providing lubricants but shall cover the cost of servicing visits and operation as specified above.

PS 5.7.1 Inspection of Works by Local Authority

The Contractor shall afford inspectors from the Local Authority reasonable access to all parts of the site. The Employer's Agent in the presence of representatives of the Local Authority will generally undertake testing of the works. Accordingly, the Contractor shall notify the Employer's Agent at least 24 hours in advance as to when the various sections of work will be available for testing. The Employer's Agent may require the Contractor to submit a weekly schedule of times, based on his programme, that he envisages work to be available for testing.

PS 5.8 Recording of Weather and Abnormal Rainfall

If during the time for completion of the Works or any extension thereof should abnormal rainfall or wet conditions occur, then an extension of time in accordance with Clause 5.12 of The General Conditions of Contract 2015 (3rd Edition) hereof shall be granted by the Employer, calculated on the critical path method. It shall be applied as follows:

V = (Nw - Nn) + ((Rw - Rn)/X)

V	Extension of time in calendar days in respect of the calendar month under consideration.
Nw	Actual number of days during the calendar month on which a rainfall of Y mm or more has been recorded.
Nn	Average number of days, as derived from existing rainfall records, on which a rainfall of Y mm or more has been recorded for the calendar month.
R/0w	Actual rainfall in mm recorded for the calendar month under consideration.
Rn	Average rainfall in mm for the calendar month as derived from existing rainfall records.

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

The total extension of time shall be the algebraic sum of all monthly totals for the period under consideration, but if the total is negative the time for completion shall not be reduced due to subnormal rainfall. Extensions of time for part of a month to be calculated using pro rata values of Nn and Rn.

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

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

The following average rainfall figures are applicable:

MONTH	*Nn*	*Rn*	*MONTH*	*Nn*	*Rn*
January	4,6	124.9	July	0,1	3.2
February	3,0	104.3	August	0,1	5.9
March	3.2	96,2	September	0,8	24.0
April	1,4	39.3	October	2,2	70,9
May	0,3	13.2	November	3,5	100.7
June	0,1	5.2	December	3.7	111.8
YEARLY AVERAGE					699.5

Source of information: Weather Bureau, Department of Transport, Pretoria, for Sandton.

Y = 10 mm/24-hour day

X = 20 mm

A delay caused by inclement weather conditions will be regarded as a delay if, in the opinion of the Employer's Agent, all progress on an item or items of work on the critical part of the working programme of the Contractor has been brought to halt. Delays on working days only (based on a five day working week) will be taken into account for the extension of time, but the Contractor shall make provision in his programme of work for an expected delay of 15 (fifteen) working days caused by normal rainy weather, for which he will not receive any extension of time.

Daily records of rainfall and activities within the critical parts affected shall be kept by the Contractor and signed by the Employer's Agent 's representative on the site. For this, accurate rain gauging shall be taken at a suitable point on the site, and the Contractor shall, at his own expense, take all necessary precautions to ensure that unauthorised persons do not interfere with the rain gauges. Failure to produce signed copies of the above records on a daily basis to the Employer's Agent 's representative on the site after the event having occurred will be deemed to be in breach of this Clause and will not be admissible for purposes of seeking an extension of time.

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

PS 5.9 Format of Communications

The Contractor and Employer shall follow the communication protocol through the Employer's Agent and Contractor representatives. Communication media applicable shall be site meetings, telephone, letter and email.

All communication shall be in writing and any verbal agreements shall only be binding once confirmed and agreed to in writing. Communication by registered post or email is acceptable.

The Contractor and the Employer shall follow the correct communication protocol applicable to a normal civil engineering contract. The Contractor shall not put into effect any instructions received by him, other than through such protocol.

Should the Contractor be unclear in this regard, he shall obtain a ruling from the Employer's Agent.

Contractor to provide the following reporting on a monthly basis, Local resources reporting shall include but not be limited to;

a) Number (labourers, SMMEs and suppliers),

b) Labour:
- Process of recruitment, selection and appointment
- Name and surname
- Gender and age
- Certified copies of ID not validated older than three months.
- Proof of Compliance with COID Act, which will be valid for the duration of the Construction period.
- Contact details (address, telephone numbers and ward number)
- Contract signed
- Duration of appointment
- Commencement date
- Termination date
- Activity performed
- Classification (Skilled, semi-skilled or unskilled (labourer))
- Time or task rate
- Allocated Supervisor/foreman
- Health and Safety induction undergone
- Training provided
    i. Trainer details
    ii. Type of training
    iii. Duration of training
    iv. Cost of training
    v. Attendance register

- Performance rating (good, fair, poor)
  i. For training
  ii. Work execution
  iii. Health and safety awareness
- Additional training or supervision to be provided
- Proof of Monthly and cumulative payments, including salaries or wages
- UIF Returns
- Certified copy of the contractual agreement not validated older than three months.

c) SMMEs

- Process of recruitment, selection and appointment
- Company name
- Company contact details (address, telephone numbers and ward number)
- Company registration (also VAT and TAX)
- Company age (months or years)
- Type of company
- Company size (number of permanent employees)
- Name and surname of owner
- Owner contact details (address and telephone numbers and ward number)
- Gender, age and PDI status
- Contract signed
- Certified copies of ID
- Proof of Compliance with COID Act, which will be valid for the duration of the Construction period.
- Duration of appointment
  i. Commencement date
  ii. Termination date
- Resources provided (labour and/or plant and/or materials)
- Activity performed
- Classification
- Time or task rate
- Allocated Contractor Supervisor/foreman
- Health and Safety induction undergone
- Training provided
  i. Trainer details
  ii. Type of training
  iii. Duration of training
  iv. Cost of training
  v. Attendance register

- Performance rating (good, fair, poor)
  i. For training
  ii. Work execution
  iii. Health and safety awareness
- Additional training or supervision to be provided
- Proof of Monthly and cumulative payments , including salaries or wages
- UIF returns
- Certified copy of the contractual agreement not validated older than three months.

PS 5.10 Key Personnel

Tenderers shall state the details of the key personnel as required in the Tender returnable documents.

The same key personnel shall be deployed onto site on start of the works. The Contractor shall not change or withdraw from the Site of the works any of his erection and installation staff until such time as the plant has been completely erected and installed, except with the written consent of the Employer's Agent.

The Contractor is to provide the Curricula Vitae of key personnel to be employed on the project as well as the person's position and responsibilities within the project team.

The Contractor shall provide the following minimum key staff:
a) Contracts Manager
b) Site Agent;
c) Civil, Mechanical and Electrical and C&I Engineering Senior Foremen
d) Safety Officer/s;

The key role players involved or associated with the contract are listed below with references made to the General Conditions of Contract.

- The Employer (GCC, Clause 1.1.1.15)
- The Employer's Agent (GCC, Clause 1.1.1.16)
- The Employer's Agent 's Representative (GCC, Clause 1.1.1.17)
- The Contractor (GCC, Clause 1.1.1.9)
- The Contractor's Site Agent (GCC, Clause 4.12.2)
- Responsible person in terms of the OHAS Act

PS 5.11 Management Meetings

The Employer's Agent shall hold regular (monthly) site progress meetings with representatives of the Contractor, and the Employer. Minutes of such site meetings shall be kept and distributed by the Employer's Agent. Senior Contractor management staff attendance shall be compulsory. The Contractor must include for attending technical meetings fortnightly or as required by the Employer's Agent.

The Contractor shall be required to provide reporting project progress, resources (human, plant and equipment), community issues, environmental and health and safety aspects.

PS 5.12 Forms of Contract Administration

The Contractor shall maintain a file which shall contain project information related to project progress, resources (human, plant and equipment), community issues, environmental, health and safety aspects, penalties imposed, claims lodged and outcomes, disputes and resolutions, payment and variations.

The Employer shall provide all standard forms for the administration of the contract. The Contractor shall be required to correspond on the standardized format.

PS 5.13 Daily Records

In addition to records on rainfall and weather, labour, plant, and materials, a site diary (site activities, progress made, all material deliveries for the day, personnel employed on the Site of works, equipment delivered to site or storage and the number of man-hours for the week in question), site instruction book (both in triplicate) and safety documents are to be provided and maintained by the Contractor on site and updated daily.

Such records is the property of the Employer and shall be made available to the Employer or his representative within 24 hours from being requested to do so.

The site diary shall be submitted to the Employer's Agent representative for signature daily. These shall also be submitted to the Employer's Agent on completion of the contract.

PS 5.14 Bonds and Guarantees

The Contractor shall within the period stated in the Contract Specific Data, of this document, provide the Employer with a Surety Bond in the form of a On-Demand Bank Guarantee, Bank Transfer or a Guarantee from an approved Insurance Company to the satisfaction of the Employer in the form included in the Tender Documents. The Bank Guarantee shall be for an amount equal to ten per cent (10%) of the Tender Sum, for the due and punctual fulfilment and completion of all the Contractor's obligations under the Contract. No Extension of Time or any variation of the Contract nor the termination of the Contract by the Employer in terms of GCC 2015 hereof shall in any way impair or diminish or terminate any liability to the Employer under and by virtue of such Surety Bond. The cost of the Surety Bond to be so entered into, shall be at the expense in all respects of the Contractor; the Surety Bond to be released upon issue of the Employer's Agent's Certificate of Completion of the Works, unless otherwise stated in the Contract Data

Should the Contractor, when notified of the acceptance of his offer, fail to provide an approved Surety Bond within the stated period, then the Employer may, at his sole discretion:

(a) Grant the Contractor a further reasonable period in which to provide the bond; or

(b) Withdraw his acceptance of the tender, in which case the Contract shall be deemed to be void, but without prejudice to the Employer's rights to recover whatever damages he may have suffered by virtue of the Contractor's failure to fulfil his obligations.

PS 5.15 Payment Certificates

Measurements will be done continuously between the Employer's Agent's Representatives and the Contractor on dates and times agreed on. Dates must be arranged by these parties.

Monthly payment certificates shall be submitted by the Contractor in the format approved by the Employer's Agent. Payment for particular items scheduled shall conform to the payment clauses of the Project Specifications and that of the Particular Specifications.

The progress of the following items will be recorded hereunder:

- The Contractor will provide a certificate with quantities to the Employer's Agent before or on by the 20th day of each month every month.
- If any material on site is claimed, proof of ownership must be provided either by means of the necessary receipts or a letter from the supplier stating that ownership has been transferred to the Contractor upon delivery.
- After the payment certificate has been approved by Employer's Agent, the Contractor must issue a VAT invoice. The certificate will then be ready for handing in.
- The Contractor must familiarize themselves with the payment circle under Clause 6.10.4 of the General Conditions of Contract for Construction Works 2015.

PS 6 FEATURES REQUIRING SPECIAL ATTENTIONS

PS 6.1 Security

The Van Wyksrust pump station is an area of high priority given its somewhat remote location in relation to the rest of the works and has been subject to various acts of theft and vandalism. Mitigation strategies are essential to protect both the physical assets and the safety of personnel on site. It is preferred that this area be adequately secured prior to commencing and during, construction. This may include the construction and implementation of the permanent security measures closer to the start of the project, where this proves practical to do so.

The Contractor shall be responsible for the security of his personnel; materials and construction plant on and around the site of the Works and for the security of his camp, and the Employer in this regard will consider no claims. The Contractors' camp location is proposed as per the site layout. While the security measures for the camp is at the Contractors discretion, it is advised that the Contractor consider providing at least 2x security officers armed with Shot Guns/Pump Action, per shift and secured 24 hours a day.

Security measures during the construction period related to Van Wyksrust pump station is to include, as a minimum, at least 8x security officers armed with 8x rifles with 2 full magazines, 8x pistols/handguns with 2 full magazines, with bullet proof vests, per shift and secured 24 hours a day. 2x Tactical response officers (PSIRA Grade A), per shift with a tactical response patrol vehicle are also necessary. These vehicles must, have spotlights, be clearly marked and in roadworthy condition.

All Security Officers are to have valid, relevant firearm permits and Security Clearance (no criminal records). All Security Officers are to have valid PSIRA (Grade B) and Firearm Competency (for business purposes) certification.

A provisional item has been included in the Schedule of Quantities to cover additional ad-hoc security needs should the Employer's Agent deem this necessary. The Contractor shall also ensure that none of his activities on site compromise the safety and security of the treatment works, or adjacent properties. The Contractor shall liaise with the relevant authorities of these properties and provide security to their satisfaction. The Contractor shall also liaise with them for access to respective properties and for permission to set up the Contractor's camp. The daily access to arrangements to site shall be to the satisfaction of the relevant governing bodies of the properties concerned.

PS 6.2 Operation of Existing Infrastructure

Where the operation of existing infrastructure such as valves, penstocks, etc for temporary construction activities, flow accommodation, tie-ins and the like, a request for such shall be made to the Employer's Agent, for approval by the Works personnel.

PS 6.3 Community Liaison and Community Relations

The Contractor shall in consultation with the local ward councillor employ a full time Community Liaison Officer for the duration of the contract.

In all dealings with the community and workers employed from within the community, the Contractor shall take due cognizance of the character, culture and circumstances of the community involved and shall at all times use his/her best endeavours to avoid the development of disputes and to foster a spirit of co-operation and harmony towards the project.

The Contractor shall at all times, keep the Employer's Agent fully informed on all matters affecting the community and shall at all times maintain good public relations with the public. The Contractor shall at all times, keep the Employer's Agent fully informed of progress and planned interruption on all matters affecting the community.

PS 6.4 Investigations

PS 6.4.1 Surveys

Existing topographical survey information is available for some part of the Van Wyksrust pumpstation area and has informed some part of the design already.

Additional survey (Topographical and GPR) is required for all areas of work to be undertaken during this contract, including Substation C, the existing Van Wyksrust rising mains and the rising mains tie-in at the HoWs. It is advised that these investigations be done as upfront work to enable finalisation of designs related to this contract.

There are also parts of the existing works for future projects (not included in this contract) that requires investigation (Topographical and GPR surveys), such as the existing Van Wyksrust access road as well as its' culverts, the maturation dam feed pipe, the emergency dam, emergency dam pump station, emergency dam access road, specific electrical buildings, the elutriations building, Substation B and the final effluent pump station.

PS 6.4.2 Pipe Condition and Cathodic protection (CP) Assessments

Such investigations are required on all active pipes related to the Van Wyksrust pump station (2x DN700) as well as the nearby maturation dam feed pipe (1x DN1400). The pipes are currently not in use but may still be partially or totally full. It is advised that these investigations, or some part thereof be done as upfront work to enable finalisation of designs related to this contract. The scope will include current pipes condition (internal and external) and CP, investigation, and design and/or firm requirements by a specialist. The specialist for CP must be compliant with the JW standard for such. The implementation of the recommendations and/or design for the repair and replacement required for CP and related pipe refurbishment or replacement, will be concluded in a future project.

This specialised type of investigation, analysis and reporting is to be undertaken by a qualified service provider, compliant with the Employers' requirements.

PS 6.4.3 Geotechnical

A preliminary geotechnical investigation was conducted and found that there is a high water table (say between 2 and 2.6 m below current ground level) which will have an impact on construction related activities. The contractor is to make adequate provision for dealing with water (redirection, dewatering, isolation, etc) and any other unknown ground conditions that may influence methodology.

Subsoil drains, pumping of groundwater, isolation, etc. to allow for drier working conditions within the pumpstation, during construction of the bypass facility and other excavations should be provided for but additional temporary measures may also be required, at the discretion of the contractor.

In addition, a dolomite investigation is underway. The findings of this investigation will lead to a specific category classification and designation being allocated to the site, with certain related requirements and/or limitations. Such restrictions may affect the scope of work (extent of scope, methodologies and/or procedures) that is required to be undertaken by the contractor.

PS 6.4.4 Flow Logging

A provision sum has been included in the Schedule of Quantities for flow logging at manholes leading to the pump station. The information obtained will be used to for design confirmations and for future projects. Flow logging requirements will be directed during construction by the Employer's Agent.

PS 6.5 Existing Pipe Refurbishment

Provision has been made for refurbishment of one of the two existing DN700 rising mains as a priority with allowance for also repairing limited sections of the second DN700 rising main. The outcome and recommendations form the pipe condition assessment is necessary for finalisation of the scope necessary.

HDPE slip-lining has been identified as the preferred trenchless technology method for repairing the buried portions of this pipe.

The section of existing DN700 pipe to be replaced traverses the wetland, installed on existing concrete plinths. Care is to be taken during replacement of such pipes given the potential challenges of access over the river.

PS 6.6 Flow Accommodation

Certain construction activities, around the Van Wyksrust pump station facility will require diverting and/or isolation of incoming flow. The raw sewage enters the existing splitter chamber from an existing manhole upstream via a single pipe. The flow leaving the splitter chamber, does so through two pipes, one per existing channel.

This incoming flow may be diverted where work in the existing channels is to take place. This may be done at the splitter chamber itself and/or at the existing channel, including its overflow facility, where one channel may be isolated and the other remains open, to enable the incoming flow to overflow through one channel while work is being undertaken on the

other. The existing splitter chamber may have an existing recess in the concrete, on either side of one of the existing pipe entrances that may be used to install a precast member to isolate that pipe and its channel.

Where work is to be done on the downstream section of the channel (such as at the existing pump station sump or pump station basement), further isolation will be required on the downstream faces.

For work to be undertaken at the splitter chamber, this will require diversion of the incoming flow upstream (likely at the existing manhole) to ensure that the splitter chamber itself is isolated.

Given that the existing infrastructure is currently flooded, there is uncertainty regarding what the condition of the existing is and what construction methodologies may be possible.

The existing rising mains are currently not in use and will likely contain some portion of raw sewage. These pipes will require draining and cleaning prior to other construction activities. The discharge points of the pipes may be isolated by way of existing knife gate valves. It is possible that these pipes may be drained back to the Van Wyksrust pump station, by gravity, depending on the levels of the existing pipe. Further intervention will be required to fully drain the remaining volume of its contents and should be accounted for.

PS 6.7 Environmental Management

Various existing infrastructure and planned scope of work falls within Environmentally sensitive areas (within the 1:100 year flood line, wetland buffer zones and the wetland itself). It is imperative that the Contractor adheres to all the Environmental specifications and guidance (as outlined in PS 8).

PS 6.8 Structural and Building Work

Given that the existing Van Wyksrust channels and pump station basement is flooded, the integrity of these structures could not be verified prior to construction. Provision has been made in the document for addressing some possible defects but may only be finalised once these structures have been isolated, drained, cleaned and assessed by the Employers' agent and/or structural Engineer. Investigation of the structure may require the use of specialised technology and/or service providers. This should to be programmed as upfront work to allow adequate time for potential design updates and other relates tasks.

Where the extent of building work related to the pump station and Substation C are uncertain, this will be further investigated and workshopped during construction but provision has been made in the Schedule of Quantities for inclusion of such scope.

PS 6.9 Setting-Out Verification

The contractor shall satisfy themselves that the setting-out of the various scope of work, for construction and installation has been checked, especially prior to any permanent work being undertaken.

Allowance and co-ordination for the works to arrange for their waste collection service provider to do a “dry run” of their waste skips truck manoeuvrability should be made, once the setting out has been done for the new screenings’ facility and perimeter walls extent.

PS 6.10 Access

The current existing access road, from the northern side of the Van Wyksrust pump station, crossing the wetland, may prove challenging, especially during wet weather and/or high river conditions. An alternative, existing informal vehicle track on the west side of the Maturation dam, accessible from the R554, may be used as an informal access path to the pump station. Care and precautionary measures are to be considered where the use of this road is concerned as this is outside the current works enclosure.

PS 6.11 Schedule of Quantities for Mechanical, Electrical and C&I Work

The schedules for the electrical, control and instrumentation works differentiate between the supply and delivery of equipment and the installation and commissioning thereof so as to avoid delays in payment after equipment has been supplied and to improve the Contractor’s cash flow. The installation and commissioning items shall therefore not be paid for under materials on site.

It is an explicit requirement of the Contract that specialist contractors are engaged for the electrical, control and instrumentation works.

PS 6.12 Conditions and Procedures for Existing Services

The Contractor shall throughout the Contract take adequate precautions to protect all existing services from damage whether or not they have been pointed out to him. The Contractor shall as soon as practically possible inform the Employer’s Agent of any damages to services and shall not repair any such damage unless instructed to do so.

All cables and pipes shall be considered “live” unless confirmed otherwise by the relevant service authority.

PS 6.13 Additional Meetings

The costs of all additional meetings or inspections over and above the normal, that take place because of the Contractor not keeping to his program or because or due to the poor quality of his work shall be for the account of the Contractor and shall be deducted from the following month’s payment certificate. An amount of R 5 000.00 per meeting shall be paid by the Contractor to compensate for the travelling cost, time, etc. of both the Employer’s Agent and the Employer.

PS 6.14 Certificate of Completion

A Certificate of Completion of the works shall be issued after the successful commissioning of all equipment and in accordance with the Conditions of Contract. The twelve months defects liability period shall start on the date stated in the Certificate of Completion.

Guarantees shall be reduced or returned to the Contractor after issuing of the Certificate of Completion and retention monies shall be paid out after the defects liability period has elapsed. The Certificate of Completion shall not be issued until the documents required in

terms of this Contract have been lodged with and accepted as satisfactory by the Employer's Agent.

The issuing of the Certificate of Completion could be delayed if the equipment supplied under this contract cannot be commissioned. If the issuing of the Certificate of Completion is delayed for reasons beyond the Contractor's control, the Contractor shall be compensated for his expenses because of the time delay between the Completion of the works and the commissioning of the equipment. The rate tendered for the payment item for the postponement of the issuing of the Certificate of Completion must include for all the Contractor's expenses.

Measurement and Payment	Unit
Compulsory postponement of the issuing of the Certificate of Completion	Rate/day

PS 6.15 Foreign Exchange Risks

The provision of forward cover against foreign exchange fluctuations on the imported content of all equipment required under the contract might be required. In his Tender, the Tenderer must state the value of the imported content of each item and the applicable currencies and the exchange rates on which his tender was based.

The successful Tenderer might be required to take out forward cover on all foreign exchange transactions required in his tender for this contract, the rate applied shall be that ruling at the starting date of the Contract when that is stated in the Letter of Acceptance.

Amounts tendered shall be adjusted for foreign exchange variations up to the starting date of the Contract; any fluctuations after this date shall be for the Contractor's account.

PS 6.16 Tools and Spares

As part of the equipment supplied, the Contractor shall supply all special tools or keys required for adjustment to any parts of such equipment.

The Contractor shall supply such spares ordered by the Employer's Agent.

The cost of special tools and keys shall be covered by the tendered rate or price for the Supply and Delivery of the relevant equipment.

Payment for spares and standard spanners and cabinet(s) shall be made out of the Prime Cost Sum allowed in the Schedule of Quantities for such items. The Contractor's profit, administration and delivery charges shall be paid at the tendered percentage of the actual purchase price of the goods.

PS 6.17 Operation Manual

The Contractor must compile and provide three copies of a complete operation manual for the pump station, including the equipment provided. This manual shall contain comprehensive information as set out hereafter.

(a) Drawings of the pump station and equipment detailing all part numbers and materials.

(b) A complete spares list.

(c) A lubrication and maintenance schedule showing all maintenance and lubrication operations, their recommended frequency and the grades of lubricant required.

(d) A maintenance brochure describing all maintenance, adjustment and replacement procedures.

(e) Operating manual describing the automatic and manual operation of the equipment with performance curves where applicable.

(f) A manual detailing all dismantling and reassembly procedures.

(g) Maintenance procedure for corrosion protection painting systems.

(h) Complete Data book of the equipment on Completion of the Contract.

The Contractor shall amplify and amend such drafts until the Employer's Agent is satisfied that they shall fulfil the purpose of ensuring that the Employer's staff is adequately instructed to operate and maintain the works. Once the drafts have been approved by the Employer's Agent, the Contractor shall prepare three suitably bound copies and deliver them to the Employer's Agent.

The manuals shall be drawn up in English.

In addition to the above, the Contractor, and where necessary the suppliers of equipment, shall be required to instruct the works personnel in the proper and correct operation of the equipment installed for a maximum period of 1 day. The timing of this training shall be determined in consultation with the Employer and the Employer's Agent.

PS 6.18 General

PS 6.18.1 Abbreviations

Wherever abbreviations for published national Standard Specifications or named Standard Specifications are used, they shall be deemed to refer to the latest edition of the Specification concerned, including all amendments, published 30 days before the closing date for receipt of tenders. Typical abbreviations are:-

ASTM : American Society for Testing Materials
BS : British Standard
BSCP : British Standard Code of Practice
SANS : South African National Standards
SABS : South African Bureau of Standards
SIS : Standards Institute Sweden
IEC : International Electrotechnical Commission

PS 6.18.2 Metric Symbols

Symbols prescribed by the System Internationale (SI) are used in these Specifications.

PS 6.18.3 Definitions

OHS ACT : Occupational Health and Safety Act, 1993 (Act 85 of 1993), as amended and including any regulations made thereunder.

PS 6.18.4 SANS Standard

All materials used and the standards of workmanship employed for the execution of the works shall comply with the appropriate SANS Standard and or Code and if they do not carry the SANS mark, the Contractor shall obtain a certificate from SANS stating that the items comply with the appropriate SANS standard.

PS 6.19 Installation of Equipment

PS 6.19.1 Safety

The Contractor shall at all times observe proper and adequate safety precautions on the Site. Where adequate, safety precautions are not being observed, the Employer's Agent may order the Contractor to comply with minimum safety requirements at the Contractor's expense and compliance with such an order shall not absolve the Contractor from any of his responsibilities and obligations under the Contract and the Occupational Health and Safety Act.

PS 6.19.2 General

A skilled erector shall be in charge of the work at all times and any instructions and explanations which the Employer's Agent shall give to him, shall be deemed to have given the Contractor.

The work shall be neat and workmanlike true to line and level, plumb and in proper working order.

Where any item of plant is mounted on a frame or bed plate, packers of 10 mm minimum thickness machined to size shall be provided and fitted by the Contractor to ensure accurate alignment.

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

All cut edges shall be without burrs. Shims with wrinkles in the material shall not be permitted.

Only small lugs shall protrude after completion.

All equipment shall be properly assembled and mounted to avoid the setting up of initial stresses in the materials and to ensure perfectly free running of all moving parts.

PS 6.20 Work Outside Normal Working Hours

Should the Contractor wish to work outside normal working hours (Monday to Friday 07h00-17h00) he shall obtain permission from the Employer's Agent. This permission shall not be unreasonably withheld.

PS 6.21 Construction Impact on the Works

No additional impact is expected on the Works as the status of the Van Wyksrust pump station is currently "non-operational" and will remain so, until such time as the project is complete. During this time, any necessary tie-ins and installation of isolating penstocks, flow accommodation, etc. should take place.

The incoming flow to Van Wyksrust pump station would continue to be diverted to carry out the necessary improvements and repairs. Where diversion and/or blocking of flow is necessary, these are to be planned during low flow periods.

Components such as the existing sewer manhole, feed channels, overflow weirs and rising mains may have to be isolated or bypassed to enable construction and installation activities to take place.

Isolation, dewatering and cleaning of certain components are necessary for inspections and feedback thereof.

PS 7 HEALTH AND SAFETY SPECIFICATION FOR CONSTRUCTION WORK

The Occupational Health and Safety Specification of the Employer's is bound in Volume 3 of these contract documents. Volume 3 forms an integral part of the Contract Specification and, in particular, shall be a part of the HEALTH AND SAFETY SPECIFICATION FOR CONSTRUCTION WORK.

In terms of Construction Regulations 4 (1) (a) of the Occupational Health and Safety Act, Act No 85 of 1993, the Employer is required to compile an occupational health and safety specification for any intended project and to provide the specification to prospective tenderers.

The objective of this specification is to ensure that the principal Contractor entering into a contract with the Employer achieves and maintains an acceptable level of occupational health and safety performance.

The specification provides the requirements that the principal Contractor and other Contractors shall comply with in order to reduce the risks associated with the contract work, and that may lead to incidents causing injury and/or ill health, to a level as low as reasonably practicable and possible.

The Contractor, appointed by the Employer in terms of Regulation 4 (1) (c), is required to prepare an occupational health and safety plan.

This plan has to be prepared in terms of Regulation 5 (1) as well as the Employer's occupational health and safety specification. In terms of Regulation 4 (2), the Employer

and the principle Contractor are required to agree on the occupational health and safety plan before any work may commence.

The principal Contractor's health and safety plan has to follow the framework in Volume 3, as a minimum.

PS 7.1 Site Specific Health and Safety Issues

Tendering Contractors are to refer to Johannesburg Water's Health and Safety Specification (refer to Volume 3: OCCUPATIONAL HEALTH, SAFETY AND ENVIRONMENTAL SPECIFICATION AND ENIRONMENTAL MANAGEMENT PLAN).

PS 7.2 Barricading of Trenches

The Contractor shall ascertain himself of the nature, volume, stability, depth and possible safety risks of the excavations, before any decision with regards to the method of excavation is made.

Allowance for hand excavation has been made for the location of services. Extreme caution shall be taken when excavating for existing services and structures. Any damages and or repairs to the existing infrastructure will be for the Contractor's account.

The length of open excavation must at all times not exceed 100m

Adequately protected by a barrier or fence comprising fluorescent orange plastic netting of height at least 1 000mm and as close to the excavation as practicable; and

- Provided with notice boards marked "CLOSED" at each end of closed or partially closed roads,
- The barrier or fence (at least 1m high) shall be suitably wrapped with reflective red and white danger tape or provided with flashing orange lights, placed at 15m intervals along the barricading at night.
- Where the depth of an excavation or the nature of the material excavated renders the sides of the excavation liable to movement that might endanger the works or the workers engaged on the excavation,
- the sides of the excavation shall be supported by suitable timber or other sheeting adequately strutted and braced, all properly assembled and of sufficient strength and stiffness to prevent movement in the materials supported, or, alternatively,
- the slope of the excavated face or faces shall be reduced so that any danger to the works or workers is removed.

Any cavities formed by the fall of rock or earth due to rain, flooding, insufficient timbering or other causes, shall be adequately filled.

The Contractor shall so maintain borrow pits that they do not become a danger to persons or livestock.

Trenches may not be left open during the builder's holidays or for any shutdown period exceeding 5 calendar days. Should the Contractor not comply with this requirement without

the written approval of the Employer's Agent ; the Employer's Agent shall have the open trenches closed by others at the expense of the Contractor. Furthermore, all further opening-up of the backfilled excavation and dealing with the excavated material and subsequent making good will all be to the Contractor's cost.

PS 7.3 Operations Under Live Conditions

Prior to the execution of any operation under live conditions, such as flow accommodation of operational sewer pipes, the Contractor shall liaise with the Works and Employer's Agent , at least 4 working days in advance, in this regard

PS 8 ENVIRONMENTAL MANAGEMENT

Various existing infrastructure falls within Environmentally sensitive areas (within the 1:100 year floodline, wetland buffer zones and the wetland itself).

The scope of work for this contract triggers various environmental activities leading to authorisations and approvals by the authorities. Such applications have been attended to by the Employer and feedback from the authorities are currently outstanding.

Feedback may include additional remedial measures and conditions that may be attended to by the Contractor with the provisional sum included in the Schedule of Quantities.

Appointment of the Contractor and commencement of construction shall only take place once the necessary approvals from the authorities have been received.

The contractors' camp, storage and temporary facilities are limited to 300 m2 extent of vegetation clearance, where it may fall within the wetland buffer zone. A proposed area for the contractors' camp has been identified but is subject to confirmation prior to site establishment, by the Employer.

A 32 m buffer is assigned around the edges of the Klip River's channelled valley bottom

wetland and should be considered a "No-Go zone" for site establishment, vehicle movements and stockpiling activities.

The Contractor shall acquaint himself and his staff with the provisions of any potential EMP and applicable regulations, duties, obligations and prohibitions and shall accept responsibility for due compliance with the aforementioned. In the case of failure to comply with any requirements of any potential EMP, the Employer shall be entitled to employ and pay other persons to undertake any remedial work or measures to rectify any consequences or prevent possible consequences resulting from the non-compliance by the Contractor and all costs consequent thereto shall be borne by the Contractor and shall be recovered from him by the Employer. If it is not practical to rectify any consequence resulting from the non-compliance of the Contractor with the requirements of the EMP, the Employer will be entitled to impose a penalty on the Contractor which penalty shall be in relation to the expense which the Contractor would have incurred to comply. A generic EMP is attached in Volume 3.

PORTION 2: VARIATIONS AND ADDITIONS TO THE STANDARDISED SPECIFICATIONS

The following variations and additions to the SANS 1200 Standardized Specifications referred to in the last clause of Portion 1 apply to this Contract. The prefix PS indicates an amendment to SANS 1200. The letters and numbers following these prefixes respectively indicate the relevant Standardized Specification and clause numbers in SANS 1200.

PSAA: GENERAL (Small Works)
(Applicable to SABS 1200 AA – 1986)

PSAA 3 MATERIALS

PSAA 3.1 QUALITY AND SAMPLES

ADD TO THE SUBCLAUSE:

"No used or recycled material may be used in the Works unless expressly authorised by the Engineer.

All materials to be provided under this Contract shall bear the mark of the South African Bureau of Standards wherever such materials are the subject of a SABS standard.

Samples of concrete aggregates and pipe bedding material are to be delivered to an approved laboratory for analyses."

PSAA 4 PLANT

PSAA 4.1 CONTRACTOR'S OFFICE AND STORES (Refer SANS 1921-1 Clause 4.14)

ADD TO THE SUBCLAUSE:

"Neither housing nor shelters are available for the Contractor's employees, and the Contractor shall make his own arrangements to house his employees and transport them to site.

The Employer will place an area of ground at the disposal of the Contractor at the Ennerdale WwTW site to enable him to erect his site offices, workshops and stores. The temporary facilities and ablution facilities shall comply with the requirements of the Local Authority.

On completion of the Works or as soon as the Contractor’s facilities are no longer required the Contractor shall remove such facilities and clear away all surface indications of their presence. The site is to be rehabilitated as described elsewhere."

PSAA 5 CONSTRUCTION

PSAA 5.1 SURVEY

PSAA 5.1.2 Preservation and Replacement of Pegs subject to Land Survey Act (Refer SANS 1921-1 Clause 4.15)

ADD TO THE SUBCLAUSE:

"Before the commencement of construction work in the vicinity of boundaries, the Contractor, under the direction of the Engineer, shall search for plot pegs where boundaries have not been established by the erection of walls or fences and the Contractor shall compile a list of such pegs that are apparently in their correct positions. At the completion of the contract, the Contractor shall expose the pegs that were listed at the commencement of the construction and the Engineer will arrange for any such pegs that are missing to be replaced at the Contractor's expense.e
All plot boundary pegs shall be marked with fencing droppers which shall be painted.

As the construction of the Works may necessitate the removal and re-siting of certain survey beacons the Employer will make the necessary application to the Surveyor-General and, notwithstanding the provisions of Subclause 5.1.2 will meet the costs of the re-survey by a Land Surveyor of these servitude beacons in their new position.

The Employer will accordingly indemnify the Contractor against all costs implied in Subclause 5.1.2 in respect of those beacons which may have to be removed by the Contractor.

The Engineer will arrange for any pegs that are missing to be replaced at the Contractor's expense.

All survey reference marks shall be clearly marked and protected by the erection of three fencing standards."

ADD NEW ITEM

"PSAA 5.1.3 Topographical survey

An adequate number of survey points (spot shots) must be surveyed to ensure that the true topography and features of the surveyed area are accurately and correctly reflected when the data is plotted.

All topographical features such as banks, ditches, drains, natural water courses, existing infrastructure (structures, manholes, roads, tracks, cable markers, poles, overhead power lines, pipelines, houses, fences, etc) must be accurately surveyed and clearly annotated both on the drawings and as part of the electronic data. For existing structures, all significant features shall be surveyed (structure outline, top of wall, invert levels, floor levels, etc.). Prior to commencing work on site, the Employer's Agent may require certain special/specific key features to be included and if so these will be pointed out to the surveyor.

The surveyed data and information shall be suitable for plotting at a scale of 1 : 250 showing 0,5 m contours.
All survey should be undertaken according to the Hartebeesthoek94 datum with WGS84 as the reference ellipsoid and a Transverse Mercator projection about the closest odd-numbered line of longitude unless specific instructions are given to the contrary.
Each survey point should include a survey code, and a list of codes must be provided.
A coordinated DXF or DWG drawing file showing information must be provided.
A triangulated DTM is required with the preferred formats being AutoCAD DXF with 3D polylines for all triangles, as well as an ASCII XYZ file. The file should include the survey code for each point. Triangulation must take proper account of topographic features. Automatic triangulation is not acceptable.

All documents and data produced as a result of work performed on the project shall remain the property of the Employer and shall not be traded or made available to any third party without prior written consent of the Employer.

PSAA 5.2 PROTECTION OF UNDERGROUND SERVICES

DELETE THE TITLE AND REPLACE WITH THE FOLLOWING:

"PROTECTION OF VISIBLE AND UNDERGROUND SERVICES (Refer SANS 1921-1 Clause 4.17)"

PSAA 5.3 DEALING WITH WATER ON WORKS (Refer SANS 1921-1 Clause 4.16)

ADD TO THE SUBCLAUSE:

"For this purpose he shall provide, operate and maintain in sufficient quantity such pumping equipment, well points, pipes and other equipment as may be necessary. He shall also provide any sumps, furrows, cross-embankments, coffer-dams and other temporary works as may be necessary to minimise damage, inconvenience, or interference."

PSAA 5.4 SAFETY (Refer SANS 1921-1 Clause 4.18)

ADD TO THE SUBCLAUSE:

"All work and particularly work carried out in the proximity of buildings, bridges, tanks or other structures shall be carried out in conformance with the regulations framed under the Occupational Health and Safety Act, 1993 and the Minerals Act, Act 50 of 1991, including shoring where necessary, to ensure the safety of structures that are at risk.

The Contractor shall make available for the duration of the contract safety helmets, gumboots, shoes, and any other necessary safety equipment for sole use by the Engineer and his/her Representative(s)."

PSAA 6 TOLERANCES

PSAA 6.2 DEGREES OF ACCURACY

ADD TO THE SUBCLAUSE:

"Generally, Degree of Accuracy II shall be applicable to the whole of the Works, unless specified otherwise (refer specifically to PSDA 6 and PSGA 6)."

PSAA 7 TESTING

PSAA 7.2 APPROVED LABORATORIES

ADD TO THE SUBCLAUSE:

"The Contractor shall establish a testing laboratory equipped in such manner that it may be deemed by the Engineer to be an approved laboratory. Alternatively, he may use the services of an established testing laboratory which the Engineer has approved. The Engineer shall be given free access to the testing laboratory."

PSAA 8 MEASUREMENT AND PAYMENT

PSAA 8.5 PROVISIONAL SUMS, PRIME COST ITEMS, DAYWORK AND TEMPORARY WORKS

ADD NEW ITEMS:

PSAA 8.5.1 Temporary Works Dealing with Water on the Works ..... Unit: Sum

The tendered sum(s) shall cover the cost of providing, operating and maintaining the necessary equipment and other temporary works for dealing with groundwater and flow accommodation (such as isolating or diverting) where necessary to carry out construction activities without adversely affecting normal operating conditions.

PSAA 8.5.2 Daywork

a) Skilled labour ..... Unit: Rate/hr

b) Unskilled labour ..... Unit: Rate/hr

PSAA 8.5.3 Accredited Training ..... Unit: Provisional Sum

The training of locally sourced labour and upskilling of the community members as determined by the local councillor and approved by the Client, is to be inclusive of all related expenses.

PSAA 8.5.4 Ground penetrating survey ..... Unit: Sum

To investigate and determine the positions of existing services and/or potential obstructions and risks at the areas of work as defined in the Bill of quantities or as indicated on drawings; the tendered sum(s) shall be all inclusive.

PSAA 8.5.5 Topographical survey..... Unit: Sum"

"PSAA 8.7 NEW BEACONS ..... Unit: No

Supply and erect survey beacons as shown on the drawings.

The rate shall cover all costs of manufacture of the beacons, transporting to site, excavation, setting up of the beacons, backfilling and disposing of surplus material."

PSAB: ENGINEER'S OFFICE
(Applicable to SABS 1200 AB - 1986)

PSAB 2 INTERPRETATIONS

PSAB 2.1 (b) Supporting Specifications

Delete the Sub-Clause and substitute the following:

"b) SABS 1200 AA"

PSAB 2.3 Definitions

Delete the first two lines and substitute the following:

"For the purposes of this specification the definitions given in SABS 1200 AA shall apply:"

PSAB 3 MATERIALS

PSAB 3.1 Nameboards

In the 3rd line delete “South African Institution of Civil Engineers” and substitute with “Consulting Engineers South Africa”.

PSAB 3.2 Office Building(s)

Delete the first sentence and substitute the following:

"The Contractor shall supply and furnish one air-conditioned “Kwikjack” (6 m x 3 m) office for the use of the Engineer and his/her staff, and one air-conditioned “Kwikjack” (9 m x 3.4 m) conference facility for conducting meetings".

Add to the Sub-clause:

"In addition to the furnishings listed under sub-items (a) to (i), the following shall be provided and properly maintained:

(j) electrical installation to include a light and two 15 A plug points plus an adequately sized air conditioning unit (for heating and cooling) for each room, with minimum 1,5 kW capacity

(k) one refrigerator of at least 100 litre capacity

(l) one kettle of at least 2 litre capacity

(m) one microwave of at least 20 litre capacity with minimum output 700W

(n) one tea set comprising six cups and saucers, six teaspoons, one teapot, one sugar bowl and one milk jug

(o) covered parking for two vehicles

(p) un-covered parking space for two vehicles

(q) two “Barhold” or similar wall mounted racks each with 6 clamps suitable for hanging A0 sized drawings

(r) Desk lamp – Architect spring balanced swing arm type

(s) 8 additional chairs

(t) A white board of area 1,5 m^2 with a set of whiteboard marker pens

PSAB 3.3 Ownership

Add new Sub-Clause:

The ownership of all offices, furnishings and equipment, car ports, sanitary equipment, and all other items provided by the Contractor shall, when they are no longer required by the Engineer, revert to the Contractor upon written advice of the Engineer and shall be dismantled and removed from site.

All equipment listed above shall be delivered and maintained in good working order for the duration of the Contract.

The Contractor shall keep the equipment continuously insured against any loss, damage or breakage and he/she shall indemnify the Engineer, his staff and the Employer against any claims in this regard."

PSAB 4 PLANT

PSAB 4.1 Telephone

Delete the Sub-Clause and substitute the following:

"In addition to the fixed telephone line and at least 4G router including sim (with uncapped, unshaped high-speed internet data package) that the Contractor is to provide, the Engineer’s Representative and his/her staff will provide their own mobile phones."

PSAB 4.2 Survey Equipment (New Sub-Clause)

Add new Sub-Clause:

"The Contractor shall provide the following survey equipment on the Site from the commencement to the completion of the Works:

- One automatic reading Engineer’s level plus tripod
- Two tachometric staffs (5 m long, 1 cm graduations)
- Two steel-tipped ranging rods, each 2,5 m long
- One staff angle bubble
- One metal change-point for levelling
- One separate plumb-bob
- One spirit level (one metre long)
- One hammer (2 kg) with steel or wooden pegs as necessary
- One 50 m steel tape
- A 5,0 m and 10,0 m retractable steel tapes

The "Total Station" or tachometer, if required, will be shared by arrangement between the Contractor and the Engineer or his representative on Site. All other survey equipment shall be for the sole use of the Engineer's Representative and his staff. The Contractor shall keep the equipment continuously insured against any loss, damage, or breakage and he shall indemnify the Engineer and the Employer against any claims in this regard. Upon completion of the Works the survey equipment as listed above shall revert to the Contractor.

The Contractor shall maintain the equipment in good working order and keep it clean until the completion of the Works."

PSAB 4.3 Computer Equipment (New Sub-Clause)

Add new Sub-Clause:

"The Contractor shall provide a 23.6" (56cm) wide LED Monitor (1920x1080) or better complete with HDMI cable and an A3 printer/scanner/copier, of approved manufacture and of standard acceptable to the Engineer. The Contractor shall keep this equipment continuously and comprehensively insured and shall indemnify the Employer and the Engineer against any claims in this regard. The Contractor shall maintain this equipment in good working order until the completion of the Works, whereupon ownership of said hardware and software shall revert to the Contractor."a

PSAB 5 CONSTRUCTION

PSAB 5.2 Engineer's Office (Refer SANS 1921-1 Clause 4.14)

Add to the Sub-Clause:

"The toilet facilities provided for the sole use of the Engineer or his representative(s) shall be maintained in a hygienic and sanitary condition and shall be removed on completion of the Works. The facilities provided shall conform to the local health authority's requirements as applicable and the Contractor shall pay all sanitary fees and charges."

PSAB 5.4 Telephone

Add to the sub-clause:

"The Engineer's Representative and his staff will each pay their own mobile phone accounts and they will be reimbursed by the Contractor for those calls that are authorised as being project related. The amounts paid by the Contractor will be

recoverable from the Employer. A Sum has been included in the Bills of Quantities to cover these costs."

PSAB 5.5 Survey Assistants

Delete the first sentence and substitute the following:

"The Contractor shall make available to the Engineer two suitably educated labourers for use on and about the site on survey and other work directed by the Engineer at all reasonable times."

PSAB 5.6 Computer Equipment (New Sub-Clause)

"The Contractor shall ensure that adequate supplies of consumables (paper and ink cartridges) are available on site at all times. The amounts paid by the Contractor will be recoverable from the Employer – a Provisional Sum has been included in the Bills of Quantities to cover these costs."

PSAB 8 MEASUREMENT AND PAYMENT

PSAB 8.1 Scheduled Items

Delete the 1st sentence and substitute the following:

"Items will be scheduled in terms of Sub-Clauses 8.3.2 & 8.4.2 of SABS1200 AA."

PSAB 8.2.1 Fixed and Time-related Charges

Delete the 1st sentence and substitute the following:

"The terms of Sub-Clause 8.2 of SABS 1200 AA shall apply."

PSC : SITE CLEARANCE

(Applicable SABS 1200 C - 1980 as amended 1982)

PSC 3 MATERIALS

PSC 3.1 DISPOSAL OF MATERIAL

DELETE THE FIRST THREE SENTENCES "Material obtained ..... by the Engineer." AND REPLACE WITH:

"Material obtained from clearing must be disposed of offsite by the Contractor at his expense. Disposal of combustible material by burning will not be permitted. The Contractor will be held responsible for observing the by-laws and regulations of the local authority and for any injury to persons and damage to property caused by any fire starting on site, in his/her camp, or a fire started for any reason by his/her employees, regardless of whether such injury or damage is the direct or indirect result of such fire. The Contractor shall indemnify the Employer and the Employer\s Agent against all claims or damages arising from this source."

PSC 5 CONSTRUCTION

PSC 5.2 CUTTING OF TREES

PSC 5.2.3 Preservation of Trees

PSC 5.2.3.2 Individual trees

DELETE THE SECOND SENTENCE OF THE SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"The amount of the penalty payable by the Contractor for the removal or damage by him of a tree designated for preservation shall be R750 for each tree having a girth of less than 1 000 mm and R1500 for each tree having a girth of 1 000 mm or more."

PSC 5.3 CLEARING

ADD NEW SUBCLAUSES:

“PSC 5.3.1 Restoration of Fences

Where existing fencing is encroaching in the area of work, such fencing shall be removed prior to construction and re-erected to a condition no worse than that pertaining prior to the removal. For the period that the fence or wall is dismantled and not yet re-erected, the Contractor shall erect, at the end of each day’s operations, a temporary fence to close the gap in the existing fence or wall and shall maintain adequate security to prevent use of the temporary fence as a point of access by unauthorised persons.e

PSC 5.3.2 Temporary Fencing Closures

Where the construction activities are obstructed by an existing fence or wall, a section of fencing or wall not exceeding 10,0 m in length may be removed temporarily during construction and thereafter reinstated to a condition no worse than the original condition as soon as the works have been completed in the immediate vicinity of the fence. For the period while the existing fence or wall is dismantled, the Contractor shall erect, at the end of each day's operations, a temporary fence to close the gap in the existing fence or wall and shall maintain adequate security to prevent use of the temporary fence as a point of access by unauthorised persons.i

PSC 5.3.3 Demarcation Fencing

The Contractor shall also supply, install, and maintain, temporary fencing on all sides of the working area and around the perimeter of all additional working areas during construction for prevention of unauthorised access and shall remove on completion of the works. The fencing shall comprise 1,8 m high 2 mm diameter wire mesh fencing with a mesh spacing not exceeding 100 mm in both the vertical and horizontal directions and with intermediate posts and straining posts and straining wires according to supplier's recommendations. Chevron tape shall be interwoven in a zig zag pattern from the top to the bottom of the fence thereby clearly marking off the working areas.u
Gates shall be provided by the Contractor at all points as required for construction access purposes. The Contractor shall be held responsible for the control of access at these gates at all times, as well as to the worksite during removal and re-erection of fencing. No other opening in the fence shall be permitted and the Contractor shall be responsible for monitoring the fencing on a daily basis and repairing any such opening within the same day that it is detected. Notices in two official languages (English and isiZulu/Xhoza) shall be attached to the fence where appropriate to indicate that the site is for personnel employed on the Contract only and that unauthorised entry is forbidden.

PSC 5.3.4 Childproof Barrier

In proximity to residential areas, and wherever ordered, the Contractor shall provide and fix to the demarcation fencing described in PSC 5.3.3 above, approved and substantial plastic square mesh to act as an additional childproof barrier and shall remove it on the completion of the works."

PSC 5.4 GRUBBING

IN THE FOURTH LINE DELETE "200 mm" *AND REPLACE WITH* "300 mm".

PSC 5.6 CONSERVATION OF TOPSOIL

ADD TO THE SUBCLAUSE:

"All topsoil shall be conserved for later use by stockpiling clear of the working area."

PSC 5.8 DEMOLITION OF STRUCTURES

ADD NEW SUBCLAUSES:

"PSC 5.8.1 Removal and Re-Erection of Structures

Where the Contractor is directed to dismantle structures to facilitate construction and thereafter to re-erect the same structures, the structure shall be erected at the same location, or such other location as may be required by the owner within the same property, using the same or similar materials as those set aside when removing the structure. The acceptance of the work by the Engineer and certification for payment shall be subject to the Contractor submitting to the Engineer documentary evidence of the owner's satisfaction with the re-erected structure, the over-riding consideration being that it shall be in a condition no worse than that pertaining prior to its removal.t
The tendered rates shall include for the provision of a detailed photographic and written record of all of the affected structures before dismantling commences and following re-erection.

PSC 5.8.2 Demolition of Buildings or Structures

Where the Contractor is directed to demolish structures, the Contractor shall provide a Method Statement for the approval of the Engineer. Entering upon the premises for the purpose of the demolition shall not commence before the Contractor has received a release form, duly authorised by representatives of the Employer and the Engineer, in which any special conditions applicable to the demolition are documented."

PSC 8 MEASUREMENT AND PAYMENT

PSC 8.2 SCHEDULED ITEMS

PSC 8.2.10 Remove topsoil to nominal depth of 150 mm and stockpile

DELETE FROM THE SUBCLAUSE HEADING THE WORDS: "to nominal depth of 150 mm"

ADD TO SUBCLAUSE:

"All topsoil shall be conserved for later use by stockpiling clear of the working area."

ADD THE FOLLOWING PAYMENT ITEMS:

"PSC 8.2.11 Restoration of fences to servitude boundary .....Unit: m

Separate payment will be made for dealing with fences in the manner specified in PSC 5.3.1 above as scheduled.

PSC 8.2.12 Temporary fencing closures..... Unit: No

Separate payment will be made for dealing with fences in the manner specified in PSC 5.3.2 above including re-instatement as scheduled.

PSC 8.2.13 Removal and re-erection of structures ..... Unit: No

Separate payment will be made for removing and re-erecting structures in the manner specified in PSC 5.8.1 above as scheduled, including the costs of photographic and written records.

PSC 8.2.14 Demolition of buildings or structures .....Unit: m³

Separate payment will be made for demolishing structures in the manner specified in PSC 5.8.2 above as scheduled, including the cost of removal of rubble to an approved spoil site, backfilling any excavations and compacting to 90% modified AASHTO density and shaping the ground level in line with the natural terrain.

PSC 8.2.15 Demarcation fencing.....Unit: m

Payment will be made per linear metre of temporary fencing installed in the manner specified in PSC 5.3.3 above, and the rate shall include for maintaining such fencing in good condition, including daily surveillance and repair, throughout the duration of construction and removal on completion of the works.

PSC 8.2.16 Childproof barrier.....Unit: m

Separate payment will be made as an extra-over for the installation of plastic mesh on the demarcation fencing to provide a childproof barrier in the manner specified in PSC 5.3.4 above and the rate shall include for maintaining such barrier in good condition throughout the duration of construction so as to serve its intended purpose and removal on completion of the works."

PSC 8.2.17 Remove existing precast kerbing and/or channelling:

a) To stacking area for reuse:
   i) Barrier Kerbs ..... **Unit: m**
   ii) Combination mountable kerb and channel..... **Unit: m**

b) To approved dump site:
   i) Barrier Kerbs ..... **Unit: m**
   ii) Combination mountable kerb and channel..... **Unit: m**

The rate in respect of (a) shall include full compensation for all plant, labour, materials, transport and other incidentals required for the careful removal of existing kerbing and/or channelling and the cleaning and stacking thereof in temporary sites agreed with the Engineer.

The rate shall also include full compensation for the extra care and diligence required to remove the units without damage. Only units removed on the instructions of the Engineer will be measured for payment.

The rate in respect of (b) shall include full compensation for all plant, labour, materials, transport and other incidentals required for the marking and removal of damaged kerbing and/or channelling and the disposal thereof in an approved dump site".

PSC 8.2.18 Remove existing concrete block paving:

a) To temporary sites for reuse **.....Unit: m²**

b) To dump in approved site **.....Unit: m²**

The rate in respect of (a) shall include full compensation for all plant, labour, materials, transport and other incidentals required for the careful removal of existing concrete block paving and the cleaning and stacking thereof at temporary sites agreed with the Engineer.

The rate shall also include full compensation for the extra care and diligence required to remove the units without damage. Only units removed on the instructions of the Engineer will be measured for payment.

The rate in respect of (b) shall include full compensation for all plant, labour, materials, transport and other incidentals required for the marking and removal of existing concrete block paving and the disposal thereof in an approved dump site. Should the existing base be damaged by the Contractor's operations during the removal process, it shall be repaired to the Engineer's satisfaction at the Contractor's own cost".

PSDA: EARTHWORKS (SMALL WORKS)
(Applicable to SABS 1200 DA – 1988 (as amended 1990))

PSDA 2 INTERPRETATIONS

PSDA 2.3 DEFINITIONS

DELETE THE SENTENCE FOLLOWING THE WORDS "Restricted excavation." *AND REPLACE WITH*:

"An excavation so restricted in area or width as to preclude removal of material by excavating machinery used for bulk excavation measured in terms of Subclause 8.3.1(b). Restricted excavation may be carried out by smaller machinery or by hand, as selected by the Contractor. The extent of restricted excavation shall be as scheduled and/or shown on the drawings; all other excavation shall be regarded as bulk excavation."

PSDA 3 MATERIALS

PSDA 3.1 CLASSIFICATION FOR EXCAVATION PURPOSES

PSDA 3.1.1 Method of Classifying

DELETE THE FIRST PARAGRAPH AND REPLACE WITH:

"The Contractor may use any method he chooses to excavate, subject to the requirements of the project specifications, but his chosen method of excavation shall not determine the classification of the excavation."

PSDA 3.2 EMBANKMENTS AND BACKFILL

PSDA 3.2.1 General

ADD THE FOLLOWING:

“Embankment material shall be compacted to 90% modified AASHTO density.”

ADD NEW SUBCLAUSE:

“PSDA 3.3 EMBANKMENTS

Sufficient material arising from excavations for structures, foundations, footings and the like and which is suitable for forming embankments and backfilling against finished structures shall be temporarily stockpiled in the vicinity of the structures. All other material from the excavations shall be disposed of as directed by the Engineer."

PSDA 4 PLANT

ADD NEW SUBCLAUSES:

"PSDA 4.3 COMPACTION PLANT

Where plant is used for applying the dynamic load, controlling the moisture content and grading or mixing, the plant shall be capable of achieving the compaction specified using the material available for the construction of the Works.

PSDA 4.4 RESTRICTION ON USE OF PLANT

Where the Contractor finds it impractical to use mechanical plant for excavation or to complete portions of the work due to restrictions caused by difficult access or the presence of existing structures, pipelines or services shown on the tender drawings, the Contractor shall satisfy himself as to the alternative requirements when entering rates against the appropriate items in the Bill of Quantities as no claim for extra payment based on the inability to use plant in such circumstances will be considered...**PSDA 4.5 VIBRATION LOADINGS FROM USE OF PLANT**

The onus will be on the Contractor, when proposing to use heavy plant or equipment to complete work in close proximity to existing structures, pipelines or services, to determine the effect of the vibration loading from the plant or equipment on the supporting ground or foundation and the structure, pipeline or service and take all necessary steps to ensure that the stability or integrity of the element concerned is not compromised by the particular selection and use of plant or equipment.

Any damages caused to existing elements directly or indirectly arising out of the use of plant and equipment in close proximity shall be made good, to the satisfaction of the Engineer by the Contractor at his own expense."

PSDA 5 CONSTRUCTION

PSDA 5.1 PRECAUTIONS

PSDA 5.1.1 Safety

PSDA 5.1.1.1 Barricading and lighting (Refer SANS 1921-1 Clause 4.18.2 and 4.18.3)

DELETE THE SUBCLAUSE AND REPLACE WITH:

"Without limiting any obligation which the Contractor may have in terms of any Act, Ordinance or other legislation, the Contractor shall ensure that all excavations which are accessible to the public or which are adjacent to a public road or thoroughfare, or by which the safety of persons may be endangered are protected as set out in the General Safety Regulations of the Occupational Health and Safety Act, 1993 and that watchmen are employed to ensure that barricades, barriers and lights are effective at all times.a

Trench excavations shall be protected by means of at least two horizontal double sided 'red/white' chevron tapes approved by the Engineer. The tapes shall be stretched tightly between supports along both sides and ends of the excavation at levels approximately 0,45 m and 1,12 m above the ground. The supports shall consist of poles or iron standards securely planted in solid ground at not more than 10 m centres so as to enclose the spoil and the excavations.

Bridges for vehicles and/or pedestrians shall be provided along the route of the work as and where may be considered necessary by the Engineer. They shall consist of a number of suitably sized steel plates laid across open excavated trenches. They shall be protected on each side by a stout two rail timber safety barrier, at least 1 m high, consisting of 150 x 75 mm timber verticals set firmly into the ground, 75 mm x 50 mm rails securely fastened to them. At least 4 lamps or reflective markers must be provided at each crossing.p
Where construction is in, or across, public roads the barricades or barriers and temporary road signs shall be erected. All such signs and positioning thereof shall comply with the requirements set out in Road Signs Note 13 read in conjunction with the SA Road Traffic Signs Manual."

PSDA 5.1.1.2 Safeguarding of excavations (Refer SANS 1921-1 Clause 4.18.3)

IN SUBCLAUSE (a) *DELETE THE WORDS* "Machinery and Occupational Safety Act" *IN THE THIRD AND FOURTH LINES AND REPLACE WITH* "regulations to the Occupational Health and Safety Act, 1993."

PSDA 5.1.1.3 Explosives (Refer SANS 1921-1 Clause 4.7)

ADD NEW SUBSUBCLAUSES:

"(a) Notwithstanding Subclause 5.1.1.3, the Engineer shall be notified at least 48 hours beforehand of the Contractor's intention to use explosives on site.

It shall be incumbent on the Contractor to make himself aware of the restrictions to blasting imposed by electric transmission or telephonic lines and other similar services. Where the presence and location of electric transmission or telephonic lines, etc, are known or are shown on the Engineer's drawing at tender stage; the Contractor must make allowance in his rates and programmes for restrictions and delays which may result from restrictions imposed by the authorities.

(b) Generally, the Contractor will be permitted to use explosives for breaking up rock and hard material during excavations, for demolishing existing structures and for such other purposes where it may normally be required, subject to the following conditions:

(i) The Engineer or Inspector of Explosives shall have the power to prohibit the use of explosives in cases where in his opinion, the risk of injury or damage to persons, property or adjoining structures is too high. Such action by the Engineer shall not entitle the Contractor to any additional payment for having to resort to other less economical methods of construction unless otherwise provided in the Contract Data or Bill of Quantities.

(ii) Should blasting be necessary, the Contractor shall take every precaution to protect the Works and persons, animals and property in the vicinity of the site. The Contractor will be held responsible for any injury or damage caused by any blasting operations and shall make good such damage at his own expense.

(iii) The requirements for the Explosives Regulations Act (Act 26 of 1956) and the requirements of the Inspector of Explosives shall be complied with. In addition, where applicable, the requirements of Chapter 9 of the Regulations published in terms of the Mines and Works Act (Act 27 of 1956) and the requirements of the Government Mining Engineer shall be complied with.

(iv) A copy of each blasting permit issued to workmen, and of each permit issued to the Contractor to cover the purchase, storage and transport of explosives, shall be handed to the Engineer. The Contractor shall grant the Engineer access to all records maintained for the Inspector of Explosives or the Government Mining Engineer, as the case may be.

(v) Before any blasting is undertaken, the Contractor, together with the Engineer shall examine and measure up any buildings, houses or structures in the vicinity of the proposed blasting and establish and record together with the owners thereof the extent of cracking or damage that may exist before commencement of blasting operations. It is advised that a photographic record will be required of neighbouring structures before blasting commences. These structures will be pointed out by the Engineer. It shall be the responsibility of the Contractor to make good at his own expense any further damage to such houses, buildings or structures which is a result of the blasting.

(vi) Where there is reasonable danger of damage to power and telephone lines or any other property, the Contractor shall suitably adapt his methods of blasting, the size of the charges and use adequate protective measures such as cover blasting in order to limit the risk of damage as far as possible.

(vii) When blasting to specified profiles, the Contractor shall so arrange the holes and charges that the resulting exposed surfaces are as sound as the nature of the material permits. The Contractor shall make good at his own expense any additional excavation necessitated by the shattering of rock in excess of any overbreak allowance specified in the Specification Data or in any other specification or given on a drawing."

ADD NEW SUBCLAUSES:

"PSDA 5.1.1.4 Limitations for Blasting

(a) Approval of methods and keeping of records

No blasting work may be carried out prior to the Engineer's approval being given in writing.

Prior to starting any drilling for the first section of blasting, the Contractor shall submit for approval to the Engineer, details of the proposed overall methods of blasting that will be used on site, including spacing, depth and pattern of holes, charging levels (kg/m^3), spacing and positioning of relays, method of blast initiation, precautions to prevent 'fly rock', maximum charge per relay, traffic arrangements during blasting, and any other details he may consider relevant. These details shall be submitted in writing and supported with sketches at least 7 days before the commencement of drilling and blasting.

The Engineer will evaluate these details in relation to the given limitations and prior to giving his approval, will indicate to the Contractor any changes that may possibly be needed to comply with the limitations.

For all subsequent blasts, the Contractor shall, at least 24 hours beforehand, notify the Engineer of the intention to blast and at the same time shall note if any changes will be made relative to the approved method.

The Engineer reserves the right to order the Contractor to modify his method of drilling and blasting, or to employ reduced blasting, without thereby invalidating the Contract. The Contractor shall have no claim for extra payment, over and above his tendered rates, due to his being ordered to use such a different method of drilling or blasting or reduced charges, regardless of any prior approval by the Engineer of any previous method.

After every blast, the Contractor shall, within 24 hours, submit to the Engineer details of the actual total mass of explosives used, the approximate volume of material loosened and the maximum simultaneous mass of explosives detonated (maximum charge per relay).

Notwithstanding any approval given by the Engineer, the Contractor shall at all times be responsible for the safety of the Works, persons, animals and property in the vicinity of the Site during blasting operations.

(b) Vibrations

Blasting vibrations are caused by the transmission of the shock wave from the explosion charge through the material being blasted. This shock wave could cause damage to structures in the vicinity of the blasting if the vibrations are not limited to acceptable levels. Damage to structures is closely associated with peak

particle velocity of the ground vibrations in the vicinity of the structure. Advisable maximum levels for peak particle velocity are given in Table 2.

Table 2: Maximum Particle Velocities (Vibration)

Maximum Peak Particle Velocity (mm/s)	Effect on People and Buildings
0,5	Threshold of human perception unlikely to cause damage of any type
5	Limit for blasting adjacent to historical monuments
25	Limit for blasting near private dwellings in order to reduce disturbance to residents to a minimum
50	Limit for blasting adjacent to residential structures on good foundations
84	Limit for property owned by concern doing the blasting (i.e. minor plaster cracks acceptable)
120	Recommended maximum level for blasting adjacent to sturdy reinforced concrete structures

The peak particle velocity V is related to the distance D from the blast and the maximum mass of explosive E instantaneously detonated (maximum charge per relay) by the general equation:

$$V = \left(\frac{k}{D}\right)^{m} x\, E^{n}$$

where k, m and n are constants for a particular set of circumstances. V is in mm/s, D is in metres and E is in kilograms. Experimentation has shown that n = 0,5 but k and m have to be determined for each site by means of vibration measurements. However, blasting can be safely conducted without vibration measurements or expert advice if the following relationship is used:

$$V = \left(\frac{1150}{D}\right)\ x\, E^{0.5}$$

which gives the maximum charge levels for V = 50 mm/s listed in Table 3.

Table 3: Maximum Charge Levels

Minimum Distance from Nearest Blast Hole Structure (m)	Maximum Charge Mass per Relay (kg)
10	0,19
20	0,76
30	1,7
40	3,0
50	4,7
60	6,8
70	9,3
80	12,1
90	15,3
100	18,9

Only detonating relays of at least 20 milliseconds delay interval shall be used. The above relationship can be used to calculate charge mass for other velocity limits. However, if higher charge levels have to be used for practical reasons, expert advice and possibly vibration measurements will be required.

Notwithstanding the above blasting limits, the Contractor shall at all times be responsible for the safety of the Works, person, animals and property in the vicinity of the Site during blasting operations.

PSDA 5.1.1.5 Negligence

The Contractor shall be liable for all damages to services caused as a result of the Contractor's negligence."

PSDA 5.1.2 Protection of Structures

ADD TO THE SUBCLAUSE:

"Protection will be required for every building structure that encroaches within the pipeline servitude as shown on the drawings. Payment items are provided in respect of each of these structures for the protection of the structure and the tendered rates will be deemed to include for all costs associated with working within a restricted working width.

During the site clearance operations, the Contractor shall notify the Engineer of any structure that is not included in the scheduled items in the Bill of Quantities for protection or for demolition but that in his judgment requires protection under Clause PSDA 5.1.2. After due investigation the Engineer will consider the Contractor's proposal regarding the protection or demolition of the structure."

PSDA 5.1.3 Existing Services (Refer SANS 1921-1 Clause 4.17)

ADD TO THE SUBCLAUSE:

"All existing services on the site may not be shown on the Drawings or be visible on the site. The Engineer may order excavation by hand in order to search for and expose services. An item has been included in the Bill of Quantities to cover the cost of such work if so ordered by the Engineer.

Where a service is damaged because of the Contractor's negligence, he shall be liable for the costs involved in the repair of the service and any other costs consequent upon the interruption of the damaged services."

PSDA 5.1.4 Stormwater and Groundwater

DELETE THE THIRD SENTENCE AND REPLACE WITH:

"Except where the use of tremies has been approved, foundation excavations for structures shall be kept free of water at all times until they have been inspected and approved and the concrete substructures, together with their related superstructures, have been completed."

PSDA 5.1.5 Excessive Pollution (Refer SANS 1921-1 Clause 4.19)

ADD THE WORDS "noise and", *BEFORE THE WORD* "dust" *IN THE SECOND LINE*.

PSDA 5.1.6 Excavated Material not to Endanger or Interfere (Refer SANS 1921-1 Clause 4.10)

DELETE THE SENTENCE: "If the necessity ……..will be borne by the Employer."

DELETE THE LAST SENTENCE AND REPLACE WITH:

"All material that is unsuitable or not required for backfilling (surplus material) shall be disposed of as described in project specification. No additional payment will be made for these activities."

PSDA 5.1.8 Road Traffic Control

DELETE FROM THE THIRD AND FOURTH LINES, THE WORDS "and such barricades and warning lights as are ordered" *AND ADD TO THE SUBCLAUSE*:

"An item has been included in the Bill of Quantities to cover the relevant costs."

PSDA 5.2 METHODS AND PROCEDURES

PSDA 5.2.1 Site Preparation

DELETE THE LAST SENTENCE AND REPLACE WITH:

"Material so removed shall be disposed of by the Contractor to Sites designated by the Engineer."

PSDA 5.2.2 Excavation (Refer SANS 1921-1 Clause 4.10)

ADD THE FOLLOWING TO SUBCLAUSE (d):

"In order to minimize potential differential settlement of the shallow foundations for the proposed new works in relation to existing or new valve chambers or undermining of the existing structures, it may be necessary to carry out ground improvement.

Once excavation to the base of the existing structure has taken place, a Dynamic Cone Penetration Test (DCP) shall be carried out to a minimum depth of 1 m to ascertain the necessity or otherwise to carry out the ground improvement. DCP results of ≥ 5 blows per 100 mm are deemed to indicate the presence of stiff clays.

Where stiff clays are encountered in the 1 m zone below the existing structure, it is recommended that the clay is immediately blinded with a lean mix of concrete and construction proceeds on the basis of a 'raft' type foundation / base slab supporting the sidewalls of the new structure.

If the clays are soft or loose sand is encountered, vertical lightweight trench sheeting is to be vibrated or driven down as close as possible to the existing foundations for a distance of at least 1,0 to 1,2 m below founding level.

The base area shall then be over-excavated, both vertically and horizontally, and the material shall be replaced with well compacted granular material (G6 minimum). The surface shall be blinded with a lean concrete mix after removal of the trench sheeting, following which the base slab to support the sidewalls shall be cast."

DELETE PARAGRAPH (f) *OF THE SUBCLAUSE AND REPLACE WITH*:

"(f) Borrow pits where and when ordered shall be so maintained that they do not become a danger to persons and livestock. The necessary access shall be constructed to each site. Topsoil and overburden shall be stockpiled temporarily and, on completion of the work, returned to and spread over the area of the borrow pit in such a manner that the sides are graded 1:2 and the floor is self-draining, or otherwise as directed. Any access constructed by the Contractor shall be scarified and the area reinstated..

ADD THE FOLLOWING SUBSUBCLAUSES:

"(h) Where outside shuttering is ordered by the Engineer, the excavations shall be carried out for an extra width of not more than 600 mm all around the structure, measured from the base of the face to be shuttered, to allow for the shuttering to be fixed, this extra excavation and refilling where necessary is to be measured and paid for under quantities allowed for this purpose in the Bill of Quantities. Outside shuttering shall be used for the construction of all major structures unless ordered otherwise by the Engineer.

(i) Where permanent concrete is to be placed against an excavated face, the excavation shall be trimmed to ensure that there is no projection greater than 20 mm protruding into the excavation profile.

(j) The Contractor shall not spoil, waste or stockpile excavated material without approval."

PSDA 5.2.3 Placing

PSDA 5.2.3.1 Embankments

IN THE THIRTEENTH LINE DELETE "600 mm" *AND REPLACE WITH* "300 mm"

IN THE SIXTEENTH LINE DELETE "300 mm" *AND REPLACE WITH* "150 mm"

DELETE THE NINETEENTH LINE AND REPLACE WITH THE FOLLOWING:

"Each layer shall be compacted to achieve 90% modified AASHTO density except where indicated otherwise on the Drawings."

PSDA 5.2.3.2 Restricted backfill and compaction at structures

DELETE THE EIGHTH AND NINTH LINES AND REPLACE WITH:

"not exceeding 250 mm and compacted by means of mechanical tampers to achieve a 90% modified AASHTO density except where indicated otherwise on the Drawings."

PSDA 5.2.5 Finishing

PSDA 5.2.5.2 Topsoiling

DELETE THE CONTENTS OF SUBCLAUSE 5.2.5.2 AND REPLACE WITH THE FOLLOWING:

"Where scheduled, topsoil shall be placed on all surfaces and on embankments and shall be lightly compacted by wheeled vehicles or by tamping, and trimmed neatly to the required lines grades and levels. The final thickness of topsoil after compaction shall be at least 200 mm. Prior to topsoiling, the surfaces to be topsoiled shall be prepared by pulling horizontal ruts into the soil with the tines of a front-end loader or other suitable method to retard erosion of the topsoil."

PSDA 5.2.6 Transport for Earthworks

PSDA 5.2.6.1 Freehaul

DELETE THE CONTENTS OF SUBCLAUSE 5.2.6.1 AND REPLACE WITH THE FOLLOWING:

"All haul will be regarded as freehaul. No overhaul will be paid under this contract."

PSDA 5.2.6.2 Overhaul

DELETE THE SUBCLAUSE.

PSDA 6 TOLERANCES

PSDA 6.2 PERMISSIBLE DEVIATIONS

ADD THE FOLLOWING PERMISSIBLE DEVIATIONS FOR WORK TO DEGREE OF ACCURACY II:

"

6.2(a)	1 2 3 4	 From direction of slope Between 1/100 and 1/300 1/400 and flatter	± 300 mm ± 100 mm ± 50 mm Nil 10% 5%
6.2(b)	1 2 3 4		± 35 mm ± 50 mm ± 50 mm ± 15 mm
6.2(c)	1	Read '-2% + 1%' in place of ' ± 2%'	

"

ADD NEW SUBCLAUSE:

"**PSDA 6.3 EXCAVATION BY MECHANICAL MEANS**

Where bulk excavation is carried out by earthmoving equipment, such excavation will only be allowed to within a level of 300 mm, or less as ordered by the Engineer, above the general level to which the ground has to be reduced, the balance of the bulk excavation being carried out by hand or by other means approved by the Engineer."

PSDA 7 TESTING

ADD NEW SUBCLAUSES:

"**PSDA 7.4 DELAY FOR INSPECTION AND TESTING FOUNDATIONS**

In the case of the structure(s) listed hereunder, the prices quoted in the Bill of Quantities and the programmed time for carrying out foundation excavations shall include for up to seven days delay to permit the Engineer to carry out tests or to get an expert opinion on the exposed foundation, should he consider these to be necessary. No claim for standing time or other extra cost for such delay will be accepted by the Engineer, neither will an extension of time be granted, except where the delay exceeds 7 days.s

The structure(s) to which this Subclause applies is/are as follows:

None

PSDA 7.5 TESTS FOR THE CONTRACTOR'S ACCOUNT

The Contractor shall make arrangements with a soils testing laboratory to undertake the following tests and to pass the test results to the Engineer. The costs of such tests shall be included in the rates tendered for the appropriate item in the Bill of Quantities.

(a) Material imported from outside the Contract Site as working surfaces, subgrade improvement or for fill material

One CBR and indicator test per 200 m^3 of compacted material brought on to site, (river sand will normally be exempted from this requirement). A sample and one CBR and indictor test of the material proposed for importation shall be submitted to the Engineer for approval prior to the commencement of importation.

(b) Fill material in place

One density and moisture content test per 100 m^3 of compacted fill.

(c) Compacted subgrade or finished level

One density and moisture content test per 200 m^2 of compacted surface area. Should any of the above density tests fail to comply with the specified requirements, the Contractor shall at his own expense remedy the failure and submit a new test to the Engineer.

PSDA 7.6 DETERMINATION OF COMPACTION

Determination of the standard of compaction achieved shall be carried out in accordance with Standard methods of testing road construction materials published by the Department of Transport Division of National Roads, Publication TMH.1.

PSDA 7.7 TESTS AT THE EMPLOYER'S REQUEST

Where CBR, indicator tests and the like are required on materials from within the Contract Site the Contractor shall also make arrangements with a soils testing laboratory to undertake these tests, the costs of which have been allowed for in the Bill of Quantities as a Provisional Sum. Payment for such tests will be per sample tested and reported to the Engineer. "

PSDA 8 MEASUREMENT AND PAYMENT

PSDA 8.1 BASIC PRINCIPLES

PSDA 8.1.1 *DELETE THE THIRD LINE OF THE FIRST SENTENCE AND REPLACE WITH*:

"material in backfilling, forming embankments, etc., including any necessary additional offloading, stock-piling and reloading and the cost of disposal of any"

IN THE SEVENTH LINE DELETE "Drawing DA-2" AND REPLACE WITH "Fig DA-2"

ADD TO THE SUBCLAUSE:

"Unavoidable over-excavation for structures located in boulder formation will be measured and paid for up to a maximum of 600 mm in Class A boulder formation and 300 mm in the case of Class B boulder formation, as applicable, as measured beyond the required outline of the structure and at right angles to it."

PSDA 8.1.2 *DELETE THE FIRST LINE OF THE FIRST SENTENCE AND REPLACE WITH:*

"Excavations which are required to be backfilled, or partially backfilled, will be measured as if taken out"

DELETE THE FIFTH AND SIXTH LINES AND REPLACE WITH:

"other such structures, the volume will be measured from the finished outline of the concrete, or the blinding to the concrete (as the case may be), as shown on the Drawings."

PSDA 8.1.3 *DELETE THE THIRD LINE AND REPLACE WITH*:

"will be measured as part of the bulk excavation or restricted excavation, as applicable".

PSDA 8.3 SCHEDULED ITEMS

PSDA 8.3.1 Excavation

(a) Remove topsoil to nominal depth, 150 mm, stockpile and maintain

ADD TO THE SUBCLAUSE:

"Where removal to greater depths is ordered, the area measured for payment will unless otherwise scheduled, be increased pro rata to the average increase in depth".

(b) Excavate in all materials and use for embankment or backfill or dispose, as ordered

REPLACE "Drawing DA-1" *IN THE THIRD LINE WITH* "Fig DA-1".
DELETE THE THIRD LINE OF THE SECOND SENTENCE AND REPLACE WITH:

"-ation, offloading to stockpile, stockpiling and reloading as may be necessary, spreading or backfilling, compacting and watering"

(c) Extra-over for

REPLACE "Drawing DA-1" IN THE LAST LINE WITH "Fig DA-1".

PSDA 8.3.2 Restricted Excavation

(a) Excavate for restricted foundations, footings and trenches in all materials and use for backfill or embankment or dispose

REPLACE "Drawing DA-2" *IN THE FOURTH LINE WITH* "Fig DA-2".

(b) Extra-over for

ADD TO *THE SUBCLAUSE:*

"(3) boulder excavation Class A ..... Unit: m^3

(4) boulder excavation Class B ..... Unit: m^3

DELETE THE LAST TWO LINES AND REPLACE WITH:

(a) above for any portion of the excavated material that is classified as intermediate, hard rock, boulder Class A or boulder Class B as applicable."

PSDA 8.3.3 Overhaul

DELETE THE SUBCLAUSE AND REPLACE WITH:

"(a) Overhaul (provisional) ..... Unit m^3.km

Overhaul is applicable only when the appropriate information set out in 5.2.6.1(b) was not available to the Contractor at the tendering stage.

Volumes will be computed from designated dimensions. No allowance will be made for bulking. Overhaul distances will be measured to the nearest 0,1 km from the limit of the freehaul range, in one direction only, by the shortest practical route."

PSDA 8.3.4 Importation of Materials from Commercial Sources or from Borrow Pits

DELETE THE LAST FIVE LINES.

ADD THE FOLLOWING SUBITEMS:

"(a) For Embankment Construction ..... Unit: m^3

The rate shall cover the cost of royalties (if any) and acquiring suitable material, loading, transporting with freehaul distance, unloading, spreading in layers not exceeding 150 mm thick, watering, compacting to 90% Mod AASHTO density, trimming slopes of embankment to required outline all in accordance with the Specifications. The rate shall also include for carrying out density testing and the disposal of any surplus material.

(b) For Backfilling around Structures ..... Unit: m^3

The rate shall cover the cost of royalties (if any) and acquiring suitable material, loading, transporting with freehaul distance, unloading, spreading in layers not exceeding 150 mm thick, watering, compacting to 90% Mod AASHTO density, trimming upper surfaces to the required outline all in accordance with the Specifications."

ADD THE FOLLOWING ITEMS IN SUBCLAUSE 8.3:

"PSDA 8.3.9 Additional Compaction ..... Unit: m^3

Where so scheduled additional compaction over that required to achieve 90% Mod AASHTO density in order to achieve the scheduled higher density shall be paid for by the volume so compacted.

The rate shall include for all additional plant, labour and materials necessary to achieve the additional compaction scheduled.

PSDA 8.3.10 Survey of Surrounding Structures before Blasting .....Unit: Sum

The rate shall cover the cost to examine and measure up any buildings, houses or structures in the vicinity of the proposed blasting and establish and record together with the owners thereof the extent of cracking or damage that may exist before commencement of blasting operations. The rate shall cover the cost of providing a photographic record of neighbouring structures before blasting commences.

PSDA 8.3.11 Protection of Structures: Buildings .....Unit: Sum

The rates shall cover the cost of examining and measuring up any buildings, or structures that encroach within the area of work and establishing and recording, together with the owners thereof, the general condition and/or damage that may exist before commencement of blasting or excavation operations, including the cost of providing a photographic record, the costs of reduced working width, and the costs of any special working methods required to protect the structure throughout the course of the nearby construction work. This shall include, where required, but is not necessarily limited to, the use of shoring or lateral trench support and the placing of barriers to demarcate restricted working area in the vicinity of the structure.

PSDB: EARTHWORKS (Pipe Trenches)
(Applicable to SABS 1200 DB - 1989)

PSDB 3 MATERIALS

PSDB 3.1 CLASSES OF EXCAVATION

ADD TO SUBCLAUSE:

"Notwithstanding the provisions of Subclause 3.1, the materials excavated other than hard rock shall not be classified for purposes of measurement and payment. The unit rate for excavation shall cover excavation in all materials other than hard rock and where scheduled separately boulders classes A and B (as specified in SABS 1200 DA Subclauses 3.1.2(d) and 3.1.2(e)."

PSDB 3.3 SELECTED GRANULAR MATERIAL

ADD TO SUBCLAUSE:

"The requirements for bedding material (padding) for steel pipes is given in PSLB 3.3."

PSDB 3.4 SELECTED FILL MATERIAL

DELETE THE SENTENCE "The requirements ..... shall apply." *AND REPLACE WITH*:

"All material up to the underside of backfill shall be measured as selected granular. The requirements for bedding material (padding) for steel pipes is given in PSLB 3.3."

PSDB 3.5 BACKFILL MATERIAL

IN THE THIRD LINE OF SUBSUBCLAUSE (a) *DELETE* "150 mm" *AND REPLACE WITH* "100 mm".

IN THE SECOND LINE OF SUBSUBCLAUSE (b) *DELETE* "PI not exceeding 12" *AND REPLACE WITH* "PI not exceeding 6."

ADD THE FOLLOWING NEW SUBSUBCLAUSE (c):

"(c) Cement Stabilised Backfill

Where scheduled, or directed by the Engineer, backfill shall be stabilised with 5% cement by mass. The backfill material shall have a plasticity index not exceeding 10 and all material must pass through a sieve of aperture size not exceeding that specified in SABS 1200 LB, Subclause 3.2, as amended.

The dry materials shall first be mixed in a concrete mixer, thereafter sufficient water is to be added to produce the stiffest consistency available for placing and compacting with vibrators."

PSDB 3.6 MATERIALS FOR REINSTATEMENT OF ROADS AND PAVED AREAS

DELETE THE SUBCLAUSE AND REPLACE WITH:

"Material used in the reinstatement of roadways shall fall into the following relevant categories:

(a) Foundation material recovered from the excavation of trenches across existing roadways which, if so instructed by the Engineer, shall be set aside and re-used as sub-base material.

(b) New material which shall conform to the requirements of:
- (i) Clause 3.2.1 of SABS 1200 ME for the Subbase
- (ii) Clauses 3.2 and 3.3 of SABS 1200 MF for the Basecourse
- (iii) Clause 3.2.2 of SABS 1200 ME for the Gravel Wearing Course
- (iv) Clause 3 of SABS 1200 MH for the asphalt surfacing."

PSDB 3.7 SELECTION

DELETE THE SECOND SENTENCE AND REPLACE WITH:

"The Contractor is not required to use selective methods of excavating but shall, if so instructed by the Engineer, screen or otherwise treat excavated material in order to produce material suitable for the bedding cradle or the bedding blanket."

PSDB 4 PLANT

PSDB 4.1 EXCAVATION EQUIPMENT

IN THE FIRST LINE DELETE "The Contractor" *AND REPLACE WITH*: "In sections deemed to be suitable for excavation by mechanical means, the Contractor"

ADD TO THE SUBCLAUSE:

"Should any portion of a pipe trench exceed the specified depth, the Contractor will be held responsible for any additional costs which may arise as a result of such over-excavation. Concrete filling or imported compacted fill may be ordered by the Engineer to be placed below the bottom of the trench."

PSDB 5 CONSTRUCTION

PSDB 5.2 MINIMUM BASE WIDTHS

ADD TO THE SUBCLAUSE:

"Trench sides shall be as near vertical as possible in order to minimise the quantity of backfill material required and to avoid possible difficulties where pipelines have to be installed parallel to existing services, fences, hedges, etc and to minimise the loading on the pipe.

The base width for trenches for cables, ducts and unbedded flexible continuous piping, of external diameter less than 125 mm laid at a depth not exceeding 1,5 m, shall be equal to the external diameter of the cable, duct or pipe, plus a side allowance of 200 mm on either side."

PSDB 5.4 EXCAVATION

ADD TO THE SUBCLAUSE:

"Except where otherwise specified, trenches shall be of such depth as to result in a minimum cover over the pipes of 800 mm except at road-crossings where the minimum cover over the pipes shall be 1 000 mm.

Where the pipe trench crosses surfaced roads the Contractor shall neatly cut two parallel grooves into and through the 'black top' before excavating between the grooves. The grooves are to be set back at least 200 mm from the edge of the excavation face to prevent ravelling of the cut edge. The cost of this operation, where not scheduled separately, will be held to be covered in the general rates for excavation."

PSDB 5.5 TRENCH BOTTOM

ADD TO THE SUBCLAUSE:

"In waterlogged conditions and/or where so instructed by the Engineer a 200 mm thick layer (See PSLB 5.2.5) of imported single sized stone (19 mm size unless otherwise instructed by the Engineer) with a geofabric filter surround ('Bidim' Grade A4 or similar approved) shall be constructed under the bedding layer specified for the pipes."

ADD THE FOLLOWING NEW SUBCLAUSE:

"PSDB 5.5.1 Jointing Holes

Jointing holes shall be cut of sufficient length and depth to allow for the proper making or bolting of pipe joints and to ensure that joint collars or sleeves do not rest on the trench bottoms. After the pipework has been inspected, tested and approved by the Engineer, the jointing holes shall be refilled with selected soft material free from stone (padding materials as specified under PSLB in the case of coated steel pipes) and then rammed to provide a continuous uniform support for the pipework. No specific payment will be made for forming and refilling holes, the cost of which is deemed to be included in the tendered rates."

PSDB 5.6 BACKFILLING

PSDB 5.6.1 General

ADD TO THE SUBCLAUSE:

"Notwithstanding the requirements of Subclauses 5.6.1 and 5.6.6, no pipe joint or pipe fitting shall be covered by either blanket or backfill material prior to the successful completion of the visual inspection and pressure testing of the relevant section of the pipeline.

All backfilling shall be carried out by hand and the Contractor must price his tender accordingly. No mechanical plant shall be used in backfilling without prior written consent of the Engineer."

PSDB 5.6.2 Material for Backfilling

DELETE FOURTH, FIFTH AND SIXTH LINES AND REPLACE WITH:

"Hard rock material shall not be used for, or incorporated into, the backfill above the bedding layers without the Engineer's approval."

PSDB 5.6.3 Disposal of Soft Excavation Material

ADD TO THE SUBCLAUSE:

"Surplus material or unsuitable material shall be disposed of off site by the Contractor."

PSDB 5.6.4 Disposal of Intermediate and Hard Rock Material

ADD TO THE SUBCLAUSE:

"Surplus intermediate and hard rock material from trench excavations shall be disposed of off site by the Contractor."

PSDB 5.6.8 Transport for Earthworks for Trenches

DELETE THE SUBCLAUSE AND REPLACE WITH:

"The requirements of Subclause 5.2.6 of SABS 1200 DA as amended and as applicable shall apply."

PSDB 5.7 COMPACTION

PSDB 5.7.2 Areas subject to Traffic Loads

ADD AT THE END OF THE SUBCLAUSE:

"for an extent of 2 m on either side of the carriage-way at each crossing."

PSDB 5.9 REINSTATEMENT OF SURFACES

PSDB 5.9.4 Bitumen Roads, Subbase and Base

ADD TO THE SUBCLAUSE:

"Each Tenderer is required to make provision in his/her tender for allowances to cover the costs of reinstating all surfaces, inclusive of all layers to their conditions pertaining before the commencement of construction.

Items have been included in the Bill of Quantities to cover the reinstatement of certain surfaces (grassed lawns, concrete and/or asphalted/gravel driveways and/or roads) and for payment purposes, the area of those specific surfaces shall be calculated from the product of the length of the trench and the specified trench width plus 400 mm (refer PSDB 5.4)."

PSDB 8 MEASUREMENT AND PAYMENT

PSDB 8.1 BASIC PRINCIPLES

DELETE SUBCLAUSE 8.1.4 AND REPLACE WITH:

"Except that the volume will be computed as specified in 8.2.3, the requirements of Subclause 5.2.6.1 (Freehaul) of SABS 1200 DA as amended and as relevant, shall apply to freehaul.

No additional payment will be made for excavating and backfilling bell (fox) holes as the cost of that work will be deemed to be included in the rates for trenching."

PSDB 8.3 SCHEDULED ITEMS

PSDB 8.3.2 Excavation

(a) Excavate in all materials for trenches, backfill, compact and dispose of surplus material

IN THE SECOND SENTENCE DELETE "1,0 m" *AND REPLACE WITH* "as scheduled in the Bill of Quantities"

(b) Extra-over item (a) above for

ADD THE FOLLOWING SUBITEMS:

"(3) Hand excavation and backfill only where ordered by the Engineer ..... Unit : m^3
(4) Backfill stabilised with 5% cement where directed by the Engineer ..... Unit : m^3
(5) Boulder excavation Class A .....Unit : m^3
(6) Boulder excavation Class B ..... Unit : m^3"

The tendered rates for (4) above shall include full compensation for selecting, mixing, backfilling and compacting of the stabilised material to 90% of modified AASHTO density.

Measurement of extra over for (5) and (6) above will not apply to any length of trench in soft material more than 2 m long. Surplus boulder material from trench excavation shall where applicable, be disposed of to the designated spoil areas except where shown otherwise on the drawings."

PSDB 8.3.3 Excavation Ancillaries

PSDB 8.3.3.1 Make up deficiency in backfill materials (provisional)

ADD TO THE SUBCLAUSE:

"Payment for imported, graded stone laid under pipelines in accordance with PSDB 5.5 shall be paid for under either Subclause 8.3.3.1(c) or as scheduled."

PSDB 8.3.3.4 Overhaul

DELETE THE SUBCLAUSE AND REPLACE WITH:

"All haul will be regarded as free haul."

PSDB 8.3.5 Existing Services that Intersect or Adjoin a Pipe Trench

ADD TO THE END OF THE SUBCLAUSE:

"(v) all work involved in locating the service by hand excavation
(vi) notifying and attending upon the owner of the service
(vii) supporting and protecting the service while the pipeline is installed, inspected, tested and backfilled."

PSGA: CONCRETE (SMALL WORKS)
(Applicable to SABS 1200 GA - 1982)

PSGA 2 INTERPRETATIONS

PSGA 2.3 DEFINITIONS

(a) General

ADD TO THE SUBCLAUSE:

"Adverse weather. Cold weather or weather in which:

(i) the ambient temperature is above 25°C, or
(ii) the relative humidity is low, or
(iii) the wind velocity is high.

or weather in which any combination of these three conditions occurs, and which tend to impair the quality of fresh or hardened concrete or otherwise causes the concrete to have abnormal properties."

(b) Quality

ADD TO THE SUBCLAUSE:

"Consistency. The extent, as measured by the slump test, to which fresh concrete resists flow or deformation."

ADD NEW SUBCLAUSE:

"(d) Exposure Conditions

Mild Conditions. Conditions under which the concrete is protected from the weather and exposed only to air.

Moderate Conditions**.** Conditions under which the concrete is:

(i) sheltered from severe rain and is not subject to freezing when wet, or
(ii) buried in non-aggressive soil, or
(iii) continuously under fresh water.

Severe Conditions. Conditions under which the concrete is exposed or subjected to any of the following:

(i) driving rain
(ii) alternate wetting and drying out
(iii) freezing when wet
(iv) fresh water (at the water-line)
(v) splashing or spraying with fresh water
(vi) corrosive fumes or heavy condensation of water
(vii) aggressive soil
(viii) salt-laden air".

PSGA 3 MATERIALS

PSGA 3.2 CEMENT

PSGA 3.2.1 Applicable Specifications

DELETE THE CONTENTS OF THIS SUBCLAUSE AND REPLACE WITH:

"The standard cement specifications SABS 471, SABS 626, SABS 831, and SABS 1466, have been withdrawn and are replaced by SANS 50197-1: Common cements, and SANS 50413-1: Masonry cement. These specifications will be applicable to this Contract and the descriptions and types of cements, where specified, will be based on the designations as defined in these specifications.

Unless agreed to otherwise by the Engineer, the cement used on the works shall be either Type Cem 1, Type Cem II A-S, CEM II A-V, CEM II B-S or Cem II B-V.

Pulverised Fly Ash (PFA) used on the works shall be from an approved source and shall comply with the requirements of SANS 50450-1 & 2.

Ground granulated blast furnace slag used on the works shall be from an approved source and shall comply with the requirements of SANS 55167-1 & 2."

PSGA 3.2.2 Storage of Cement

ADD TO THE SUBCLAUSE:

"Cement shall be stored in a closed structure or container and shall not be kept in storage for longer than two months without the Engineer's permission."

PSGA 3.4 AGGREGATES

ADD NEW SUBCLAUSE:

"PSGA 3.4.4 Sand

Sand from a source selected by the Contractor and approved by the Engineer after testing shall be used on this Contract."

PSGA 4 PLANT

PSGA 4.4 FORMWORK

PSGA 4.4.1 Design

ADD TO THE SUBCLAUSE:

"The Contractor shall arrange for a Professional Engineer to design and sign the drawings for the formwork (including all supports) to be used for suspended slabs and roofs."

PSGA 4.4.2 Finish

DELETE THE CONTENTS OF THIS SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"The quality of the finished surfaces of the concrete shall be as scheduled or as shown on the drawings."

PSGA 4.4.3 Ties

ADD TO THE SUBCLAUSE:

"After removal of ties all ferrules are to be drilled out of the concrete to provide an oversized reamed hole free of all remnants of the ferrule and blown out to remove all dust and other loose material.

The surface of the hole is to be primed by well wetting with a cement/SBR latex slurry and the hole filled by caulking with a cementitious mortar consisting of 1 part cement to 2 parts concrete sand by volume, well mixed with sufficient clean water to obtain the required consistency. This grout is to be well rodded into the hole to completely fill the void and provide a dense, void-free plug. The surface is to be trowelled to finish flush with the surrounding area."

PSGA 5 CONSTRUCTION

PSGA 5.1 REINFORCEMENT

PSGA 5.1.2 Fixing

DELETE FROM THE EIGHTH *LINE, THE FOLLOWING*:

"or, if permitted by the Engineer, by welding".

PSGA 5.1.3 Cover

DELETE THE FIRST SENTENCE AND REPLACE WITH:

"The cover of concrete over reinforcement, other than over rail or structural steel reinforcement, shall be at least '30 mm' with a tolerance of +10 mm -0 mm unless otherwise shown on the drawings."

ADD TO THE SUBCLAUSE:

"The clearance between reinforcing and steel pipes and flanges cast into concrete shall be no less than 75 mm."

PSGA 5.2 FORMWORK

PSGA 5.2.1 Classification of Finishes

DELETE THE EIGHTH AND NINTH LINES OF THE SUBCLAUSE.

(a) Rough

ADD TO THE SUBCLAUSE:

"The finish of the concrete is to be within the tolerances of Degree of Accuracy III as set out in Subclause 6.4."

(b) Smooth

ADD TO THE SUBCLAUSE:

"The finish of the concrete is to be within the tolerances of Degree of Accuracy II as set out in Subclause 6.4."

ADD NEW SUBCLAUSE:

"PSGA 5.2.5 Fixing Blocks for Reinforcing and Fixtures in Concrete

Fixing blocks for the attachment of fixtures may be embedded in concrete provided that the strength and other desirable features such as appearance of the member are not, in the opinion of the Engineer, impaired thereby."

PSGA 5.4 CONCRETE

PSGA 5.4.1 Quality

PSGA 5.4.1.2 Consistency

DELETE THE THIRD LINE AND REPLACE WITH:

"Engineer in respect of prescribed mix and/or strength concrete."

PSGA 5.4.1.4 Prescribed mix concrete

DELETE THE CONTENTS OF THE SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"The grades of prescribed mix concrete are designated Grades 20/19, 15/19 and 10/40 and shall be composed of cement, sand and stone, as specified hereinbefore, proportioned as follows:

Prescribed **Grade**	***Size of Stone*** **(mm)**	***Cement*** **(kg)**	***Sand*** **(m^3)**	***Stone*** **(m^3)**
20/19	19	50	0,110	0,140
15/19	19	50	0,130	0,160
10/40	37,5	50	0,160	0,225

The proportion of cement to the combined quantity of sand and stone shall remain constant for each grade of concrete, as set out above, however, the relative proportions of sand and stone shall be adjusted, if required by the Engineer, so as to obtain the most suitable consistency of concrete, due allowance being made for the bulking of sand due to moisture.

The addition of water shall be regulated by the use of properly calibrated containers, only sufficient water shall be added to, in the opinion of the Engineer, afford a workable mix.

The fine and coarse aggregates approved for use in strength concrete Grades 30 and 25 shall be used for prescribed concrete mixes Grades 20 and 15 and 10."

PSGA 5.4.1.5 Strength Concrete

ADD TO THE SUBCLAUSE:

"The three grades of strength concrete used on the works shall be designated Grades 25/19, Grade 30/19 and Grade 35/19.

The use of concrete admixtures (plasticisers, retarders, accelerators, etc) will not be permitted.

Grade 35/19 Concrete for Water Retaining Structures

For Grade 35/19 concrete Ordinary Portland Cement (OPC) and Pulverised Fly Ash (PFA) shall be blended together such that the combined cementitious material comprises 70% OPC and 30% PFA by mass.

The minimum content of combined cementitious material shall not be less than 360 kg and not more than 450 kg per cubic metre of concrete and the minimum cement/water ratio shall be 2,0.

The characteristic cube strength at 28 days shall be not less than 35 MPa.

The concrete mix for the above-mentioned grade of strength concrete shall be designed by an approved laboratory. At least four weeks before placing any concrete on the Works, the Contractor shall supply and deliver to the approved laboratory, at his own cost, samples of the aggregates he proposes to use in the concrete mix. While the proportion of cement to the combined quantity of sand and stone will remain constant for each grade of concrete, as set out above, the relative proportions of sand and stone may be adjusted to achieve the required strength. The laboratory will be bound by the requirements of this Specification which are to guide the Tenderers in pricing the grade of strength concrete. The Contractor is to allow in his rate for strength concrete an amount to cover the fees and charges levied by the approved laboratory in designing the strength concrete mix."e

PSGA 5.4.1.6 Ready-mixed concrete

DELETE THE CONTENTS OF THE SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"Concrete produced at a central facility, other than at the site of the Works, shall not be accepted for use in the Works except with the prior and express approval of the Engineer. When such approval has been given the Engineer will then decide whether or not to accept the test results obtained by the facility concerned.

The use of concrete from a ready-mixed concrete facility shall be permitted subject to the following provisos:

- The facility shall be accredited as being compliant with the requirements of the ISO 9001 standard.
- The concrete batching plant shall be inspected by the Engineer for compliance with sans specifications and his approval must be obtained in writing before commencement of the concrete works.
- Before any ready-mixed concrete is used on the works, the contractor shall furnish the Engineer with a copy of his letter to the supplier in which was specified:
  (i) the type of cement(s);
  (ii) the nominal maximum sizes of aggregates;
  (iii) the cement / water ratios;
  (iv) the required compressive strengths;
  (v) the required slump at the time and place of delivery; and
  (vi) the type of additive - documentary evidence proving the suitability of the additive for use in the concrete, particularly in the grade 35/19 water retaining concrete, shall be given to the Engineer for his prior approval.

The following shall be specified in the contractor's contract/order with the ready mixed concrete supplier and a copy of the relevant documentation shall be given to the Engineer's Representative:

- a maximum delivery period of 90 minutes from the time water is added to the concrete mix to the actual completion of the discharge of concrete on site shall be permitted. 90 minutes is a max. the discharge period (including placing the concrete) shall not exceed 30 minutes.
- the concrete slump of every truckload shall be measured on delivery to site as soon as discharge commences and it shall comply with clause sabs 1200 g 5.4.1.2 prior to any concrete from that truck being placed. no additional water may be added to the mix after it has left the batching plant without the written approval of the Engineer's Representative. under no circumstances shall the cement/water ratio for concrete in water retaining structures be less than 2,0.
- a detailed computer printout of the constituents of the concrete mix from the batching plant is to be handed over to and retained by the Engineer's

Representative on site on arrival (i.e. truck registration, mix proportions and the time water was added to the mix). the masses of the concrete constituents of each truck shall be checked against that of those submitted with the trial mix, subject to the batching accuracy as specified in sans 0100-2: 1992. the arrival time of each truck on site and the time that the concrete discharge is completed shall also be recorded by the Engineer's Representative. Dedicated truck drivers shall be used, where possible, for the delivery of the concrete to site.

- when required the contractor shall satisfy the Engineer that acceptable alternative means of supplying concrete have been arranged and can be brought into operation in the event of disruption in the supply of concrete. in this regard, the Engineer may require that the alternative means of supply shall commence if the disruption in the supply of ready-mixed concrete has lasted for a period of 1½ hours.
- the use of ready-mixed concrete will in no way relieve the contractor of any of his obligations for providing concrete that complies with the specifications."

PSGA 5.4.5 Placing

ADD TO SUBCLAUSE 5.4.5.4:

"In the case of continuous walls these are to be cast in lifts of such height that each lift can be poured uninterruptedly in one continuous operation over the entire length of the wall. No vertical or inclined construction joints of any kind will be permitted in continuous walls unless they have been specifically ordered or authorised by the Engineer. The placing of concrete shall commence at convenient points on the length of the wall and shall proceed both ways simultaneously so that fresh concrete meets fresh concrete. Any rest pauses, such as for meals, shall be avoided as far as possible, and the Contractor may be required by the Engineer to make the operation continuous by working in shifts. A workable arrangement must be made before each concreting operation commences."

ADD NEW SUBCLAUSES:

"PSGA 5.4.5.5 Adverse weather conditions (See PSGA 2.3(d))

Under adverse cold weather conditions, effective measures shall be taken to ensure that the temperature of the concrete, from the time of placing until it has hardened (i.e. about 24 h), is maintained at not less than 5 °C. If the atmospheric temperature in the vicinity of the concrete is below 2 °C or is expected to fall below 2 °C during the curing period (see Subclause 5.4.7), water shall not be used for curing. All surfaces shall be protected from ice or frost damage.

When the ambient temperature is above 32 °C, the temperature of the concrete when deposited shall not be allowed to exceed 32 °C. Under adverse hot weather conditions, the Contractor shall take all reasonable steps to reduce to a minimum the placing temperature of the concrete. Stockpiles of aggregates and all metal surfaces in contact with aggregates and concrete shall be shielded from the direct rays of the sun or cooled by being sprayed with water, and windbreaks shall be erected, if necessary, to prevent

the initial rapid drying-out of concrete which would otherwise occur before normal curing procedures can be undertaken.

Concrete shall not be placed during periods of heavy or prolonged rainfall.

PSGA 5.4.5.6 Pumping

The placing of concrete by pumping will not be permitted."

PSGA 5.4.7 Curing and Protection

DELETE SUBCLAUSE (c) IN ITS ENTIRETY, AS THE USE OF CURING COMPOUNDS SHALL NOT BE PERMITTED.

ADD NEW SUBCLAUSE (c):

"(c) Continuously spraying the exposed surfaces with water."

ADD TO THE SUBCLAUSE:

"Notwithstanding the methods of curing itemised under (a) to (c) of the Subclause the walls of all water-retaining structures shall be cured by method (c) continuous spraying or "microjetting" and shall be subject to continuous spray curing for a minimum period of 10 days."

PSGA 5.4.8 Concrete Surfaces

ADD TO SUBCLAUSE 5.4.8.2:

"Concrete surfaces shall be finished as indicated in the Schedule."

PSGA 5.4.9 Watertight Concrete

ADD TO THE END OF THE FIRST SENTENCE:

"and shutter-tie positions"

ADD TO THE SUBCLAUSE:

"The following structures shall be subject to water-tightness tests:

All concrete chambers/structures below ground shall exclude water and shall be subject to a visual test for watertightness.

No horizontal or inclined construction joints of any kind will be permitted in the external walls of the inlet control chamber unless these have been specially ordered or authorised by the Engineer."

PSGA 6 TOLERANCES

PSGA 6.1 BASIS OF MEASUREMENT

PSGA 6.1.1 General

REPLACE "Degree of Accuracy III" *IN THE THIRD LINE WITH* "Degree of Accuracy II".

ADD TO THE SUBCLAUSE:

"The Permissible Deviations for the following elements of the Works shall be to Degree of Accuracy III:

- Concrete work which is not exposed after completion of the Works."

PSGA 8 MEASUREMENT AND PAYMENT

PSGA 8.1 MEASUREMENT AND RATES

PSGA 8.1.1 Formwork

IN SUBSUBCLAUSE 8.1.1.4 ADD TO THE FIRST LINE BETWEEN THE WORDS "concrete" AND "and" THE FOLLOWING:

"including forming fillets or splays up to 20 x 20 mm".

PSGA 8.4 SCHEDULED CONCRETE ITEMS

PSGA 8.4.1 Prescribed Mix Concrete

DELETE FROM THE SUBCLAUSE ALL BUT THE FIRST SENTENCE.

ADD THE FOLLOWING NEW ITEMS:

"PSGA 8.7 GROUTING

This clause is amended to delete the last sentence and to include the following: "Grouting under structural steel column bases or members or under pumps, motors or other machinery will be measured on site as executed provided the concrete is within the specified tolerances. Should the concrete not be within the specified minus tolerance, site measurements will be adjusted accordingly.

Rates for grouting are to allow for all necessary preparatory work (hacking, slurry etc.) and for all necessary formwork".

PSGA 8.9 MISCELLANEOUS

PSGA 8.9.1 Concrete coring .....Unit: No

The rate shall cover the products, tools and equipment for the coring of openings, in existing concrete structures, complete, as described on drawings or in the Bill of quantities. Any exposed existing reinforcement after coring and the prevention of concrete over-break are to be treated with approved products."

PSGA 8.9.2 Grouting of pipes/specials through walls or slabs ..... Unit: m³

Items, where so required, have been included in the Bill of Quantities for the grouting of pipes and specials through box-outs or broken out openings in walls or slabs. The rates shall include for all necessary labour, plant and materials required to carry out the work described in PSG 5.5.13 and for finishing to the required quality.

PSLB: BEDDING (PIPES)
(Applicable to SABS 1200 LB - 1983)

PSLB 2 INTERPRETATIONS

PSLB 2.3 DEFINITIONS

IN THE DEFINITION OF “main fill” *DELETE* "150 mm" *IN THE SECOND LINE AND REPLACE WITH* "300 mm".

PSLB 3 MATERIALS

PSLB 3.1 SELECTED GRANULAR MATERIAL

IN THE SECOND LINE DELETE "19 mm" *AND REPLACE WITH* "10 mm".

ADD TO THE SUBCLAUSE:

"Where scheduled and/or shown on the drawings, bedding material (padding) as specified in PSLB 3.3 shall be used in place of selected granular material."

PSLB 3.2 SELECTED FILL MATERIAL

ADD TO THE SUBCLAUSE:

"Where scheduled and/or shown on the drawings, bedding material (padding) as specified in PSLB 3.3 shall be used in place of selected fill material."

PSLB 3.3 BEDDING

ADD TO THE SUBCLAUSE:

"All PVC and HDPE pipes and fittings and steel pipes and fittings greater than DN500 are deemed to be flexible pipes.

Where scheduled or shown on the drawings, bedding (selected granular and selected fill material) shall be fine sand or fine non-cohesive soil, carefully selected, with maximum particle size of 5 mm and which shall not cake nor form lumps when drying. Material complying with the above requirements may also be referred to in this document as ‘padding’. Samples of bedding (padding) material shall be submitted by the Contractor to the Engineer for approval well in advance of construction. Only after the Contractor has received written approval from the Engineer, may he/she proceed with placing bedding (padding) material as selected granular and/or selected fill material.t
No sharp-edged stones shall be allowed to come into contact with the pipes or fittings. Joint holes (pockets) shall be provided in the trench bottom and bedding, at each pipe joint to facilitate jointing and/or welding, and no extra payment will be made for forming or filling the joint holes (pockets) with padding material.

All padding material used for the cradle beneath and surrounding the coated steel pipes shall comply with the following requirements:

Grading Analysis Range	
Sieve Size (mm)	**Percentage Passing**
6,7	98 to 100
4,76	85 to 100
2,36	55 to 95
1,18	30 to 75
0,60	20 to 50
0,425	16 to 38
0,30	13 to 27
0,15	5 to 18
0,075	0 to 12

The material shall be free of organic matter and shall have a compatibility factor of not more than 0,4. The material should be classified as silty to fine sand having a stiffness ratio of not less than 5,0 MPa. Furthermore, the origin of the materials should, preferably, be river transported since it is preferable that the larger grains (3,0 to 4,8 mm in size) be rounded and not sharp and angular.

The Contractor will be required to carry out his/her own quality control testing of the material to ensure that it meets the padding sand requirements and complies with this specification at all times. At least one grading analysis shall be carried out for every 100 lineal metres of bedding placed. The results of these tests shall be forwarded to the Engineer within 24 hours of completion of the test. Should the material not comply with the specification, the Contractor shall remove and replace it with approved material at his/her own cost.
Depending on the actual material supplied by the Contractor, the moisture content may be critical to enable satisfactory placing and compaction and the Contractor will be deemed to have allowed in his tendered rate for any and all adjustments required to the moisture content of the padding material at all times.

Where applicable, items have been provided in the Bill of Quantities for the provision of approved bedding material from approved Commercial or other approved off-site sources for padding sand.

No extra payment shall be made for forming or filling joint holes/bell holes/fox holes (pockets)."

PSLB 3.4 SELECTION

PSLB 3.4.1 Suitable Material Available from Trench Excavation

DELETE THE CONTENTS OF THE SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"The excavation of a pipe trench shall comply with the requirements of Subclause 5.4 of SANS 1200 DB and the provisions of Subclause 3.7 of SANS 1200 DB (in terms of which, for the purposes of providing bedding materials, the Contractor is not required to use selective methods of excavating) shall apply. Nevertheless, the Contractor shall take every reasonable precaution to avoid burying or contaminating material that is suitable and is required for bedding or covering the pipeline. If, in the opinion of the Engineer, bedding material can be produced from the excavated material, the Contractor shall, if so ordered by the Engineer, screen or otherwise treat (as scheduled) the excavated material in order to produce material suitable for bedding (see also Subclause PSLB 8.2.1)."

PSLB 5 CONSTRUCTION

PLSB 5.1 GENERAL

PSLB 5.1.2 Details of Bedding

ADD TO THE SUBCLAUSE:

"The pipelines shall be laid on the class of bedding indicated in the Bill of Quantities and/or on the drawings."

ADD NEW SUBCLAUSE:

“PSLB 5.1.2.1 Stone drainage layer beneath bedding

Where indicated on the drawings, or as otherwise indicated by the Engineer, a 200 mm thick layer of 19 mm stone shall be placed beneath the bedding layer to act as a drainage channel for excessive groundwater. This layer shall be wrapped in approved geofabric and provided with outlet pipes if and where required or indicated by the Engineer's Representative.”

PSLB 5.1.4 Compacting

DELETE THE SECOND LINE AND REPLACE WITH:

"top of the pipeline) shall be 93% mod AASHTO."

ADD TO THE SUBCLAUSE:

"Steps will have to be taken by the Contractor to ensure that flexible pipes do not deform excessively in cross-section during and after construction and backfilling operations. The maximum deflection which will be acceptable at any stage during or after construction is 2% of the pipe diameter horizontally or vertically. The Contractor will be required to provide the necessary apparatus and to monitor deflection during construction.

Pipe deformations will only be maintained within the specified tolerances by correct backfilling practice. No heavy compaction equipment will be permitted for compaction of any pipe bedding, only pneumatic or hand rammers being acceptable. To this end, and to achieve the 93% compaction specified, it is required that the bedding material be brought up evenly on either side of the pipe. The use of complete saturation of the material as a method of achieving the specified compaction may, subject to the Engineer's approval, be used. However, in this regard, Contractors are advised that the presence of excessive quantities of water in the pipe trench could lead to flotation of the pipe.i
Prior to the commencement of pipe laying the Contractor shall be required to submit, to the Engineer, for his approval, his proposed methods of placing, and compacting methods which he proposes to implement in order to ensure compliance with the specification."

ADD NEW SUBCLAUSE:

"PSLB 5.1.5 Testing

All flexible and flanged joints shall be left exposed with a minimum of 300 mm clearance around the bottom of the pipe during hydraulic pressure testing of the pipe to facilitate inspection."

PSLB 5.2 PLACING AND COMPACTING OF RIGID PIPES

AND NEW SUBCLAUSE:

"PSLB 5.2.5 Stone Bedding

In areas where waterlogged conditions exist or where ordered by the Engineer, special drains consisting of a 200 mm thickness (See PSDB 5.5) of single sized stone with a geofabric filter surround ('Bidim' Grade A4 or similar approved) extending the full width of the trench shall be provided below the bedding to the pipes. The excavation for these drains shall be measured in cubic metres at the contract rate applying to unsuitable excavation below the bottom of the trench. The stone filling shall be paid for per cubic metre and the geofabric filter shall be paid for per square metre. All measurements in this connection shall be to a width equal to the base widths and depths ordered."f

PSLB 5.3 PLACING AND COMPACTING FLEXIBLE PIPES

(a) Bedding Cradle

DELETE THE CONTENTS OF THIS SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"The pipes shall be bedded on a minimum 100 mm thick layer of compacted granular bedding material on which a 50 mm thick layer of uncompacted granular bedding material has been placed and spread. Loose granular bedding material lying next to the pipe shall be placed into the haunch area and compacted with suitable hand tools (covered with rubber to prevent damage to the pipe coating), and additional selected granular material shall be added and compacted in layers up to the mid point of the pipe diameter in the vertical plane. The remainder of the bedding i.e. the selected fill blanket, shall be placed in layers up the sides of the pipe, each layer being compacted until a level of 300 mm above the crown of the pipe is reached.
All bell holes (fox holes) holes shall be filled with bedding material."

(b) Selected Fill Blanket

DELETE "200 mm" *FROM THE TITLE AS SHOWN ABOVE*.

PSLB 6 TOLERANCES

PSLB 6.1 MOISTURE CONTENT AND DENSITY

ADD TO THE SUBCLAUSE:

"The permissible deviations applicable shall be those for Degree of Accuracy II class of work."

PSLB 8 MEASUREMENT AND PAYMENT

PSLB 8.1 PRINCIPLES

PSLB 8.1.3 Volume of Bedding Materials

ADD TO THE SUBCLAUSE:

"(c) The volume of bedding material shall be measured net i.e. the volume of the pipe is to be deducted.

(d) No additional payment shall be made for bedding material placed in bell (fox) holes."

PSLB 8.1.5 Disposal of Displaced Material

DELETE THE CONTENTS OF THIS SUBCLAUSE AND REPLACE WITH:

"Material displaced by the pipeline and by imported material from sources other than trench excavation, shall be disposed of by the Contractor at an approved site(s). No haulage shall be paid."

PSLB 8.1.6 Freehaul

DELETE THE CONTENTS OF THIS SUBCLAUSE AND REPLACE WITH:

"All haul shall be regarded as free haul. No overhaul shall be paid for under this Contract."

PSLB 8.2 SCHEDULED ITEMS

PSLB 8.2.1 Provision of Bedding from Trench Excavation

DELETE THE SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"PSLB 8.2.1 Provision of Bedding from Trench Excavation:

(a) Without the need for screening:

(i) Selected granular material..... Unit : m^3

The rates shall cover the cost of acquiring, from any point along the trench excavation as may be selected by the Engineer, bedding that complies with the relevant requirements of the specification, of delivering it to points alongside the trench spaced to suit the Contractor's methods of working, of making good any backfill deficiency from points where backfill has been acquired, and of disposing of displaced material.

(b) Including for screening:

(i) Selected granular material..... Unit : m^3

The rates shall cover the cost of screening or otherwise treating excavated material, at any point along the trench excavation as may be selected by the Engineer, in order to produce bedding that complies with the relevant specification, delivering it to points alongside the trench, spaced to suit the Contractor's methods of working, of making good any backfill deficiency there may be from points where screened backfill material has been acquired, and of disposing of displaced material."

PSLB 8.2.2 Supply Only of Bedding by Importation

DELETE THE SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

"PSLB 8.2.2 Provision of Bedding by Importation:

(a) Including for screening and/or other treatment:

(i) Selected granular material ..... Unit : m^3

(ii) Padding sand to specified bedding dimensions ..... Unit : m^3

The rates shall cover the cost of acquiring, loading, transporting, off-loading, screening or otherwise treating excavated material in order to produce bedding that complies with the relevant specification, delivering it to points alongside the trench spaced to suit the Contractor's methods of working and of disposing of displaced material.

NOTE: The rate for the supply and laying of pipelines covers the cost of handling the bedding material from alongside the trench, placing it under the pipeline, forming joint holes and completing the bedding around and over the pipeline."

PSLB 8.2.3 Concrete Bedding Cradle

ADD THE FOLLOWING PARAGRAPH TO THE SUBCLAUSE:

"All concrete bedding to pipes will require formwork. The rate for concrete bedding shall include for the supply, installation and stripping of all formwork."

PSLB 8.2.4 Encasing of Pipes in Concrete

DELETE THE FIFTH AND SIXTH LINES AND REPLACE WITH THE FOLLOWING:

"encasing the pipe in concrete 150 mm thick each side of the pipe and to 150 mm above the crown of the pipe including the cost of formwork, (if any), etc. and the cost of formwork to form stop ends on either side of collars, couplings, joints, etc if instructed by the Engineer."

ADD TO THE SUBCLAUSE:

"The rate for concrete encasing shall include for the supply, installation and stripping of all formwork."

PSLB 8.2.5 Overhaul of Material for Bedding Cradle and Selected Fill Blanket

DELETE THE SUBCLAUSE.

ADD NEW SUBITEM:

"PSLB 8.2.6 Drainage Layer:

(a) Stone filling..... Unit : m^2

(b) Geofabric filter material (Bidim Grade A4 or similar) .....Unit : m^2

Supply and place beneath pipe, 150 mm crushed stone layer as ground water drainage layer. The excavation for these drains shall be measured in cubic metres at the tendered rate applying to unsuitable excavation below the bottom of the trench (SABS 1200 DB 8.3.2 c).

The rate for stone filling shall be per cubic metre of stone fill, measured according to a width equal to the base widths and depths ordered.

Supply and installation of geofabric filter material (BIDIM Grade A4 or similar) around stone. The rate shall be per square metre of geofabric to enclose the stone material, measured net according to a width equal to the base widths and depths ordered."

SECTION A: STANDARD AMENDMENTS ISSUED BY COLTO

Notes to tenderer:

1. The Standard Specifications for Road and Bridge Works for State Road Authorities (1998 edition) prepared by the Committee of Land Transport Officials, (COLTO), as amended, shall apply to this contract. The amendments are those issued by COLTO and reproduced in Section A, together with additional amendments as set out in Section B.

2. Where reference is made to the General Conditions of Contract and sub-clauses thereof in the abovementioned Standard Specifications, they refer to the appropriate edition of the 'General Conditions of Contract for Road and Bridge Works for State Road Authorities" issued by COLTO (clause 1115 of the Standard Specifications refers).

3. The terms "Schedule of Quantities", (used throughout the Standard Specifications) and "Bill of Quantities", (used in all other documents forming part of this contract), and "Pricing Schedule" are synonymous.

SECTION B: PROJECT SPECIFICATION AMENDMENTS TO THE STANDARD SPECIFICATIONS

Notes to tenderer:

1. In certain clauses the Standard Specifications allow a choice to be specified in the project specifications between alternative materials or methods of construction and for additional requirements to be specified to suit a particular contract. Details of such alternatives or additional requirements applicable to this contract are contained in this part of the project specifications. It also contains some additional specifications required for this particular contract.

2. The number of each clause and each payment item in this part of the project specifications consists of the prefix B followed by a number corresponding to the number of the relevant clause or payment item in the standard specifications. The number of a new series, new clause or a new payment item which does not form part of a series, clause or a payment item in the standard specifications, and which is included here, is also prefixed by B followed by a new number. The new numbers follow on the last clause or item number used in the relevant section of the standard specifications.

3. The tenderer shall note that the standard COLTO specification is based on the COLTO General Conditions of Contract. References to specific COLTO General Conditions of Contract clauses will need to be exchanged for the equivalent clause in the GCC Conditions of Contract as amended by the Particular Conditions of Contract. The Employer assumes no responsibility for the contractor's interpretation of which are the correct relevant clauses.

SECTION B: PROJECT SPECIFICATION AMENDMENTS TO THE STANDARD SPECIFICATIONS

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COLTO SERIES 1000: GENERAL

SECTION B1100: DEFINITIONS AND TERMS

B1155 WORK IN RESTRICTED AREAS

Add the following:

"Any omission of pay items from the pricing schedule with regard to additional or extra over payment for work in restricted areas should be regarded as deliberate and any additional cost incurred shall be included in the bulk rates tendered. (Refer also to clause B1209(g))"

Add the following clauses:

B1157 LABOUR-OPTIMISING CONSTRUCTION

The cost-effective employment of as great a portion of labour as is practically and technically feasible to produce the standard of construction required by the specifications: Therefore, the economic substitution of plant and mechanical equipment with available labour using hand tools, on condition that this method is not more expensive than the conventional construction practices.

B1158 PATCHING

Patching shall be any repair work to existing pavement layers and milled surfaces with the purpose of repairing local failures with a surface area of less than 50 m². Repairs in excess of 50 m² shall be considered to be milling.

B1159 REPAIR

Measures aimed at maintaining or improving the condition and/or riding comfort of an existing road.

B1160 PROCESS CONTROL

Process control means all testing required to be carried out by the Contractor in order to ensure that the completed permanent works comply with the Specifications and drawings. All such testing will be subject to inspection and approval by the Engineer.

B1161 ACCEPTANCE CONTROL

Acceptance control means whatever testing the Engineer carries out over and above the process control testing already carried out in order to decide on the acceptability of any work submitted by the Contractor. Such testing will be carried out at the cost of the Employer.

Both the process and acceptance control testing will be carried out by an on-Site laboratory or commercial laboratory for and as may be specified by the Engineer.

B1163 AGGREGATE SIZE

Where reference is made in this specification or the standard specifications to aggregate size, nominal aggregate size or maximum aggregate size, the aggregate size as listed shall be replaced with the new corresponding aggregate size as indicated in the following table:

Aggregate size	New aggregate size
26,5	28
19	20
13,2	14
9,5	10
6,7	7
4,75	5
2,36	2
1,18	1 ”

B1164 SABS SPECIFICATIONS

Where reference is made in this specification or the standard specifications to SABS specifications, the latest published national standard shall be applicable. Use:

https://www.sabs.co.za/content/uploads/files/SABS%20Catalogue%20February%202012%20(abridged).pdf

for the most up-to-date versions of the various standards.

B1165 MODIFIED AASHTO DENSITY

Where reference is made in this specification or the standard specifications to modified AASHTO density, this shall be replaced with the new corresponding reference maximum dry density (MDD).

SECTION B1200: GENERAL REQUIREMENTS AND PROVISIONS

B1205 WORKMANSHIP AND QUALITY CONTROL

Insert the following heading after the title:

"**a) General:**

Insert the following as sub-clauses after the first paragraph:

b) Quality Systems

The contractor shall implement a quality assurance system that replicates an ISO 9002 and appoint a quality manager who shall ensure that members of the contractor's staff comply with the requirements of the quality system. The quality system and the methods used to implement it shall be described in a quality plan produced by the contractor. The quality manager shall be resident on site full time.

The contractor shall submit the quality assurance system he proposes using to the engineer, for his approval, within two weeks of the site handover. The system shall record the lines and levels of responsibility and indicate the method by which testing procedures will be conducted. Once accepted by the engineer the contractor shall not deviate from it unless written notification of proposed changes have similarly been submitted and approved.

The system shall provide for a method statement for each construction activity for which a pay item is provided in the Pricing Schedule. Each method statement shall be submitted to the engineer for his approval two weeks prior to commencement of the activity. Where appropriate the contractor shall make use of the employer's manuals in preparing his method statements. No construction activity shall commence before the engineer has approved the contractor's quality assurance system."

B1206 THE SETTING OUT OF WORK AND PROTECTION OF BEACONS

Replace "clause 14" in the first paragraph with "clause 4.7"

Add the following at the end of the fourth paragraph:

"Road markings, particularly the divergent/convergent lines of ramp interchanges and no overtaking barriers are also elements of the road that require proper setting out. The contractor shall prove to the engineer that critical reference points have been satisfactorily recorded for later reinstallation before any work commences that will obliterate the existing markings."

Delete "and of clause 14 of the general conditions of contract" *in the sixth paragraph*.

Add the following paragraph:

"The contractor shall take care that property beacons, trigonometrical survey beacons or setting-out beacons are not displaced or destroyed without the consent of the engineer. Property beacons and trigonometrical survey beacons that have been displaced or destroyed shall be replaced by a registered land surveyor, who shall certify such replacement.
The cost of replacing all beacons displaced or destroyed during the course of the contract without the consent of the engineer shall be the contractor's responsibility and included in the tender rates".

B1207 NOTICES, SIGNS AND ADVERTISEMENTS

Delete the third paragraph and replace with the following:

"All signboards erected in accordance with the drawings shall be removed at the same time as the de-establishment of the contractor's camp. Payment under subitem 13.01 for the final instalment of 15% of the tendered lump sum shall not be made unless all the advertisements, notices and temporary signs have been removed

B1209 PAYMENT

b) Rates to be inclusive

Add the following to the first paragraph:

"VAT shall be excluded from the rates."

Insert the following after "constructional plant" in lines 6 and 7 of the first paragraph:

"(distinguishing between operational costs and hire costs)".

c) The meanings of certain phrases in payment clauses

Procuring and furnishing ... (material)

Add the following:

"Payment for procuring and furnishing material from commercial sources shall include all transport costs, irrespective of distance hauled".

e) Materials on the site

Replace "clause 52" *in the first line with* "sub-clause 14.5"

Add the following sub-clauses:

"**g) Work in confined areas**

Except where provided for in the specification and the Pricing Schedule no extra payment shall be made nor shall any claim for additional payment be considered for construction in confined areas. The omission of standard pay items from the schedule of quantities shall be taken to be deliberate and any additional costs incurred shall be included in the bulk rate.

h) Split quantities

Wherever in the Pricing Schedule allowance has been made to price items of work for which a product or material is uncertain and quantities split between pricing items, the Employer reserves the right to choose whichever is the most appropriate or combination thereof, regardless of any adverse effect on the Contractor's costs and no claims for additional compensation shall be entertained."

B1210 CERTIFICATE OF PRACTICAL COMPLETION OF THE WORKS

Replace the 1st paragraph with the following:

*"*Notwithstanding that there might be natural or programmed sections of the works that will result in them being completed in their entirety before other sections, no consideration shall be given to the issuing of practical completion certificates for parts of the works. The use of any completed roadway or parts of the work, whether for unhindered use by the public or for accommodation of traffic while other parts are being constructed, shall not constitute use or occupation by the Employer.

The notice to the engineer, ito clause 5.14.1 of the Conditions of Contract applying for a Practical Completion Certificate, shall include the contractor's own list of what it considers to be the outstanding minor works that do not substantially affect the use of the Works. As justification that the issue of a Practical Completion Certificate is warranted the contractor shall take note that the following sections of the works are to be completed to the satisfaction of the engineer*:"*

Add the following to sub-clause (e) before the semicolon:

"(including road studs)"

been identified as deficient before submitting a new notice of application."

B1216 INFORMATION FURNISHED BY THE EMPLOYER

Add the following after paragraph 3:

"Although the information provided here will assist the contractor in selecting the necessary machinery and construction water requirements, it is still the responsibility of the contractor to ensure that he familiarise himself with the condition on site. No claims relating to the improper use of equipment, or the compaction of sand will be entertained."

B1219 WATER

Add the following:

"Water for use on site other than municipal, shall be subject to the required permit from Department of Water Affairs (DWA). This shall include such extraction points as rivers, dams, streams, and boreholes.

Use Table B1219 below to determine the suitability of water for construction purposes.

Table B1219: Water Classification for Construction: Testing

		Water Quality Classification Code						
		H0	H1	H2	H3	H4	H5	
Property	**Unit**	**Pure water (AR)**	**Clean water (Rain)**	**Treated water (Municipal)**	**Silty (muddy) water with low salt content**	**Highly mineralised chloride sulphate water (brackish)**	**Waste brack, sewage, marsh, sea, etc. water**	**Method**
PH*	-	7.0	5.7 – 7.9	4.5 – 6.5	4.5 – 8.5	9.0	-	SABS M113 SM 11 - 1990
Dissolved solids*	ppm	0	1000	1500	3000	-	-	SABS 213 SM213 - 1990
Total hardness*	-	None	None	Temporary	Temporary	Permanent	-	SABS 215 SM 215 – 1971
Suspended matter	ppm	0	2000	2000	5000	-	-	SABS 1049 SM 1049 – 1990
Electrical conductivity	mS/m	0	200	200	500	-	-	SABS 1057 SM 1057 – 1982
Sulphates (SO4)	ppm	0	200	300	500	1000	-	SABS 212 SM 212 – 1971
Chlorides (Cl)	ppm	0	500	1000	3000	5000	-	SABS 202 SM 202 – 1983
Alkali Carbonates (CO3) & Bicarbonates (HCO3)	ppm	0	500	1000	1000	2000	-	SABS 241 – 1999
Sugar	-	Negative	Negative	Negative	Negative	Negative	-	SABS 833
Quality of water required		Untreated layer works	✔	✔	✔	✔	Investigate the effect on the quality of the material	
		Chemically treated layer works	✔	✔	✔	Investigate the effect on the quality of the material		
		Concrete mass	✔	✔	✔	Investigate the effect on the quality of the material		
		Concrete prestressed	✔	✔	References: 1. Concrete Technology – Dr S Fulton (1989) 2. Materials Manual (PAWC)			
		Slurry & emulsion	✔	✔				
		Soil/gravel tests	✔	✔				
		Chemical or control tests	✔	✔				

- A primary property. The quality of the water is that quality where all three of the primary properties are within the limits.
- The tabulated single values are maximum value except in the case of the pH value for pure water, which must be 7.0

B1228 LEGAL PROVISION

Add the following paragraph:

"The Contractor shall be required to comply with the Occupational Health and Safety Act, 1993: Construction Regulations, 2003 (the regulations) as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003. Non-compliance with these regulations, in any way whatsoever, will be adequate reason for suspending the Works.

The proposed type of work, materials to be used and potential hazards likely to be encountered on this Contract are detailed in the Project Specifications, Schedule of Quantities and Drawings, as well as in the Employers' health and safety Specifications (regulation 4(1)) of the Construction Regulations 2003.

The contractor shall in terms of regulation 5(1) provide a comprehensive health and safety plan detailing his proposed compliance with the regulations, for approval by the employer.

The contractor shall at all times be responsible for full compliance with the approved plan as well as the Construction Regulations and no extension of time will be considered for delays due to non-compliance with the above-mentioned plan or regulations.

A payment item is/Payment items are included in the Schedule of Quantities to cover the contractor's cost for compliance with the OHS Act and the above-mentioned regulations."

B1229 SANS CEMENT SPECIFICATIONS

Add the following to this clause:

"Where reference is made in this specification or the standard specifications to the cement specifications, e.g. SANS 471: Portland cement and rapid hardening Portland cement, it shall be replaced with the new specification:

SANS 50197-1:2000 Cement compositions, specifications, and conformity criteria Part 1: Common cements.

Furthermore, where reference is made in this specification or the standard specification to a different cement type, the following names will apply, and the engineer will confirm the relevant new name from the table below:

Cement Grade	Cement Type	Approximate old product name	New Alpha	New Blue Circle	New NPC	New PPC	New Slagment
52.5	CEM I	Rapid hardening	Rapid Hard	Duracast	Eagle Super	-	-
42.5R	CEM I	Rapid hardening	-	-	-	Rapo	-
42.5	CEM I	OPC*	Portland cement	Duratech	-	OPC	-
	CEM I	LASRC	-	-	-	LASRC	-
	CEM II A-S	PC 15SL	-	-	Eagle Plus	-	-
	CEM II B-S	RH30SL	-	-	Eagle Plus	-	-
32.5R	-	-	-	-	-	-	-
32.5	CEM II A-V	PC 15FA	All Purpose Cement	-	-	Surebuild	-
	CEM II A-W	PC15FA	-	-	-	Surebuild	-
	CEM II A-L	-	All purpose Cement	-	-	Surebuild	-
	CEM II B-V or W	PC25FA/PFAC**	-	Structrete	-	Surecrete	-
	CEM IIIA	PBFC	-	BFC	Eagle Pro	-	PBFC
	CEM IIIA	RHSL	-	-	-	-	RHSL
22.5	MC 22.5X	PFAC***	Multi Purpose Cement	Durabuild	-	-	-
	MC22.5X	PFAC***	-	Buildcrete	-	-	-
12.5	MC 12.5	Wallcrete	Mortar Cement	Wallcrete	-	Masonry	-
	MC 12.5	Mortacem	-	-	-	-	-

Notes: * *OPC cements previously performed approximately as CEM 1 32,5R products*

** *PC25FA cements under the old standards achieved lower compressive strengths than the OPC's of the time*

*** *Some PFAC cements meet the new standard for MC 22,5X. Others required modification before meeting the requirements for MC 22,5X"*

B1230 MATERIALS

(a) General

The contractor, when using materials that are required to comply with any standard specification, shall, if so ordered, furnish the engineer with certificates showing that the materials do comply with this specification.

Where so specified, materials shall bear the official mark of the appropriate authority. Samples ordered or specified shall be delivered to the engineer's office on the site free of charge.

Where materials are specified under trade names tenders must be based on these materials. Alternative materials may be submitted as alternative tenders and the engineer may, after receipt of tenders, approve the use of equivalent materials. The tender must be clearly marked as an alternative tender, failing which the tender may be rejected.

Unless otherwise specified, all proprietary materials shall be used and placed in strict accordance with the relevant manufacturer's current published instructions. Agrément certified products shall be used and placed in accordance with its Agrément certification criteria.

Unless anything to the contrary is specified, all manufactured articles or materials supplied by the contractor for the permanent works shall be unused.

Any materials excavated or present on the site or within the road reserve, or in borrow areas shall not become the property of the contractor but will be at his disposal only in so far as they are approved for use on the contract, unless otherwise indicated in the project specification.

Existing structures on the site shall remain the property of the Employer and except as and to the extent required elsewhere in the contract, shall not be interfered with by the contractor in any way.

Materials to be included in the works shall not be damaged in any way and, should they be damaged on delivery or by the contractor during handling, transportation, storage, installation or testing they shall be replaced by the contractor at his own expense.

All places where materials are being manufactured or obtained for use in the works, and all the processes in their entirety connected therewith shall be open to inspection by the engineer (or other persons authorised by the engineer) at all reasonable times, and the engineer shall be at liberty to suspend any portion of work which is not being executed in conformity with these specifications.

The contractor shall satisfy himself that any quarry selected for use provides the necessary mined material in accordance with the specification.

(b) Banned materials

No tar fluid products shall be used in the construction works.

B1231 MIX DESIGNS

Before commencing with certain construction activities, the contractor shall, except where specified otherwise in the relevant construction sections in the Scope of Works, apply the following procedures with regards to mix designs:

- Taking and submitting samples of the relevant materials.
- Undertake the required mix design(s) or allow the engineer to undertake them.
- Produce, where required, laboratory, production/plant and/or trial mix(es).
- Undertake the required adjustments to the mix design(s) and reproduce required laboratory, production/plant and/or trial mix(es).
- Complete trial section(s) where required.
- Await the engineer's approval of the mix design(s) and trial section(s).

B1233 OWNERSHIP OF REDUNDANT ROAD SIDE FURNITURE AND OTHER MATERIALS

Ownership of all redundant road side furniture and other materials will become the property of the contractor unless otherwise specified by the engineer.

COLTO SERIES 3000: EARTHWORKS AND PAVEMENT LAYERS OF GRAVEL OR CRUSHED STONE

SECTION B3200: SELECTION, STOCKPILING AND BREAKING DOWN THE MATERIALS FROM BORROW PITS, CUTTINGS AND EXISTING PAVEMENT LAYERS AND PLACING AND COMPACTING THE GRAVEL LAYERS

B3203 STOCKPILING THE MATERIAL

In the first paragraph, in the first sentence insert the following before "borrow pits":

"Commercial sources, existing pavement layers, ..."

In the third paragraph, replace the second and third sentences with:

"Before any stockpiling may be done the area shall be cleared of topsoil to a sufficient depth that will subsequently allow for the complete rehabilitation of the site with a cover of topsoil that does not exceed 100mm in depth and is not less than 75mm in depth. If there is insufficient topsoil; the contractor shall acquire whatever balance is needed to rehabilitate the area at his own cost. No make-up topsoil shall be taken from the road reserve. The topsoil shall be stored in an area that shall not be affected by construction activities nor impede the natural flow of water. The topsoil so windrowed or stockpiled and its surrounds shall be kept free of all undesirable vegetation. The contractor shall not commence his stockpiling activities without prior written approval from the engineer that the site has been adequately prepared.

Stockpile sites shall be graded smooth with an adequate slope to ensure proper drainage. The surface shall be watered and compacted to a depth of at least 150 mm and to a density of 90% of maximum dry density. The compacted surface shall be firm. Upon completion, the surface shall be swept clean.

Stockpile sites shall be large enough to allow the different types of material to be stockpiled without overlapping or exceeding the limits of the prepared site. Enlargement of the stockpile sites after the stockpiles have been placed will not be permitted without the engineer's approval.

After the stockpiled material has been removed, the site shall be reinstated as closely as possible to its original condition by ripping of the affected areas, re-landscaping if necessary, re-instatement of the topsoil and re-vegetation."

B3204 BREAKING-DOWN THE MATERIAL

(b) Further breaking-down of pavement material

Add the following at the end of the 1st paragraph:

"This shall apply mutates mutandis for in situ recycling of pavement layers."

B3208 PLACING AND COMPACTING THE MATERIALS IN LAYER THICKNESSES 0F 200mm AND LESS AFTER COMPACTION

Add the following before the 1st paragraph:

"In the case of in situ reconstruction of existing pavement layers, the contents of this clause shall apply regardless of the layer thickness after compaction."

Add the following new sub-clause:

d) Construction joints in new layers

Where construction joints are formed between adjacent portions of the same layer the following conditions shall apply:

(i) Joints shall be either at right angles or parallel to the road centreline.

(ii) Joints in successive layers shall not correspond with those of the layers below and shall be offset at a minimum of 150mm or as indicated on the drawings.

(iii) The need for and positions of all proposed joints shall be approved by the engineer prior to the commencement of work.

(iv) During the creation of a joint in a layer, the existing material or the material previously placed for the specific layer shall either be cut back sufficiently (minimum 150mm) to ensure the incorporation of any loose or disturbed material, or ripped (minimum 150mm) and compacted together with the new portion of the layer to be constructed or only re-compacted together with the new portion of the layer as may be required by the engineer to ensure that a sound fully compacted joint is formed."

B3212 MEASUREMENT AND PAYMENT

In the introductory paragraph replace the comma after "below" *in the penultimate line with a full stop and delete the remainder of the paragraph.*

Add the following as a 2nd paragraph:

"Separate payment for work applicable to these payment items shall be made under the relevant sections in these specifications pertaining to the construction material required. For example, material procured from borrow that is crushed and screened for use in selected and sub-base layers shall be measured for payment under Section 3400: PAVEMENT LAYERS OF GRAVEL MATERIAL as:

34/32.01(d) and 34/32.03(d) etc., whichever is the relevant pairing of pay items under sections 3200/3400."

SECTION B3300: MASS EARTHWORKS

B3302 MATERIALS

b) Fill

Add the following under item (iv):

"The maximum swell at 100% Mod AASHTO compaction shall not be more than 2%."

B3303 CLASSIFICATION OF CUT AND BORROW EXCAVATION

Classification of cut and borrow excavation shall be revised as follows:

"**a) Classes of excavation**

(ii) Intermediate excavation

No distinction shall be made between soft and intermediate excavation, and all intermediate excavation shall be classified and measured as soft excavation."

B3305 TREATING THE ROADBED

a) Removing unsuitable material

Replace "or" in the eight line of the third paragraph with "and"

d) In situ treatment of roadbed

Add the following after the second paragraph:

"Shales and mudstone shall be treated as directed by the engineer."

B3307 FILLS

a) General

Add the following:

"Where existing embankments are to be widened, or where new embankments are to be constructed adjacent to existing embankments, the existing side slopes shall be benched as specified in subclause 3307(d) and in accordance with the details on the drawings.

In addition the material in the fill widening shall, unless otherwise instructed by the engineer, be compacted as follows:

(i) where the thickness exceeds 1,5 m, it shall be compacted to a minimum of 93% modified AASHTO density to a depth of at least 1,5 m below the final road level; or

(ii) where the thickness is less than 1,5 m, the in situ roadbed and fill material shall be compacted to 93% modified AASHTO density."

d) Benching

Replace the first sentence of the second paragraph with the following:

"The dimensions of benches as well as the extent to which existing fills have to be cut back to form benches shall be as indicated on the drawings or indicated by the engineer."

Add the following after the second paragraph:

"In order to obtain sufficient working width for road-building equipment when the existing road fill is widened, it may be necessary to form benches that extend beyond the normal road prism or to cut back into the existing road fill or both. The contractor shall submit his proposals in this regard to the engineer for approval before proceeding with such work. The contractor will be paid in accordance with the relevant payment items for work required to obtain a working width of up to 4 m. Additional work required to provide a working width in excess of 4 m shall be at the contractor's expense."

B3312 MEASUREMENT AND PAYMENT

Amend the pay item 33.04 as follows:

"Item **Unit**

B33.04 Cut to spoil, including all haul. Material obtained from:

The tendered rates for cut to spoil shall indude full compensation for excavating from the road prism and roadbed in the various classes of excavation. for- loading, transporting the material for all-haul distance irrespective of a distance, off-loading and disposing of the material as specified, including shaping and levelling-off any piles of spoilmaterial.

Amend the pay item 33.07 as follows:

"Item **Unit**

B33.07 Removal of unsuitable material, including all haul:

The tendered rates shall include full compensation for the removal of all classes of unsuitable material and shall distinguish only between stable and unstable material and layer thicknesses of less than and exceeding 200 mm. It will also include compensation for all-haul distance irrespective of a distance

Add the following items:

"Item **Unit**

B33.20 Fill constructed with material obtained from commercial sources or sources provided by the contractor, including all haul

(a) Gravel material in compacted layer thicknesses of 200 mm and less:
  i) Compacted to 90% of modified AASHTO density ..... cubic metre (m^3)
  (ii) Compacted to 93% of modified AASHTO density ..... cubic metre (m^3)

The unit of measurement is the cubic metre of material measured in the compacted fill. The quantity measured shall be calculated by the method of average end areas from levelled cross-sections prepared from the ground line after clearing and grubbing and the removal of topsoil and the completion of any preparatory roadbed treatment which may have been ordered by the engineer, but prior to the construction of the fill, and the final specified or authorised fill cross-section superimposed at 20 m intervals along the centre line of the road. All measurement shall be neat and no payment will be made for that part of the fill placed in excess of the authorised cross-section shown on the drawings or instructed by the engineer, irrespective of the tolerances in workmanship allowed under the contract. Where the roadbed has subsided under the fills, the quantities shall be adjusted to make allowance for such subsidence, as set out in the note at the beginning of clause 3312. Measurement of fill shall distinguish between the alternative methods of processing and compacting.

Where measurement by cross-sections is considered by the engineer to be impractical, the compacted volume of the material may be taken as equal to 70% of the loose volume of material in the hauling vehicles as an alternative method of measurement.

The tendered rates shall include full compensation for the costs of negotiations and payment of royalties, for procuring, furnishing and transporting the materials over an unlimited free-haul distance from the sources to the site, for placing, preparing, processing, shaping, watering, mixing and compacting the materials to the densities or in the manner specified, and for removing and disposing of all oversize material from the road after processing, including transport for the haul distance to approved dumping sites provided by the contractor.

Payment shall distinguish between the various methods of processing and compacting specified, as itemised above.

SECTION B3400: PAVEMENT LAYERS OF GRAVEL MATERIAL

B3402 MATERIALS

a) General

Add the following at the end of the second paragraph:

"For chemically stabilised layers the material shall conform to the requirements in table B3402/5.

For cold in situ recycled layers the target grading shall be as indicated in table B3402/7"

Add the following after the second paragraph:

“Distinction shall be made between crushed and natural G4, G5 and G6 materials. Where the crushing and/or screening of these materials has been specified, the combined grading shall conform to the grading limits specified for G4 class material in Table B3402/1.

The same shall apply for all materials obtained from commercial sources.”

Replace the grading section in Table 3402/1 with:

Grading	Nominal aperture size of sieve (mm)	Percentage passing through sieve by mass			The percentage by mass passing the 2,00mm sieve shall not be less than 20% not more than 70%
		Crushed material Nominal max size		Uncrushed material	
		37,5 mm	28 mm		
	53			100	
	50			95 - 100	
	37,5	100		85 – 100	
	28	86 - 95			
	20	73 - 86	87 - 96	61 - 91	
	14	61 - 76	73 – 86		
	5	37 - 54	43 - 61	31 - 66	
	2	23 – 40	27 – 45	20 – 50	
	0,425	11 – 24	13 – 27	10 – 30	
	0,075	4 - 12	5 - 12	5 - 15	

Note:

Refer to standard COLTO table for COLTO grading if required

Replace Table 3402/5 with:

"Table B3402/5: Requirements for Chemically Stabilised Layers

Classification	C1	C2	C3	C4
Material before treatment	At least G2 quality	At least G4 quality	At least G5 quality	At least G6 quality
PI after treatment	Non-plastic	Non-plastic	6 max. *(1)	6 max. *(1)
UCS (MPa) *(2)	6 min.	4 min.	1,5 min	0,75 min.
ITS (kPa) *(3)	-	-	250 min.	200 min.
WDD (% loss)	5 max.	10 max.	20 max.	30 max.

Note:

* (1) For materials derived from the basic crystalline rock group, the Plasticity Index after stabilisation shall be non-plastic.

* (2) Unconfined Compressive Strength @ 100% Mod. AASHTO density

* (3) Indirect tensile Strength @ 100% Mod. AASHTO density (Rapid Curing)

* (4) Wet/Dry Durability according to Method B 8110"

B3405 CONSTRUCTION TOLERANCES

(a) Level

Replace the table in the sub-sub-clause with the following:

"	H_{90}	H_{max}
Selected layers	*25 mm*	*33 mm*
Sub-base layers	*15 mm*	*20 mm*
Base layers	*12 mm*	*15 mm*
Shoulders		*25 mm"*

Add the following:

"Level control for the various pavement layers shall be done at least at the following intervals in the longitudinal direction:

Layer	Interval
Selected layer, sub-base, shoulders and wearing course	20 m
Base	10 m

(b) Layer thicknesses

Replace the table in the sub-sub-clause with the following:

"	D_{90}	D_{max}	D_{ave}
Selected layers	*25 mm*	*35 mm*	*8 mm*
Sub-base layers	*18 mm*	*24 mm*	*5 mm*
Base layers	*15 mm*	*22 mm*	*5 mm*
Shoulders		*30 mm*	*0 mm"*

B3406 QUALITY OF MATERIALS AND WORKMANSHIP

Replace the second paragraph with the following:

"Test results and measurements will be assessed in accordance with the provisions of Section 8200."

B3407 MEASUREMENT AND PAYMENT

Add the following items:

"Item **Unit**

B34.15 Pavement layers constructed from gravel obtained from commercial sources or sources provided by the contractor, including all haul

(a) Gravel selected layer compacted to:

i) 93% of modified AASHTO density for a compacted layer thickness of 150mm (G7 Material) ..... cubic metre (m^3)

(b) Gravel subbase (chemically stabilised material) compacted to:

i) 95% of modified AASHTO density for a compacted layer thickness of 150mm (G5 Material) ..... cubic metre (m^3)

ii) 97% of modified AASHTO density for a compacted layer thickness of 200mm (G5 Material) ..... cubic metre (m^3)

iii) 97% of modified AASHTO density for a compacted layer thickness of 250mm (G5 Material) ..... cubic metre (m^3)

The unit of measurement is the cubic metre of material measured in the compacted pavement layer and the quantity shall be calculated from the authorised dimensions of the completed layer. All measurement shall be neat, and no payment will be made for that part of the pavement layer placed in excess of the authorised cross-section shown on the drawings or instructed by the engineer, irrespective of the tolerances in workmanship allowed under the contract.

Where measurement by cross-sections is considered by the engineer to be impractical, the compacted volume of the material may be taken as equal to 70% of the loose volume of material in the hauling vehicles as an alternative method of measurement.

The tendered rates shall include full compensation for the costs of negotiations and payment of royalties, for procuring, furnishing and transporting the materials over an unlimited free-haul distance from the sources to the site, for placing, preparing, processing, shaping, watering, mixing and compacting the materials to the densities or in the manner specified, and for removing and disposing of all oversize material from the road after processing, including transport for the haul distance to approved dumping sites provided by the contractor. The tendered rate shall also include protection and maintenance of the layer and the conducting of control tests, all as specified.

SECTION B3500: STABILIZATION

B3501 SCOPE

Add the following as a 3rd paragraph:

"The use of recyclers for cold in situ recycling purposes is also covered in this section, which includes cement, lime, emulsion and foam stabilisation of base and subbase layers consisting of gravel and/or crushed stone material as described in sections 3400 and 3600."

B3502 MATERIALS

a) Chemical stabilizing agents

Delete sub-clauses (ii) Ordinary Portland cement *and* (iii) Portland blast-furnace cement *and replace with the following*:

"Cement shall comply with the relevant requirements of SANS 50197-1:2000. The use of strength classes greater than 32,5 shall not be permitted.

On this contract (CEM 11/B-L32.5N) shall be used for stabilization purposes."

Add the following sub-clause:

B3503 CHEMICAL STABILIZATION

a) Preparing the layer

Insert the following before the first paragraph:

"Moisture content tests shall not be undertaken more than one day in advance of in situ stabilization operations. Care shall be taken to ensure that samples are representative of the in situ material. Checks shall be conducted when wet weather occurs between initial testing and work commencing on any section."

b) Applying the stabilizing agent

Replace the second sentence of the second paragraph with the following:

"Spreading shall only commence when the engineer is satisfied that the correct quantity of stabilizing agent has been placed on the layer and has given permission that the stabilizing agent may be spread uniformly over the entire surface to be treated."

h) Curing the stabilized work

Add the following to method (ii):

"The covering material shall be placed by end-tipping, spread, and not compacted until the underlaying layer has cured for at least 7 days."

Add the following to paragraph:

"Method (iii) and (iv) shall not be applicable."

i) Construction limitations

Replace the fourth paragraph starting with "No stabilization ..." *with the following:*

"No stabilization shall be done during windy conditions, wet weather or with falling air temperatures (7°C and dropping), or during rising air temperatures (when the air temperature is below 3°C).

The surface temperature of a compacted stabilized layer shall not be allowed to fall below 1°C during the first three (3) days after stabilization. The contractor shall be responsible for taking the necessary precautions to prevent the layer from freezing.

All stabilized layers damaged by rain, frost or by the formation of ice in the layer shall be removed and replaced by the contractor at his own expense.

The contractor shall make allowance for these requirements in his construction programme."

In Table 3503/1, delete "8 hours" for Ordinary portland cements and cement blends *and replace with* "6 hours".

B3506 TOLERANCES

b) Uniformity of mix (chemical stabilisation)

Test method 3506(b)(i) shall be used.

Replace the full stop at the end of paragraph (i) with the following:

"using the formula $(\underline{S_n} / X_n)$

where:

S_n is the standard deviation of stabilizer
X_n is the average stabilizer content."

B3507 CONSTRUCTION OF TRIAL SECTION

Insert the following before the second paragraph:

"Prior to carrying out the trial section for cold in situ recycling, the contractor shall assemble all items of plant and equipment that he proposes to use for the recycling operation. Only those machines he intends using for production work shall be used to construct the trial section and under no circumstances shall he be permitted to use any substitutes. The first section of pavement to be recycled shall be regarded as a trial section with the objective of:

- demonstrating that the equipment and processes he proposes to employ are capable of constructing the recycled layer in accordance with the specified requirements;
- determining the effect on the grading of the recycled material by varying the forward speed of the recycling machine and the rate of rotation of the milling drum; and
- determining the amount of rolling necessary to achieve the compaction requirements.

The trial section shall be at least 200m in length and shall cover the full lane-width or half-road width in accordance with the geometry of the road and the accepted work plan.

To allow the engineer sufficient time to assess all aspects of quality of the completed trial section and contingent on the results being satisfactory, the contractor shall programme to start production recycling work no sooner than one week after constructing the trial section.

Should the contractor make any alterations in the methods, processes, equipment or materials used, or if he is unable to comply consistently with the specifications due to variations in the in situ material, or for any other reason, he may be required to undertake further trial sections before continuing with the permanent work."

Insert the following new paragraph after the third paragraph:

"For cold in situ recycling provision is made for payment for the first approved trial section. Such payment will be made as an extra-over to the various payment items for recycling work together with all additives that will be measured and paid as normal production work. Any further trial sections ordered by the engineer shall likewise be paid provided they are approved."

B3509 QUALITY OF MATERIALS AND WORKMANSHIP

Add the following paragraphs:

"The engineer shall be notified in good time to enable him to conduct tests himself.

Sample preparation and testing for cement stabilization testing shall be done by means of the Rapid Cure Method as described in clause B8110.

The stabilized material sampled from the layer for the compaction of modified AASHTO briquettes, shall be prepared according to SANS 3001; GR54; i.e. discard material coarser than a 37,5 mm test sieve, and compacted according to SANS 3001; GR31.

Any delamination of the completed layer (biscuiting), identified by the hollow sound caused when a chain is dragged over the stabilized layer, shall be removed and repaired prior to the construction of subsequent layers. The repair method shall be approved by the engineer. No payment will be made for repairs.

(a) Process control for cold in situ recycling

The contractor shall establish a comprehensive process control system for the recycling work.

The following daily reports shall be submitted as a minimum:

- The production plan;
- The completed pre-start check list;
- Weather conditions and temperature measurements;
- Details of the recycling work completed during the day with the following information for each cut that was made:
  - start and end chainage;
  - depth of cut (including a schedule of dip measurements);
  - width of application of stabilising agent(s);
  - nozzle settings (closures) for each spraybar (where relevant);
  - computer data input;
  - cement / lime spreading check measurements (where relevant); and
  - compaction data in electronic format from the integrated compactometer device fitted to the primary roller (if applicable):
- Relevant comments / information concerning the recycling operation. These shall include but shall not be limited to:
  - standing time and the reason(s);
  - sections where in situ pavement conditions changed together with a description of the change (e.g. thick asphalt between km 1+200 and km 1+230 in Cut #2);
  - details of any non-routine tests that were undertaken;
  - any changes in the weather during the day (e.g. strong wind from 13:00); and
  - relevant instructions received and from whom; and
- The location where the daily sample of pulverised material was taken."

B3513 PROTECTION AND MAINTENANCE

(a) Trafficking the completed layer

(i) Cementitious stabilisation

Under no circumstance shall traffic be allowed to travel on layers of cement stabilised material.

(c) Application of surfacing

To prevent environmental degradation and/or abrasion damage, new base layers shall be surfaced as soon as the moisture content at all positions within the layer is below 50% of optimum moisture content according to TMH 1, Method A7.

The maximum time delay between completing a new base layer and applying the surfacing shall be 14 days (with due allowance made for inclement weather)."

B3510 MEASUREMENT AND PAYMENT

Item **Unit**

B35.02 Chemical stabilizing agent

Replace the full stop at the end of the third paragraph with the following:

" and layer dimensions."

Item **Unit**

Add the following new payment items:

"**Item** **Unit**

B35.14 Sampling of in situ material for mix design procedure ..... Number (No)

The unit of measurement shall be the number of positions for sampling of in situ material for the mix design procedure.

The tendered rate shall include full compensation for all costs to make available, operate and to transport the recycling machine and other equipment to the sampling position. To provide the required traffic accommodation in terms of section B1500. The tendered rate shall further include full compensation for breaking up the pavement for sampling and temporary patching the disturbed road way by adding make-up material, watering,

COLTO SERIES 8000: SUNDRIES

SECTION B8100: TESTING MATERIALS AND WORKMANSHIP

B8102: TESTING METHODS

Insert the following as a new first paragraph:

"Where reference is made to TMH test methods in this specification or the standard specifications, it shall be replaced with the relevant current published SANS test method."

B8105 TESTING OF AGGREGATES

Add the following sub-clause:

"**g) Determination of Ethylene Glycol Durability Index**

The Ethylene Glycol Durability Index shall be determined as follows:

(i) Apparatus

Suitable pans or basins

Ethylene Glycol solution

Stirring rod

(ii) Method

Obtain three or more representative samples from the source to be evaluated.

If not already crushed, crush the material in order to obtain sufficient minus 19mm plus 13mm sized aggregate in order to totally cover the bottom of the basin or pan with a single layer of stone. Add sufficient ethylene glycol to each basin ensuring that every aggregate particle is completely submerged.

After soaking for 24 hours, gently stir the aggregate and allow to settle. Observe and record the response of the aggregate to the ethylene glycol according to the criteria listed in (iii) below. Continue the above cycle at intervals of 24 hours for a further 4 days, in each case recording the observed response. After 5 days allow the samples to remain submerged in the solution and observe and record the disintegration response after a total period of 15, 30 and 60 days have elapsed.

(iii) Classification of response

After each cycle, classify and record the response of the aggregate as follows:

DISINTEGRATION CLASS

Class 1: No obvious effects, or only very minor spalling of sand sized particles or very small flakes.

Class 2: Splitting of rock, accompanied by any other disintegrative effects.

Class 3: Fracturing (spheroidal and/ or internal) without extensive spalling or distortion.

Class 4: Fracturing (spheroidal and/or internal) with extensive spalling or distortion.

Class 5: Complete disintegration.

TIME CLASS

The time factor in the above disintegrative process is classified according to the time taken for the most serious effect of the expansive stresses to occur i.e.

Class 4: 0 - 5 days
Class 3: 6 - 15 days
Class 2: 16 - 30 days
Class 1: 31 - 60 days
Class 0: Over 60 days

(iv) Determination of Glycol Durability Index

The Ethylene Durability Index is determined by adding the class number as assigned for the specific disintegrative response observed to the class number as assigned for the period for this response to occur. A durability index ranging from 1 (no response) to 9 (rapid and complete disintegration) is thus determined."

B8108 DETERMINING THE TOTAL APPROXIMATE DRY BULK RELATIVE DENSITY AND THE APPARENT DENSITY

Add the following at the end of this clause:

"For materials where the total water absorption, when determined according to TMH1 Methods B14 and B15, is in excess of 1,5%, the Apparent Density shall be calculated in accordance to the following formula:

$$\frac{(b - a)}{(d - a) + \{ (w - 1.0)/100 \times (b - a) \} - (c - b)}$$

This formula shall be used as an alternative to note (5) regarding soaking period, when so instructed by the engineer."

SECTION B8200: QUALITY CONTROL

B8206 JUDGEMENT PLAN B

Notes (Table 8206/3)

(1) Asphalt base or surfacing: Specification limits for-

(c) **Voids**

Delete and replace the contents of this subitem with the following:
"L_s = specified values -1,0% points
L'_s = specified values +1,0% points"

PORTION 3: PARTICULAR CIVIL SPECIFICATIONS

PQA: BRICKWORK, BLOCKWORK AND PLASTERING
(Supplementary to SABS 1200 – 1986)

PQA 1 BRICKS AND BLOCKS

PQA 1.1 Burnt Clay Masonry Units

Solid clay masonry units (bricks) shall be of nominal dimensions 222 x 106 x 73 mm, shall comply with SANS 227 and conform to the types scheduled, as selected from the following:

	Nominal Compressive Strength	Max Water Absorption
FBX - face brick extra	17,0 Mpa	10%
FBS - face brick standard	17,0 MPa	12%
NFP - non facing to be plastered	10,5 MPa	15%
NFX - non facing extra for damp conditions	14,0 MPa	15%

Engineering bricks shall carry the suffix 'E' and the compressive strength in MPa and shall be of one or more of the following types as scheduled:

		Max Water Absorption
FBXE 45	the best engineering brick	7%
FBSE 30	a good engineering brick	8%
NFXE 14	the lowest acceptable category	10%

Sample bricks shall be taken at random by the Employer's Agent, should he consider tests to be necessary. These tests shall normally comprise an inspection for defects, a compressive strength test and a water absorption test. Should any deficiencies become apparent after testing in accordance with SANS 227, the Employer's Agent shall have the right to reject the complete consignment.

PQA 1.2 Concrete Masonry Units

Concrete masonry units (blocks) shall comply with SANS 1215 and shall be either solid or hollow as called for in the Bill of Quantities or shown on the drawings.

The preferred dimensions of units, where not otherwise called for, are as follows:

Solid Units		222 x 106 x 73 mm
	or	190 x 90 x 90 mm
Hollow Units		390 x 90 x 190 mm
	or	390 x 190 x 190 mm

Preferred size when used in conjunction with clay bricks:

FU	-	Face Units	the nearest matching size to the clay bricks
FUA	-	Face units aesthetic	being used, especially in regard to height in order to suit brick courses

The nominal compressive strength of solid units or hollow blocks shall be at least 14 MPa except where shown otherwise on the drawings or the Bill of Quantities. The alternative strengths shall be either 7 or 21 MPa (3,5 MPa strength is not acceptable).

Masonry units manufactured with aggregates which contain slag, clinker or burnt clay brick shall not be used unless prior approval has been obtained from the Employer's Agent.

The average drying shrinkage of units shall not exceed 0,06% and the average expansion on rewetting shall not exceed 0,02% in excess of the actual drying shrinkage obtained from manufacturer's tests.

Sample units shall be taken at random by the Employer's Agent, should he consider that tests are necessary to satisfy himself that there are no deficiencies in any consignment. Should deficiencies occur when tested in accordance with SANS 1215, the complete consignment may be rejected.

PQA 2 BONDING OF BRICKWORK AND BLOCKWORK

PQA 2.1 Brickwork Bonds

Brickwork shall be laid in the following bonds, except where shown otherwise on the drawing or scheduled to the contrary:

Brickwork	230 mm thick	English bond
Brickwork	280 mm thick to cavity walls	Stretcher bond
Brickwork	350 mm thick below damp proof course	English bond

Cavity brickwork shall include wall ties which connect the inner and outer skins of the wall. The ties shall be galvanised and of approved pattern, fixed along every fifth course at spacings not exceeding 600 mm, with alternate rows staggered.

PQA 2.2 Blockwork Bonds

Bonding of blockwork shall be carried out in full compliance with SANS 10145.

PQA 3 BRICKLAYING AND BLOCKLAYING

PQA 3.1 Laying Clay Bricks

Brickwork shall be well and regularly bonded, with no false headers and none but whole bricks, except where legitimately required as closers. All bricks must be thoroughly wetted before laying and each brick is to be pressed into its bed so as to squeeze out superfluous mortar and give a finished joint generally 10 mm thick, but in no case shall it exceed 12 mm thickness. All joints, both horizontal and vertical, notwithstanding any trade custom to the contrary, are to be filled solid with mortar for their full width and depth, each course being flushed with mortar, worked well down into all vertical joints before the succeeding course is laid. All brickwork shall be built true and plumb with the perpends vertically in line.h
Horizontal and vertical joints shall be rounded, square or flush pointed as required by the Employer's Agent. All joints of facework shall be pointed flush. Walls to be plastered shall have the joints raked out to a depth of 6 mm to form a key for the plaster.

Bricklaying is to be carried out uniformly so that no part of the work shall be in advance of any other part by more than six courses, unless otherwise authorised by the Employer's Agent. In the latter case, the work is to be stepped back as toothing will generally not be allowed.

The cavity in cavity walls shall be kept free from mortar droppings and movable boards of the appropriate widths shall be used for that purpose. Vertical joints in the outside leaf on the course immediately above the damp proof course shall be raked out every fifth brick to drain the cavity. Around the periphery of all built-in frames the cavities shall be closed with interior brickwork.

PQA 3.2 Laying Concrete Blocks

Concrete blocks shall be laid in compliance with Code of Practice SANS 10145.

Blocks shall not be wetted prior to laying in a wall and the moisture control at the time of laying shall comply with Table 2 of that Code of Practice. The drying shrinkage of the blocks to be laid shall be available to the Employer's Agent in the form of a directive from the manufacturer of each type of masonry unit. The average annual humidity shall likewise be made available to the Employer's Agent.

Blocks shall be laid on a full bedding of mortar. All joints are to be nominally 10 mm thick and both vertical and horizontal joints shall be completely filled. Blocks shall be laid with the thicker shell face outermost. They shall be laid in stretcher bond with the horizontal distance between vertical joints in adjacent course equal to at least one quarter of the length of the block. All blockwork shall be built true and plumb with the perpends vertically in line.

Control joints shall be formed at spacings indicated in Table 3, should joints not be detailed on the drawings. The spacing is a function of the vertical spacing of the horizontal reinforcement.

Corners and other work where the blocks are necessarily laid to a higher level than the general progress of work, shall be stepped back and not raised above the level of the remaining blockwork by more than one metre.

Blocks below damp proof course level shall be concrete-filled using concrete having the same mix proportions as the concrete in the strip foundations. The concrete shall be struck off flush at damp proof course level.

Horizontal reinforcement shall be placed at 600 mm vertical spacings unless shown otherwise on the drawings and bond beams shall be incorporated in the structure as shown on the drawings.

Fire resistance ratings as shown in Table 4 of the Code of Practice shall be adhered to, if required by the drawings.

PQA 4 LOUVRE VENTS AND AIR FILTERS

Where indicated on the drawings or ordered by the Employer's Agent, openings for louvre vents shall be formed through walls, and approved vents shall be built in or installed in the opening and neatly finished off.

Where indicated on the drawings, openings shall be formed through walls for air filters and the filters, supplied by an approved manufacturer, shall be jointed together to form panels as shown on the drawings and fitted in accordance with the manufacturer's instructions.

PQA 5 BUILDING IN PIPES, FRAMES, STEELWORK ETC

All window and door frames and wall vents are to be set up and built-in as the brickwork proceeds. Window and door frames are to be set, bedded and pointed in 4:1 sand cement mortar and the tendered unit rates are to include for any cutting and fitting of brickwork and for making good thereafter. The unit rates are also to include for attending to windows, doors and vents etc, in order to leave them in perfect working order. The Contractor will be held liable for the repair of any damage done to such items during progress of the work.t
Where pipes, frames, brackets or other such parts pass through or have to be set into brickwork, the bricks shall be carefully cut and fitted around the parts so as to maintain regularity of courses and uniformity of joints, the shaped bricks being bedded and pointed to conform to the surrounding brickwork. Where such parts have to be set into position after brickwork is built, holes shall be left wherever possible, in preference to cutting out bricks, and the work shall be subsequently made good in the manner described.m

PQA 6 DAMP PROOFING

PQA 6.1 Damp Proof Course

Where indicated on the drawings, and at window sills, a damp proof course is to be embedded into the work, consisting of a SABS approved bituminous sheeting of mass not less than 1,3 kg/m^2 or PVC sheeting of 0,375 mm thickness laid over the full width of the wall, lapped and sealed at all joints. Where shown on the drawings, the damp proof course is to be stepped up one course of brickwork in the inner skin. Proper returns are to be made at all door frames.

Damp proof courses in blockwork shall be laid strictly in accordance with Subclause 5.3.6 of SANS 10145 at all places indicated in that Code or Practice.

PQA 6.2 Underfloor Waterproofing

Underfloor waterproofing membranes, where called for, shall be of approved 250 micron thick PVC sheeting lapped to a minimum of 200 mm at all joints.

PQA 6.3 Waterproofing Blockwork Faces

Where the external faces of blockwork are not to be plastered, they shall be treated with an approved waterproof coating applied in accordance with the manufacturer's instructions.

PQA 7 WINDOW SILLS

Window sills shall be constructed as shown on the drawings or specified in the Bill of quantities, including items such as damp proof course and expanded metal reinforcement, where called for.

PQA 8 PRECAST CONCRETE LINTELS

Precast concrete lintels over doors and windows shall be E-type, supplied by an approved manufacturer and suitable for the thickness of the walls being constructed. Shoring of soffits of lintels shall be fixed on spans exceeding 2,5 m and left in place for as long as the Employer's Agent considers necessary. The length of lintels shall be such as to give at least 200 mm of bearing at each end.

PQA 9 EXTRACTION FANS

Where indicated on the drawings, openings shall be formed through walls for extraction fans. The required fans, complete with bird proof weather cowls, shall be supplied and fitted therein by an approved specialist firm. Making good around the fan unit shall be carried out by the Contractor.

PQA 10 WALL CHASING

Where directed by the Employer's Agent, the Contractor shall chase brickwork to accommodate electrical conduits. Such chasing shall precede plastering or rendering and on no account shall the plastering or rendering be commenced until the conduits have been installed. The rates for chasing shall include for making good the brickwork after the conduit has been fixed.

In the case of unplastered concrete walls, electrical conduits shall either be cast into the concrete during pouring or shall be surface mounted as indicated on the drawings or in the Bill of Quantities.

Chasing in masonry units shall be carried out in compliance with SANS 10145 and, where possible, as directed by the Employer's Agent, shall be cut prior to laying the blocks.

PQA 11 CEMENT MORTAR

PQA 11.1 Mortar for Brickwork

Sand for mortar shall comply with SANS 1090 and be well graded from 5 mm down in accordance with Table 1. Sand shall not contain an excess of dust or fine material. Cement shall be Portland cement Type CEM.I 42,5 to SABS.ENV 197-1.

Cement mortar shall be in the proportion 1 part Portland cement to 4 parts sieved sand in the case of face brickwork, and 1 part cement to 5 parts sand for all other brickwork.

PQA 11.2 Mortar for Blockwork

Mortars to be used for blocklaying are to be in accordance with either Classes I, II or III as specified in SANS 0145, Subclause 3.2.3 as called for in the Bill of Quantities or on the drawings. Should no specific strength be specified then Class II, mortar having a compressive strength of 5 MPa at 28 days shall be used. The mortar mix shall be 170 ℓ of sand to 50 kg of Portland cement 42,5 and shall be used in conjunction with an approved mortar plasticiser conforming to BS EN 934-3: 2009+A1: 2012.

Alternatively, 50 kg of an approved masonry cement (supplied by a reputable manufacturer) may be used in lieu of 50 kg of Portland cement in the mix to give the same 28 day strength as required under the previous paragraph, but in that case no mortar plasticiser is to be used.

PQA 12 REINFORCEMENT

PQA 12.1 Reinforcement to Brickwork

Brickforce mesh or similar approved welded mesh supplied in rolls shall be built into brickwork where specified or shown on the drawings.

Reinforcement to brickwork shall comprise galvanised welded mesh as called for on the drawings supplied in rolls. The mesh shall be of suitable width to suit the brickwork thickness and the minimum cover from any external face shall be at least 10 mm. Reinforcement is to be built in every third course except where shown otherwise on the drawings. Except where shown to the contrary on the drawings, galvanised steel strips of dimensions 1 360 mm long x 40 mm wide x 1,6 mm thick shall be used to tie brickwork into concrete columns at every fourth course.

PQA 12.2 Reinforcement to Blockwork

Reinforcement to blockwork shall comprise galvanised welded mesh supplied in rolls. The mesh shall be of suitable width to suit the blockwork thickness and the minimum cover from any external face shall be at least 20 mm. The number of courses where reinforcement is to be built in shall be at 600 mm (maximum) vertical spaces, except where shown otherwise on the drawings.

PQA 13 HOOP IRON TIES AND ANCHORS

Galvanised hoop iron ties shall be provided for securing roof timbers to brick walls and shall be built-in to a vertical depth of not less than six courses of brickwork with bottom ends bent square to form an anchor. The upper ends shall project at least 450 mm above the brickwork for attachment to roof timberwork.

Anchoring of roofs and floors in blockwork shall be carried out in accordance with SANS 10145 except where shown otherwise on the drawings.

PQA 14 PLASTERING

Plastering shall be composed of one part Portland cement 42,5 plus one tenth part lime to four parts fine plaster sand from an approved source. An equivalent mortar comprising other cementitious materials may be approved by the Employer's Agent, after testing. Plaster shall be applied to walls in one coat 12 mm thick and well worked into brickwork or blockwork joints, which shall have been previously raked out to form a key. The surface of the work shall be finally smoothed with a wooden float or steel trowel, as may be called for, depending upon the nature of the surface required. Angles and edges are to be carefully plumbed or levelled, as the case may be, and corners shall be arris rounded.
In the case of plastering to concrete work, the surface of the concrete shall first be hacked sufficiently to afford proper bond and the plaster applied as a thin skimming coat, or coats. V-joints shall be formed at the junction of concrete and brickwork. Plaster adhesive supplied by a reputable manufacturer may be used on the concrete faces in lieu of hacking, subject to prior approval by the Employer's Agent.

Where scheduled or shown on the drawings, the external faces of brickwork, blockwork and/or concrete shall be cement mortar plastered.

Should any plaster show signs of cracking, blowing or other defects at any time before or during the Defects Liability Period, the defective work shall either be stripped and re-plastered or locally repaired by the Contractor, all at his own expense, as directed by the Employer's Agent. The defective areas shall be cut out to a rectangular shape unless otherwise permitted, with edges undercut to form a key and the joint carefully smoothed off flush with the surrounding plaster. Plasterwork should in all cases be commenced at the top and proceed downwards and every care must be taken to prevent staining of face brickwork and other finished parts with plaster droppings. Such droppings shall not be allowed to harden, but shall be cleaned off continuously as plastering proceeds. Plaster droppings in sumps must be removed to the satisfaction of the Employer's Agent. Plastering must be carried out from ceiling to floor and from wall to wall without any breaks in the plastered surface.

PQA 15 PAYMENT FOR BRICKWORK

PQA 15.1 Brickwork ..... Unit: m²

Payment for brickwork will be made by area of finished brickwork of the various wall thicknesses and types as scheduled, measured in elevation.

Prices shall be inclusive of the supply of all materials, plant and labour necessary for completing the work, including the supply and building in of wire ties, all plumbing of corners and faces, lining, levelling, forming reveals and openings, cutting where necessary but not specially scheduled. The measurement of the work will be taken net with window and door openings deducted, but no deductions from the measurements will be made for lintels, air bricks, pipes up to and including 150 mm diameter or fittings up to 150 mm square built into the work. Small openings of area up to 0,05 m² will not be deducted.

Items for brickwork are scheduled separately for reinforced and unreinforced brickwork, except for small areas of reinforced brickwork over openings, windows and doors etc, which are deemed to be included in the rate for unreinforced brickwork.

PQA 15.2 Louvre vents.....Unit: No

Payment for louvre vents and air filters will be made by number supplied and installed.

PQA 15.3 Building in window frames, door frames, pipes, Steelwork, etc.....Unit: No

Payment for building in window frames, door frames, pipes, steelwork etc shall be paid separately for each type and size as scheduled.

PQA 15.4 Damp proof course ..... Unit: m²

Payment for damp proof course will be made by the net area of each size supplied and installed. No payment will be made for overlaps, etc.

PQA 15.5 Lintels . ..... Unit: m

Payment for lintels will be made by length installed.

PQA 15.6 Extraction fans .....Unit: No

Payment for extraction fans will be made by number supplied and installed. The tendered rate shall include for forming the necessary openings through the walls.

PQA 15.7 Chases in brickwork ..... Unit: m

Payment for chases in brickwork for electric conduits will be made per linear metre of chase cut.

PQA 15.8 Hoop iron ties.....Unit: No

Payment for hoop iron ties will be made by number supplied and installed.

PQA 15.9 Brickforce brick reinforcement ..... Unit: m

Payment for Brickforce brick reinforcement will be made for each different wall thickness.

PQA 16 PAYMENT FOR BLOCKWORK

PQA 16.1 Blockwork ..... Unit: m^2

Payment for blockwork will be made by area of finished blockwork of various thicknesses and types, measured in elevation.

Prices shall be inclusive of the provision of all materials, plant and labour necessary for completing the work, including the building in of wire ties, all plumbing of corners and faces, lining, levelling, forming reveals and openings, cutting where necessary and plastering where specified. The measurement of the work will be taken nett with window and door openings deducted, but no deductions from the measurements will be made for lintels, air bricks, pipes up to and including 150 mm diameter or fittings up to 150 mm square built into the work. Small openings of areas up to 0,05 m^2 will not be deducted.

PQA 16.2 Infilling of blockwork with concrete ..... Unit: m^2

Payment for infilling of blockwork with concrete shall be extra over the payment item PQA 16.1 above, for various thickness and types, measured in elevation. The rate shall include the provision of expanded metal mesh where indicated.

PQA 16.3 Brickforce brick reinforcement ..... Unit: m

Payment for Brickforce brick reinforcement will be made for each different wall thickness.

PQA 16.4 Waterproof coating of external faces ..... Unit: m²

Payment for waterproof coating of external faces shall be by the surface area actually treated.

PQA 17 PAYMENT FOR PLASTERING

PQA 17.1 Plastered finish to walls. ..... Unit: m²

Payment for plastered finish to walls will be made by area of finished plaster, measured in elevation, for each surface finish specified. Prices shall be inclusive of the provision of all materials, plant and labour necessary for carrying out the plastering work, including the plumbing of corners and faces and forming reveals and openings. The measurement of the work will be taken net with window and door openings deducted. Small openings of areas up to 0,05 m² will not be deducted.

PQB: FLOOR FINISHES AND WALL TILING
(Supplementary to SABS 1200 – 1986)

PQB 1 GRANOLITHIC FLOOR SCREEDS

PQB 1.1 Materials

Granolithic screed shall consist of one part Portland cement Type CEM.I 42,5 to SABS.ENV 197-142,5, one part sand and two parts 5 mm stone chippings, thoroughly mixed as for concrete and applied to the surface of the underlying concrete in a layer not less than 20 mm thick, levelled or graded and trowelled to a smooth uniform surface. Granolithic shall be either untinted or tinted, as called for in the Bill of Quantities.

PQB 1.2 Laying

The laying of the granolithic finish shall be in full compliance with the relevant clauses of SANS 10109 Part 2. To ensure thorough bond, the granolithic should, where possible, be applied before the concrete below has become properly set and preferably while it is still green, and every precaution must be taken to keep the concrete damp and clean until the granolithic is placed. If this is not possible, then the underlying concrete must be chipped or otherwise roughened to the satisfaction of the Employer's Agent, flushed with clean water and then coated with cement grout before the granolithic is laid.
Granolithic paving is to be V-jointed in squares of approximately 1,25 metres side length, the V-joint being formed while the surface is still soft.

Where floor cables are not covered by chequered plate or other steel flooring, cable ducts in the floor shall be filled with clean river sand to a depth of 70 mm from the finished granolithic level after all cables are in position and have been tested and approved. A 50 mm thick layer of Grade 20 concrete shall be placed on top of the sand, which in turn shall be covered with granolithic screed. V-joints shall be formed at both sides of all cable ducts, the joints being accurately positioned.

V-joints are to be formed in straight lines and extend to 75% of the full depth of the granolithic layer.

The screed shall be finished with its upper surface perfectly smooth and continuous without voids or float marks.

Where shown or directed by the Employer's Agent, 100 mm high granolithic skirtings are to be formed. They shall include rounded top edges, and radiused corners and a 38 mm radius coving at junctions with the floor. The tendered rates shall include for forming all internal and external mitres, returns, stopped ends, etc, all finished smooth with a steel trowel. At steps a sloping skirting shall be formed, 100 mm high above the noses of the steps. Where ordered, the tread risers and sides of steps, shall also receive a granolithic finish and at the edge of steps and slabs rounded nosing and reeded treads shall be provided. A sunk and weathered threshold shall be provided in the granolithic at all doors.
The risers and treads of stairs shall also receive a granolithic finish and the treads shall be reeded and the front edges are to have a rounded nosing.

PQB 2 FLOOR SCREEDS

Floor screeds shall comply with all of the requirements set out above for "Granolithic Floor Screeds" save that the mix shall not contain any stone chippings and shall comprise four parts sand to one part Portland cement Type CEM.I 42,5 to SABS.ENV 197-142,5 and be of 25 mm average thickness and minimum of 20 mm thick, except where otherwise scheduled or shown on the drawings.

PQB 3 VINYL (PVC) FLOOR TILING

PQB 3.1 General

Where indicated on the drawings or scheduled in the Bill of Quantities, vinyl (PVC) semi-flexible floor tiles or sheeting shall be supplied and installed.

PQB 3.2 Materials

The tiles/sheeting shall comply with SANS 581: 2007 and shall receive the prior approval of the Employer's Agent. Unless otherwise indicated, the tiles shall be 300 x 300 mm and the tiles/sheeting shall be 2,5 mm thick. The vinyl flooring shall be of an approved colour chosen from the manufacturer's standard range. Vinyl cove skirtings shall be of similar quality and colour to the floor tiles and 70 mm in height unless otherwise stated. Where sheeting is called for, it shall be welded at all joints and to the skirting.

PQB 3.3 Laying and Fixing

Floors to receive vinyl tiles/sheeting shall be covered with a mortar screed comprising four parts sand to one part Portland cement 42,5 and of 25 mm average thickness and minimum of 20 mm thick, except where laid on an unbonded damp-proof membrane, in which case the screed shall be 50 mm thick. The screed shall be finished with its upper surface perfectly level and continuous without voids or float marks. The screed materials and methods of laying shall be in full compliance with SANS 10109 Part 2. The screed shall be at least 7 days old and perfectly dry, to the satisfaction of the Employer's Agent, prior to laying the vinyl tiles. The underlaying concrete shall be thoroughly cleaned to the Employer's Agent's satisfaction prior to laying the screed.
The tiles shall be laid strictly in accordance with the manufacturer's instructions onto the screed using the recommended adhesive. This adhesive shall be spread with a Vee notched trowel 1,5 x 1,5 x 1,5 mm triangular notches at 4 mm centres. The coverage of adhesive shall be between 5,0 and 5,5 m^2 per litre. After laying, the tiles are to be rolled with a suitable roller to ensure complete adhesion. The floor tiles shall be cut where required and neatly fitted against adjoining walls, floors, thresholds, etc. Vinyl skirtings shall be close fitted to floors and walls, butted and end jointed, neatly mitred at internal angles and dressed around external angles, and fixed with adhesive as for the flooring.

Finished floors and skirtings shall be protected from damage during the progress of the remaining work, and at completion shall be cleaned and handed over in a perfect condition. The work shall be carried out by skilled workmen experienced in laying this type of floor finish.

PQB 4 TEXTILE FLOOR COVERING

PQB 4.1 Materials

Textile floor coverings shall be of the type shown on the drawings or scheduled in the Bill of Quantities, and shall include an underlay where called for, and laid in full compliance with SANS 10186.

Skirtings shall comprise standard meranti hardwood skirting mitred at all corners and joints and fixed with steel nails.

PQB 4.2 Substrate

The substrate on which textile floor coverings are to be laid shall be as shown on the drawings, and where textile floor coverings are laid on a concrete screed, the screed shall comply with Clause PQB 3.3 above.

PQB 5 INTERFACE BETWEEN DIFFERENT FLOOR FINISHES

At junctions of differing floor finishings, a 25 x 3 mm brass strip with a 3 mm wide top edge flush with the adjoining finishings shall be supplied and installed.

At each external door, a 25 x 3 mm brass strip with a 3 mm wide top edge flush with the internal surface shall be supplied and installed so as to create a vertical step 6 mm high in line with the inner face of the opening outwards door(s).

PQB 6 WALL TILING

PQB 6.1 Tiles for Interior Work

Glazed ceramic tiles and fittings shall comply with the requirements of SANS 22 and, unless otherwise called for on the drawings or Bill of Quantities, shall be white, size 150 x 150 mm and 6,5 mm thick.

PQB 6.2 Fixing of Tiles

The tiles shall be fixed to previously sand/cement rendered walls with an approved cementitious tile adhesive. Horizontal and vertical joints in the tiling shall be continuous and be at least 2 mm wide. After fixing and setting for at least 12 hours, the joints shall be filled in completely with an approved white cement grout. Tiles shall not be soaked in water before fixing except where recommended by the tile manufacturer. The finished work shall be thoroughly cleaned off after grouting is completed...Unless otherwise specified, the wall tiling shall project approximately 4 mm beyond the face of adjoining plaster with all exposed edges finished with glazed edge tiles.

Tiling shall be returned into reveals of openings and onto window sills, and shall be butted at internal angles and provided with glazed edged tiles to external angles, unless otherwise specified. All necessary cutting of tiles shall be properly performed.

Unless otherwise specified on drawings, tiles are to be fixed outwards from the centre of the walls and upwards from approx 140 mm above the floor, with cut tiles at the extremities of the wall face and floor areas. Exposed external edges must be finished with a full glazed edge tile. The 140 mm of height below the bottom tiles shall be filled in with the same type of tile cut to fit where no special skirting tile is scheduled or shown on the drawings.

Provision must be made for any pipework or protrusions through the walls. Tiles must be finished off around the protrusion and take the necessary shape to accommodate any pipework, etc.

Joints around such protrusions are to be similar in width to joints in the rest of the tiling, unless the Employer's Agent instructs otherwise.

Expansion joints for wall tiles, unless otherwise specified by the manufacturers, are to be provided in areas that are in excess of 6,0 metres, measured horizontally along the floor and 3,0 metres, measured vertically along the wall, or as indicated on drawings. These joints are to have a maximum width of 4 mm and be filled with white silicone.

PQB 7 MEASUREMENT AND PAYMENT

PQB 7.1 Payment for Granolithic finish

PQB 7.1.1 Granolithic finish ..... Unit: m²

Payment for granolithic finish shall be by area of finished surface irrespective of whether it is horizontal, vertical (except for skirting) or on the slope. The price shall include for all the work specified, including treating the underlying concrete surface.

PQB 7.1.2 Granolithic skirting ..... Unit: m

Payment for granolithic skirting shall be per linear metre of completed skirting, for each height scheduled. Price shall be inclusive of the provision of all materials, plant and labour necessary to complete the granolithic work and for any material which is wasted.

PQB 7.2 Payment for Vinyl Floor Tiling/Sheeting

PQB 7.2.1 Vinyl flooring ..... Unit: m²

Payment for vinyl flooring shall be per net area of completed floor surface. The rate shall include for all the work specified above including the cement mortar screed and the preparation of the surface of the concrete structural floor.

PQB 7.2.2 Skirting ..... Unit : m²

Payment for skirting shall be by length of the completed skirting of each height scheduled.

Prices shall be inclusive of the provision of all materials, plant and labour necessary to complete the required work and for all cutting and waste.

PQB 7.3 Payment for Textile Floor Coverings

PQB 7.3.1 Textile floor coverings..... Unit : m²

Payment for textile floor coverings shall be per net area of completed floor surface. The rate shall include for all work specified, including the preparation of the structural surface, the cement mortar screed, the underlay where called for and the laying of the textile floor covering.

PQB 7.3.2 Skirting..... Unit : m

Payment for skirting shall be by length of completed skirting for each height scheduled.

Prices shall be inclusive of the provision of all materials, plant and labour necessary to complete the required work and for all cutting and waste.

PQB 7.4 Payment for interface between different floor finishes

PQB 7.4.1 Brass strips ..... Unit : m

Payment for the brass strips shall be by length and shall be inclusive of the provision of all materials, plant and labour necessary to complete the required work and for all cutting and waste.

PQB 7.5 Payment for Wall Tiling

PQB 7.5.1 Tiling..... Unit : m²

Payment for tiling will be by area of completed tiling including exposed tiled ledges, window and door returns, etc but the area of window and door openings will be excluded.

PQB 7.5.2 Expansion joints ..... Unit : m

Expansion joints will be paid for separately per linear metre.

PQB 7.5.3 Supply and installation of toilet roll holders and soap dishes. .....Unit: No

PQB 7.5.4 Skirting ..... Unit: m

Payment for skirting will be measured separately by length only if and where a special skirting tile is called for.

PQF: PLUMBING
(Supplementary to SABS 1200 – 1986)

PQF 1 SCOPE

PQF 1.1 Pressure Piping

Pressure piping for water supply and distribution shall comprise galvanised steel, polypropylene and/or copper piping together with the associated fittings, for medium pressure duty and suitable for installation within buildings.

PQF 1.2 Drainage Piping

Drainage piping for domestic wastewater shall comprise galvanised steel, cast iron, black polyethylene and uPVC piping with the associated fittings, for installation within buildings.

PQF 1.3 Applicable Specifications

PQF 1.3.1 Pressure Piping Specifications

SANS 62	Steel Pipes and Fittings
SANS 460	Copper Tubes for Domestic Plumbing
SANS 14	Malleable Cast Iron Pipe Fittings
SANS 1067	Copper-Based Fittings for Copper Tubes
SANS 15874-1, 2, 3, & 5	Plastic Piping Systems for Hot and Cold Water Installations - Polypropylene (PP)

PQF 1.3.2 Drainage Pipe Specifications

SANS 746	Cast Iron Pipes and Fittings for use above Ground
SANS 791	uPVC Sewer and drain Pipes and Fittings
SANS 967	uPVC Soil, Waste and Vent Pipes and Fittings
SANS 1321-1	Non-Metallic Waste Traps

PQF 13.3 Installation Specifications

SANS 791	Appendix C : Notes and Uses of uPVC Pipes
SANS 1011	The Installation of Polyethylene and uPVC Pipes
SANS 10252-1:	Part 1 - Water supply installations for buildings

PQF 2 MATERIALS

PQF 2.1 Pressure Pipework

PQF 2.1.1 Steel Pipes and Fittings

Steel pipes shall comply with SANS 62 Part 1 and shall be of the nominal bore stated in the Bill of Quantities or shown on the drawings and be of medium class, except where scheduled to the contrary. Exact length pipes are not required. The pipe ends shall be screwed (or plain-ended if scheduled) and all piping, irrespective of the class scheduled, shall be galvanised inside and outside in accordance with SANS 32 for general applications. The screw threads shall not be coated. Each pipe shall be supplied, complete with a screw-on socket at one end. A certificate of workmanship as specified under Subclause 4.13 of SANS 62 Part I shall be provided if requested by the Employer's Agent.i

Pieces and pipe fittings made from steel pipe shall comply with SANS 62 Part II and shall be of the nominal bore stated in the Bill of Quantities. The class and surface treatment shall correspond to those for the pipes with which they are to be used. Ninety degree bends shall be Type 1 bends, except where Type 2 are specifically called for in the schedule.

Malleable cast iron fittings shall comply with SANS 14, which are suitable for working pressures up to 1 400 kPa in the case of water. The types and sizes of fittings to be provided are as scheduled and all fittings shall be galvanised.

The piping layout shall be as shown on the drawings.

PQF 2.1.2 Polypropylene Pipes and Fittings

Polypropylene pipes shall comply with SANS 15874-1, 2, 3, & 5 and shall be of the classes and nominal sizes stated in the Bill of Quantities or shown on the drawings. The extrusion polymer (either homo-polymer Type PP or co-polymer Type PPC) shall be the most suitable for pipe runs to be installed within buildings.

Pipes may be provided in manufacturer's standard coils, subject to them not being kinked or deformed whilst being coiled.

Fittings shall be manufacturer's standard fittings to suit the size and classes of pipe with which they are to be used, all as detailed in the Bill of Quantities or shown on the drawings. Special fittings shall be scheduled or detailed on the drawings.

The piping layout(s) shall be such as to supply water to all of the outlets shown on the drawings and/or scheduled in the Bill of Quantities.

PQF 2.1.3 Copper Tubes and Fittings

Copper tubes shall comply with SABS 460 and shall be of the nominal outside diameter and of Classes 2 or 3 (as detailed hereunder) or as scheduled or shown on the drawings.

Class 2 (Medium) - for pipework having a maximum working pressure of 2 000 kPa chased into walls and floors.

Class 3 (Heavy) - for pipework having a working pressure over 2 000 kPa up to a maximum of 3 250 kPa, surface mounted internally or externally to buildings.

Tubes shall be supplied in standard lengths of 5,5 m, except that Class 2 tubes of 15 mm diameter may be provided in standard annealed copper coils, subject to them not being kinked or deformed in the coils.

Fittings shall comply with SANS 1067 and be the manufacturer's standard fittings to suit the sizes and classes of pipes with which they are to be used. Fittings shall be of the capillary type where a permanent joint is required and the compression type where it may be necessary to occasionally disconnect the joint.

The piping layout(s) shall be such as to supply water to all of the outlets shown on the drawings and/or scheduled in the Bill of Quantities.

PQF 2.1.4 Steel Pipes and Fittings

Steel piping shall comply with SANS 62 Part 1 and shall be of the nominal bore stated in the schedules or shown on the drawings and be of light class, except where indicated to the contrary. Exact length pipes are not required. The pipe ends shall be screwed and all piping shall be galvanised inside and outside in accordance with SANS 32 for general applications. The screw threads shall not be coated. A screw-on socket shall be provided at one end of each pipe.

The piping layout(s) shall be such as to supply water to all of the outlets shown on the drawings and/or scheduled in the Bill of Quantities.

PQF 2.1.5 Cast Iron Pipes and Fittings

Cast iron pipes and fittings for use above ground shall comply with SANS 746 and shall be supplied without a socket anti-siphon vent and without ears, except where called for to the contrary on the drawings or in the schedule.

Pipes and fittings shall be printed with a bituminous coating and lining.

Alternative primers and/or uncoated and lined pipes shall be provided where specifically called for.

The piping layout(s) shall be such as to supply water to all of the outlets shown on the drawings and/or scheduled in the Bill of Quantities.

PQF 2.1.6 uPVC Soil Waste and Vent Pipes and Fittings

uPVC pipes and fittings shall comply with SANS 967 and shall be of the nominal sizes and effective lengths scheduled or shown on the drawings. Plain ends shall not be chamfered and sockets shall be suitable for use with rubber ring seals.

Standard fittings shall be provided as shown on the drawings and shall be of a size to suit the pipes with which they are to be used. Inspection openings and covers shall be provided on all bends 45° and over. Vent horns are not required except where specifically called for.

PQF 2.1.7 Sanitary Ware, etc

Sanitary ware, etc shall be of the types indicated on the drawings or scheduled. The quality of items such as washbasins, baths, shower fittings, lavatory cisterns, water closets, hot water geysers, etc shall be consistent with the prime cost price allowed for in the documents or indicated on the drawings.

All stopcocks and valves to be used shall bear the SABS mark and shall be of brass or gunmetal and be suitable for the application in all respects. All other fitments, which are the subject to a SANS specification, shall comply with such specification and bear the appropriate mark.

PQF 2.1.8 Rainwater Goods

Rainwater gutters and downpipes shall be of the seamless type without joints, as supplied and installed by an approved roof gutter specialist.

PQF 3 INSTALLATION

PQF 3.1 General

Installation of plumbing pipework, both pressure and drainage pipes, shall generally be chased into the walls and/or floors of the building and only where specifically called for on the drawings, or elsewhere, shall it be surface mounted. All plumbing work shall be carried out by suitably registered firms and by suitably qualified plumbers.

PQF 3.2 Installation Work

PQF 3.2.1 General

The method of carrying out the installation shall be in accordance with the best practice and in the case of water piping in accordance with the relevant sections of SANS 0252.

PQF 3.2.2 Pipework in Chases

Chases in walls and floors shall be wide enough and deep enough to contain the full diameter of the pipework and jointing sockets, etc. No part of any pipe run shall extend into the finishing plaster work. Fastenings shall be adequate to hold pipes firmly in position and all pipework shall be tested for possible leakage prior to being grouted in.

PQF 3.2.3 Surface Mounted Pipework

Surface mounted pipework shall be adequately and suitably fixed in position in accordance with the best practice and in accordance with the applicable SABS specifications. The pipework shall be able to withstand, without movement or damage, the normal wear and tear to be expected within the building.

PQF 3.2.4 Sanitary Ware, etc

All items of sanitary ware shall be firmly fixed to withstand expected normal usage without movement. The items shall be fixed truly plumb and/or horizontal as the case may be. Any article damaged after acceptance from the supplier up to the time of completion of the work shall be replaced by the Contractor at his own expense.

No electrical connections to hot water geysers and the like may be made by the plumber but shall be carried out by a suitably qualified electrician.

PQF 4 TESTING

All pipework and fittings including stopcocks, valves, taps, etc shall be tested for operation and for watertightness. Any malfunction or leak shall be rectified by the Contractor at his own expense.

PQF 5 MEASUREMENT AND PAYMENT

PQF 5.1 Provision of all material, plant and labour necessary to complete the required installation and testing .....Unit: Sum

Measurement and payment for the provision of all materials, plant and labour necessary to complete the required installation and testing shall be in accordance with the method of scheduling in the Bill of Quantities.

PQH: PAINTING
(Supplementary to SABS 1200 – 1986)

PQH 1 SCOPE

This specification covers the normal work required for small to medium size buildings. It does not cover the painting of steelwork (which is covered by SANS 1200 HC as amended by PSHC), but does include painting of galvanised iron for roof sheeting, gutters, downpipes, etc.

This specification should be adhered to, but as the formulation of paints is subject to continual modification, the specification for a particular material may be amended, should the paint manufacturer recommend an improvement thereto and provided such amendment receives the prior approval of the Employer's Agent.

A change of specification purely to reduce costs by using less suitable materials will not be acceptable.

PQH 2 MATERIALS

PQH 2.1 General

All materials which are to be used for painting under this Contract shall be from the same approved manufacturer (except in special cases which have had prior approval from the Employer's Agent) and shall be supplied in unopened containers. Thinning will be permitted only in conformity with the applicable manufacturer's recommendations.

The approved manufacturer of the paints shall be either Plascon or Dulux or as selected by the Contractor. Other manufacturer's products may be used, subject to them being approved by the Employer's Agent prior to any orders being placed.

The paint systems to be applied shall be the applicable of the systems itemised in PQH 3.2 to 3.5 hereunder.

PQH 2.2 Approved Materials

The following materials, as supplied by the selected paint manufacturer, are approved for use under this Contract.

	Applicable Clauses	Kansai Plascon References	Dulux References
Pre-paint treatment:			
Bonding liquid	3.4.1	CVI.14	5147198
Knotting for timber	3.1	PK.2	-
Wood stopping	3.1	BS	-
Porous surface sealer	3.1	CVI 14	-
Primers for:			
Acrylic coat filler	3.2.1	PP 500	5147618
Plaster (alkali resistant)	3.2.1	UC.56	5147200
Hardboard	3.2.2	UC 56	-
Softwood timber	3.2.2	UC.2	5147196
Galvanised iron	3.5.1 3.5.2	G.I.P.	5147204
Aluminium	3.5.3	SNS 1	-
Water-Based Paint Systems:			
PVA emulsion	3.2.1	EPL	5147037
Acrylic PVA	3.3.1	PEM 600	5147037
Texture coating	3.3.2	FLX	5147080
Acrylic roof paint	3.4.1	TRP	5147005
Oil-Based Paint Systems:			
Universal undercoat	3.2.2, 3.3.3, 3.5.2	UC.1	5147206
Stain for wood	3.2.3	W 1	5147400
Alloyed roof paint	3.5.1	AW 255	-
Gloss enamel	3.2.2, 3.3.3, 3.5.2	G - Range	5147208
Interior varnishes:			
wood-gloss matt	3.2.3 3.2.3	X.33 X.44	5147426 5147430
Exterior varnishes:			
wood-gloss matts	3.3.4 3.3.4	-PNW - Gloss -PNW - Suede	5147422 -

PQH 3 APPLICATION

PQH 3.1 Surface Preparation

All surfaces to be painted must be thoroughly degreased, clean and dry prior to commencement of painting. The local environs are to be free from dust whilst painting is in progress.

Ironmongery and fittings not to be painted shall either be removed and subsequently replaced, or be suitably masked to prevent paint spots or streaks adhering to the surfaces.

All cracks are to be filled with the paint manufacturer's recommended filler suitable for the purpose and for the location (ie interior or exterior work). After drying, the filler is to be rubbed down to a smooth surface, flush with the adjacent surfaces.

Porous surfaces must be sealed in accordance with the paint manufacturer's recommendations. Timber work shall be knotted and stopped as necessary prior to commencing painting. All surface preparation shall be in accordance with the paint manufacturer's specifications.

PQH 3.2 Painting Interior Surfaces

PQH 3.2.1 PVA Emulsion System

3.2.1.1	Cement plaster, & concrete	Apply one coat of acrylic filler coat followed by two coats of PVA emulsion paint
3.2.1.2	Gypsum plaster, hardwall plaster & gypsum board	Apply one coat of alkali resistant primer followed by two coats of PVA emulsion paint
3.2.1.3	Hardboard	Apply one coat hardboard primer followed by two coats of PVA emulsion paint

PQH 3.2.2 Gloss Enamel System

3.2.2.1	Cement plaster, gypsum plaster hardwall plaster & gypsum board	Apply one coat of alkali resistant primer followed by one coat universal undercoat and one coat of gloss enamel
3.2.2.2	Hardboard	Apply one coat hardboard primer followed by one coat of universal undercoat and one coat of gloss enamel
3.2.2.3	Softwood timber	Apply one coat of oil based wood primer followed by one coat of universal undercoat and one coat of gloss enamel

PQH 3.2.3 Stain and Varnish System

3.2.3.1	Softwood timber	Apply one coat of stain followed by two coats of varnish (matt or gloss as ordered)
3.2.3.2	Hardwood timber	Apply two coats of varnish (matt or gloss as ordered)

PQH 3.3 Painting Exterior Surfaces

PQH 3.3.1 Acrylic PVA System

3.3.1.1	Cement plaster, & concrete	Apply one coat of acrylic filler coat followed by two coats of acrylic PVA paint
3.3.1.2	Asbestos board	Apply one coat of undercoat followed by two coats of acrylic PVA paint

PQH 3.3.2 Texture Coating System

Cement plaster & concrete: Apply two coats of texture coating paint

PQH 3.3.3 Gloss Enamel System

Cement plaster: As per 3.2.2.1 for interior surfaces

Softwood timber: As per 3.2.2.3 for interior surfaces

PQH 3.3.4 Varnish System

Hardwood: Apply two coats of ultra violet resistant varnish (matt or gloss as ordered)

PQH 3.4 To Roof Areas (Other than Galvanised Iron)

PQH 3.4.1 Acrylic PVA System

Cement and clay tiles: Apply one coat of bonding liquid followed by two coats of acrylic emulsion roof paint

PQH 3.5 To Non Ferrous Metal Surfaces

PQH 3.5.1 Galvanised Iron Roofs

Apply one coat G.I metal primer followed by one coat micaceous iron ore roof paint

PQH 3.5.2 Galvanised Iron Tubes etc

Apply one coat G.I metal primer followed by one coat universal undercoat and one coat gloss enamel

PQH 3.5.3 Aluminium Surfaces

Apply one coat of aluminium primer followed by one coat of universal undercoat and one coat of gloss enamel.

PQH 4 MEASUREMENT AND PAYMENT

PQH 4.1 Provision of all materials, plant and labour necessary to prepare surfaces and complete painting work as specified: ..... Unit: m²

Measurement and payment for paintwork will not be made separately, except where so scheduled in the Bill of Quantities. In the latter case, the prices tendered are to cover for the provision of all materials, plant and labour necessary to prepare the surfaces and complete the work as specified. Payment will be made by lump sum for the entire painting work, or by individual sum for each unit scheduled, or by area.

PQH 4.2 Painting of windows ..... Unit: m²

Painting of windows will be measured as the overall size of the window frame with both sides being measured and with no deductions made for glazed areas.

PZA: CLEANING OF SEWERS
(Supplementary to SABS 1200 – 1986)

PZA 1 SCOPE

This specification covers the clearing and cleaning of blocked or partially blocked sewer pipes and manholes.

PZA 2 DEFINITIONS

"Sewer" or **"sewer pipe"** is a gravity pipeline between two manholes or a pumping pipeline with no manholes.

"Route" or **"sewer route"** is a series of consecutive sewers/sewer pipes.

PZA 3 PLANT

For the duration of the Contract, the Contractor shall have on site:

- Sufficient plant and equipment and personnel, plant and equipment to carry out mechanical rodding and cleaning of sewer pipes.
- At least one high pressure jetting machine with all associated support personnel, plant and equipment.

PZA 4 CLEANING USING HIGH PRESSURE JETTING EQUIPMENT

The Employer's Agent's Representative will inspect all manholes and or pipelines and decide which sewer pipes require cleaning.

Before using a high-pressure jetting machine, the Contractor must confirm that the sewer pipes that are to be jetted are not clay pipes. Clay sewers are to be cleaned using mechanical methods.

The cleaning of the sewers is to be carried out in a systematic manner with cleaning of a pipe only commencing once all lines feeding into that pipe have been passed as cleaned.

Sewer pipes and manholes shall be cleared of blockages and other debris/detritus by high pressure water jetting methods using potable water. In the case of clearing pumping pipelines, provisions must be made for temporary access for removal of debris/detritus materials at intervals not exceeding 500 m, where necessary.

The jetting equipment to be utilised must be suitable for cleaning sewers and shall be provided with appropriate delivery hoses and cleaning nozzles and operated by experienced personnel. The working pressure for sewer pipes up to 300 mm diameter shall be between 80 and 100 bar and for larger diameter sewer pipes between 200 and 250 bar.

The minimum water delivery rate shall be 160 litres per minute for the 200 to 250 bar machine and 100 litres per minute for the 80 to 100 bar machine. The equipment must be mobile and compact to facilitate access to all of the site of works. The Employer's Agent's Representative shall have the right to require the Contractor to regularly test the effectiveness of jetting equipment at no additional cost to the Employer.

Before commencing with water jetting and cleaning of sewers, it may be necessary to clear blockages first to induce liquid flow. For this purpose rodding and mechanical cleaning equipment will be required.

High pressure water jetting of pipes shall be undertaken in the following manner. The route to be cleared is to be agreed with the Employer's Agent's Representative. All routes upstream of the route to be cleared must have been passed as cleared by the Employer's Agent's Representative. Jetting shall start at the downstream end of the route for gravity pipelines and upstream end for pumping pipelines. The first (lower) sewer pipe between manholes must be jetted until the bulk of the silt has been removed. The jetting shall then be carried out of the next (second lowest) length of sewer between manholes from the downstream end of the route. This process shall be continued until the top (highest) end of the route is reached. In this way the bulk of the silt will be cleared moving from the downstream (lower) end of the route up to the upstream (upper) of the route. The jetting process for pumping pipelines may require temporary access for removal of debris/detritus matetrials at intervals not exceeding 500 m.

While progressing upstream, most of the silt moved from one sewer pipe will be trapped at the downstream manhole of that sewer pipe. However, a certain amount will be carried past the trap and deposited in the downstream sewer pipe. For this reason, the final cleaning and pulling of the "pig" to confirm that the pipes are clean, shall be undertaken starting at the upstream end of the sewer route and progressing in a downstream direction to the lowest end of the route.

A sewer pipe will only be considered cleared and cleaned once it has been inspected and passed by the Employer's Agent or his/her Representative.

Debris and foreign material dislodged from sewer pipes during the cleaning process must be trapped at the downstream manhole of the section of sewer pipe being cleaned and shall be removed and disposed of to an approved spoil site. Whilst jetting, the Contractor shall have a silt trap in place at all times in the manhole at the downstream end of the section of sewer being cleaned. The silt trap shall be of a circular shape and the same diameter as the pipe being cleaned. The bottom half of the circle shall be solid plate and the top half open. Attached to the bottom half shall be a 300 mm long half cylinder that is to lie in and match the invert of the channel in the manhole. The silt trap shall be fitted with a handle for easy removal.

Silt and other debris caught against the trap must be removed from time to time as it builds up.

At the upstream manhole of the sewer pipe being jetted, the entrance to the pipe must, at all times, be equipped with a screen with 25 mm openings. This is to prevent material and other large foreign objects entering the pipe and becoming tangled with the jetting

hose and nozzle. This screen must be cleared as often as required to prevent blockages.

Pipes and manholes will be deemed adequately cleaned only after all silt build-up, obstructions, and all foreign materials have been removed and the Contractor has proven to the satisfaction of the Employer's Agent by means of a clear pass of the jetting equipment and by a clear pass of a suitably sized "pig" through the length of sewer being checked, that no further silt or debris can be removed by further jetting or clearing operations. The "pig" is to have a solid rim the external diameter of which is 80 mm less than the internal diameter of the pipe to be cleaned. A suitable rubber wiper/ squeegee that protrudes a further 25 mm all the way around the solid rim must be fixed to the rim. The length of the solid rim is to be at least 1,2 times the pipe diameter so as to prevent the rim rotating. On larger diameter pipes, a space frame to support two narrow solid rims at a spacing of 1,2 times the pipe diameter should be used. Inside the rim there must be sufficient opening to permit sewage to flow through it while it is being pulled through the pipe. A rope must be attached to both ends of the "pig" to permit extraction in either direction.

As an alternative to pulling a "pig" where flow is low enough to permit blocking the line for a short period, the line may be inspected using mirrors to confirm that it is clear. The Contractor may submit any alternative form of "pig" or method of proving the pipe is clean to the Employer's Agent for approval.

The Contractor must take care not to damage the sewerage system during the clearing and cleaning process. If any damage in the opinion of the Employer's Agent is caused to the existing sewerage system as a result of the Contractor's negligence, this damage shall be repaired by the Contractor at his own expense.

PZA 5 MEASUREMENT AND PAYMENT

PZA 5.1 Cleaning Sewer Pipes and Manholes:

(a) Cleaning of sewer using mechanical means. ..... Unit: m

(b) Extra over for levels of silting greater than 20% of the pipe diameter. ..... Unit: m

(c) Cleaning of sewer using high pressure jet cleaning. ..... Unit: m

(d) Extra over for levels of silting greater than 20% of the pipe diameter. ..... Unit: m

(e) Cleaning of manholes, irrespective of internal dimensions using high pressure jet cleaning. .....Unit: No

(f) Extra over for temporary access manholes for removal of debris/detritus materials.....Unit: No

Separate items will be scheduled for cleaning sewers using high pressure jetting and mechanical methods.

The rate shall cover all costs of the provision of labour and equipment, access to the site, providing water and water storage facilities, cleaning pipes, the trapping and removal of silt, dislodged debris and foreign objects and disposal thereof to the approved disposal site. The rate shall also cover measures required to accommodate normal sewer flows.

No distinction shall be made between the number of blockages in a particular sewer pipe.

An extra over rate shall apply for levels of silting greater then 20% of the pipe diameter. The level of silting shall be determined by calculation from the volume of silt removed at the downstream manhole during the desilting operation.

The rate tendered shall be per metre length of pipe including manholes. Separate items shall be scheduled for different pipe diameters.

One third of the tendered rate will be certified for payment when the Contractor has completed the initial cleaning of the pipe starting at the downstream end of the route and finishing at the upstream end of the route. The remaining two thirds of the tendered rate will be paid after the "pig" has been pulled through on the final cleaning run and the route has been inspected and approved as having been satisfactorily cleaned by the Employer's Agent's Representative.

PZC: CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION OF SEWERS
(Supplementary to SABS 1200 – 1986)

PZC 1 SCOPE

This specification covers the Closed-Circuit Television (CCTV) camera inspection of existing and new sewer pipelines.

PZC 2 CLOSED CIRCUIT CAMERA INSPECTIONS

PZC 2.1 Inspection Equipment for Mainline Sewers

The CCTV camera inspections shall be undertaken using a tractorised CCTV pipe inspection camera system.

The camera system shall be capable of overlaying text onto the recorded video image of the pipe in such a way as to identify the pipe. Overlay must include the time, date, suburb, street, pipe number and continuously updated meterage and GPS coordinates of vehicle position at start of inspection. The overlay must also be capable of being removed from the screen.

The camera system must be capable of measuring the slope of the pipe being inspected. The instantaneous angle must be filtered and is to be displayed on the screen and recorded on the video. Raw inclinometer data is also to be stored for downloading to the database for the purpose of pipe profiling. The camera system must be capable of down-loading to a database, no less than three readings per metre of pipe inspected.

The camera shall be transported through the pipe on a tractor system to allow for smooth transportation of the camera through the pipe. The tractor shall be controllable at various speeds in forward and reverse and must be able to operate in pipes from 100 mm and greater. The tractor speed shall, however, not exceed 0,5 metres per second.

No “push-pull” camera system will be deemed acceptable, as the recorded image is “jerky” and difficult to interpret and no inclinometer data can be collected.

The camera mounted on the tractor shall be mounted in such a manner as to transport the camera within 10% of the centre of the pipe.

The camera system shall provide for complete condition assessment and lighting to illuminate the pipe sufficiently to allow for the detection of cracks and other structural defects in the pipe. The lighting shall be of such a nature that the natural colour of the pipe is recorded (black & white will not be acceptable).

The camera system’s linear meterage system shall be capable of being reset to zero at the start inspection manhole.

The camera system distance measurement shall be better than 1% accuracy and all measurements shall be made from manhole centre to manhole centre.
The camera systems used by the Contractor shall be pan and rotatable and shall include

radiosonde tracking on the surface if requested by the Employer's Agent to determine lateral positions.

The equipment shall be capable of "Task handling" in order to control and log, in the correct order, the defect as found in the pipe and recorded. All defects are to be reported at the distance that they occur, but defects are to be graded only after the camera has passed the defect in question.

PZC 2.2 Lateral Inspections

The camera system shall be capable not only of locating lateral consumer connections on the main sewer pipeline, but also be capable of inspecting these connections to the same standard and specification as for the main sewer pipeline.

The camera system shall be capable of inspecting the connections from the cleaning eye down toward the main sewer pipeline and shall be able to inspect the lateral from the main sewer pipeline up towards the erf boundary and extending into the erf by at least 25 metres without any open excavation being made.

The camera equipment shall be able to negotiate typical multiple bend radii in Clay or PVC piping of diameters of 100 mm and larger.

The Contractor's camera equipment shall have the ability of tracking the camera's progress.

The Contractor's camera equipment must be capable of being tracked in X, Y and Z on the surface by means of radiosonde or similar technology.

Cameras used for lateral inspections must be fully pan and rotate-able, incorporating "right side up" technology.

PZC 2.3 Road Safety

The inspection unit shall be provided with one amber-flashing beacon, which shall comply with and be operated in accordance with the Road Vehicle Lighting Regulations.

Road signs and cones shall be carried at all time and displayed in accordance with Safety Regulations.

The Contractor is to ensure that his staff has bright coloured overalls with the Company name and fluorescent over jackets. These shall be worn at all times to provide safe working conditions in road reserves.

PZC 2.4 Sewer Health and Safety Equipment

At the time of tender, the Contractor shall provide proof of trained and certified staff who can use the health and safety equipment.

The Contractor shall have the following health and safety equipment in his possession while carrying out CCTV camera inspections:

Oxygen deficiency and gas detector apparatus per unit, regularly serviced and operable.

Fresh air breathing apparatus – face mask and demand value, 10-minute compressed air supply.

Approved vertical lift full safety harness.

Personal equipment per operative:

- Safety helmet
- Safety boots
- Sewer wading boots
- Disposal protective gloves

Adequately sized First Aid Kit suitable for the number of operatives per unit.

Facilities for washing to include:

- Soft soap
- Disinfectant
- Potable water

Radio equipment and cellular phone for on site communication.

Fire extinguisher.

PZC 3 Video Recordings

(a) All video material shall be recorded on digital mediums and shall be of a DVD format compatible with Power DVD 4. All recordings shall for 5 seconds at the start of the inspection, have superimposed the video recording, the GPS coordinates of the vehicle's position at the start of the inspection.

(b) The DVD's shall contain the video material, daily diaries as generated on site, and other relevant data pertaining to the inspection of the sewers.

(c) DVD's are to be labelled with the following information:

- Local Authority name
- Contact number
- DVD number
- Suburb
- Contractors' name
- Sub-catchment
- Streets inspected
- Date and time

(d) At the time of tender, the Contractor shall provide a recording of at least 50 m of sewer filmed with the equipment intended for use on this Contract for approval by the Employer's Agent.

(e) The above-mentioned DVD shall include pdb files and thematic maps as proof of the Contractor's ability to comply with the tender requirements.

PZC 4 Reports

(a) No reports will be manually generated by the Contractor. All reporting will take place in an automated electronic format from the inspection database.

(b) The minimum requirement for submission of inspection reports for each payment section of the works shall include:

(i) The ability to provide colour copies of the printed inspection report on request.

(ii) DVD or CD recording of the complete CCTV inspection.

(iii) 1 CD, including electronic media comprising of an electronic copy of the inspection report and a PIC database ("pdb") file of all inspection information for electronic importing of the CCTV data to PICdata and the resultant representation of the CCTV data on GIS.

(iv) Status quo report detailing all rehabilitation requirements and statistical data relevant to the project area.

(v) Thematic Maps.

(c) The condition assessment and CCTV camera inspection of the sewer system will include reporting on both the sewer pipeline and manholes within the sections inspected, with the following minimum data being required:

PZC 4.1 Manhole Inspection Report:

(a) Manhole number (to correspond with numbering manhole numbering indicated on the GIS as provided by the Employer's Agent:

(b) Suburb

(c) Street Name

(d) Stand Number

(e) Manhole type

(f) Manhole cover type

(g) Manhole depth from the rim to the base of the pipe

(h) Manhole benching condition

(i) Shaft condition

(j) Number and type of steps

(k) General manhole condition assessment

(l) GPS co-ordinates of vehicle position at start inspection

PZC 4.2 Sewer Pipeline Inspection Report:

(a) Pipe number

(b) Operator name

(c) Time and date

(d) Start and end manhole numbers

(e) Pipe material and type

(f) Pipe position

(g) Pipe diameter

(h) Inclinometer data

(i) Defects reported and graded to a standard acceptable to the client

(j) Lateral identification including stand numbers

(k) Digital images of all lateral connection points to the main sewer pipeline, taken with a tilted camera looking into the connection from within the main sewer pipeline where ever possible

(l) Digital images of severe and critical defects

(m) GIS representation of CCTV inspections and data

(n) End inspection data

The report must be structured in such a manner so that inspection data is grouped and presented sequentially with all information relating to a specific sewer section being grouped together for ease of reference and interpretation.

Lateral consumer connections are to be dealt with as individual pipes and will assume a unique ID. The Contractor will be responsible for the identification and numbering of these pipes. The inspection of lateral connections from the connection point on the main sewer pipeline towards the erf boundary and beyond will only be done on instruction of the Employer's Agent.

The complete sewer inspection, including the lateral consumer connection inspections must result in a "pdb" file format, being created for electronic importing of the CCTV data to PIC data and the resultant representation of the CCTV data on GIS.

Electronic media must be in the form of a CD / DVD and must include not only the pipe data, but the digital images, as well as a thematic map indicating the pipes completed in that payment period, as well as complete copies of all reports generated.

All meterage measured by the camera must be from manhole centre to manhole centre starting at zero from the centre of the start manhole. Each inspection must be registered from a manhole, ie the Contractor may not inspect from one manhole through an

intermediate manhole to another manhole without entering the intermediate manhole's data.

PZC 5 CLEANING

(a) If the Contractor's camera is able to pass through a sewer line from manhole to manhole, the sewer shall be considered to be clean and it would not require cleaning.

(b) Only if the Contractor's camera is not able to pass through a specific manhole or section of sewer, and only if instructed to do so by the Employer's Agent, shall the Contractor proceed with cleaning operations of the specific manhole or sewer section in accordance with particular specification PB.

PZC 6 MEASUREMENT AND PAYMENT

PZC 6.1 Site Establishment.....Unit: Sum

The unit of measurement for establishing site for the CCTV camera inspection crews shall be Sum.

The rate is to include for all costs involved in establishing crews to carry out the CCTV survey for the duration of the contract and shall be paid pro rata to progress.

PZC 6.2 CCTV Camera Inspections.....Unit: m

The unit of measurement for CCTV inspection work shall be linear metre (m).

The rate is to include for all costs involved in condition assessment of the sewer pipeline, transport, equipment, labour, accommodation of personnel, logging and mapping defects and lateral consumer connections as well as condition assessment of manholes encountered along the way, all to the set standards and criteria of the specification.

Payment for camera work will be subject to the success of the camera negotiating the sewer pipeline from manhole centre to manhole centre and subject to the submitted CCTV data meeting the criteria as set out in this specification. If the Contractor's camera is not able to pass through a sewer pipeline section, payment for the CCTV inspection will be made only for the portion of sewer pipe inspected.

PZC 6.3 Lateral Connections .....Unit: No

The unit of measurement for inspections of lateral connections shall be Number (No.) and an extra over per linear metre of the consumer connections inspected.

PZC 6.4 Plugging of Sewers.....Unit: No

The unit of measurement for plugging of sewers during CCTV camera inspections shall be Number (No.) and be an extra over per linear metre of sewer pipes inspected. The rate is to include for all plant, labour and equipment associated with plugging of the sewer pipes.

PZC 6.5 Over-Pumping of Sewer Flows.....Unit: h

The unit of measurement for over-pumping of sewer flows during CCTV camera inspections shall be Hours (h) and be an extra over per linear metre of sewer pipes inspected. The rate is to include for all plant, labour and equipment.

PZE: TRENCHLESS REPLACEMENT OF EXISTING PIPES

(Supplementary to SABS 1200 – 1986)

PZE 1 SCOPE

This specification covers the replacement of existing pipelines using trenchless technologies.

The Contractor will be responsible for the complete installation which shall include taking all necessary precautions to avoid damaging any existing underground and/or above ground services.

The trenchless installation of the new pipelines can be made using any of the following methods, and the Contractor is to make use of the method most suitable / applicable to the prevailing site conditions and constraints:

- Pipe bursting / cracking
- Pipe splitting
- Pipe eating**
- Pipe reaming
- Pipe ejection / extraction
- Slip-lining

** Pipe eating is a process whereby a defective pipeline is destroyed and removed by means of a mechanical device whilst, at the same time, installing a new pipe with the same or larger outside diameter in the void.

PZE 2 PROVING OF EXISTING PIPES

On receipt of instructions from the Employer's Agent's Representative, the Contractor shall prove the position, diameter, pipe material, depth, coupling/jointing type, and connections to the existing pipe(s) and provide a schedule showing all relevant details to the Employer's Agent's Representative.

The material of the existing pipe and / or the type of coupling/joints may influence the Contractor's method of pipe replacement and the Contractor is to submit a method statement for approval by the Employer's Agent.

Where the depth of an existing pipe is such that trenchless replacement or upsizing without damage to existing services or upheaval of the surface above the pipe, is deemed to be impractical, the Employer's Agent may permit the Contractor to replace the pipe using open trench methods. However, this approval will be conditional upon there being no additional time or cost implications.

PZE 3 MATERIALS

The replacement pipe to be used on this Contract will be Class 16 High Density Polyethylene Pipe (HDPE) manufactured from PE 100-RC (resistant to crack) material, complying with DIN PAS 1075 and SANS/ ISO 4427.

The handling of the piping shall be in accordance with the manufacturer's recommendations and to the approval of the Employer's Agent.

PZE 4 PLANT

The Contractor shall ensure that adequate and suitable equipment is available for the trenchless installation of the new pipes. This shall include equipment and fittings for a rider pipe to maintain supply, the trenchless installation, the jointing of the new pipe and testing of the completed new pipeline.

The fusion equipment to be used must comply with SANS 12176-1 & 2, and the Contractor is to produce a calibration certificate, from a reputable testing facility, prior to its use on site.

The Contractor will be required to undertake the following steps prior to the commencement of welding on site:

(a) Provide welding tables applicable to HDPE PN16 pipe and the welding plant to be used.

(b) Provide a certificate of calibration for the welding plant (butt and / or fusion) to be used. The certificate shall bear the model number of the welding machine to be used on site, the name and address of the certifying agent, the date of the test and a statement as to the accuracy of the temperature and pressure gauges on the machine in question.

(c) Provide certification that the welder/operator has successfully completed an approved training course and is qualified to weld the size and class of HDPE pipe to be used on this Contract.

(d) A test weld is to be undertaken on site in the presence of the Employer's Agent's Representative for approval prior to the commencement of welding proper.

A certificate of calibration dated prior to the date on the letter from the Employer, instructing the Contractor to commence work, is not acceptable.

No separate payment shall be made for the calibration of the welding plant as required in this Contract.

The cost of the calibration of the welding plant is to be included in the Contractor's rates.

Under no circumstances will welding be permitted to commence prior to the provision of the above certificates and the test weld, and any delays resulting from failure to timeously undertake the above-mentioned steps shall be borne by the Contractor.

PZE 5 CONSTRUCTION

PZE 5.1 Trenchless Operation

The HDPE pipe, made up of a series of shorter lengths of pipe welded together on site, shall be pulled into place by using a static and hydraulically operated tool inserted into the existing pipe from the launching trench. The slip lining mechanism together with the attached HDPE pipe shall then be drawn through the existing pipe, from the launching trench to the receiving trench.

The Contractor will be required to ensure a uniform pulling force to the liner wall. The forces on the new pipe shall be limited to respect the maximum pulling forces prescribed by the pipe manufacturer and shall be recorded. Should the pulling head get lodged within the existing pipe, the Contractor shall be responsible for all costs associated with its retrieval.

All plant, labour and associated ancillary equipment necessary to carry out the trenchless operation shall be provided by the Contractor.

The liner shall also be continuous through the sections where portions of the existing pipe have been removed, such as at launching or receiving trenches, to facilitate the lining operation.

Connection to the existing pipes shall only take place once the stresses due to the installation operation have dissipated and the liner has assumed its final position. A 24-hour relaxation period shall be allowed before any attachments or finishings to the liner is allowed. The liner shall be pulled past the termination point by at least 3% of the liner length to allow for shrinkage during the relaxation period.

The finished lining shall be free as commercially practicable from visual defects such as foreign inclusions or pinholes. The lining shall be totally watertight and free of any leakage into or from the pipe to the surrounding ground.

Any defects which will affect, in the foreseeable future, the integrity or strength of the linings, shall be repaired at the Contractor's expense, in a manner mutually agreed to by the Employer's Agent and the Contractor.

PZE 5.2 Jointing of the HDPE Pipes

Jointing of the HDPE pipes shall be by means of either:

(a) Butt welding
(b) Electro-fusion couplings
(c) Mechanical couplings (where approved by the Employer's Agent)
(d) Flanged fittings (where specified)

PZE 5.2.1 Butt Welding of the HDPE Pipe

The HDPE pipe shall be joined by means of heat fusion using fully trained operators in accordance with the pipe manufacturer's Code of Practice and SANS 10268-1 and SANS 21307.

The Contractor is to pay particular attention to the following:

(a) Cleaning the pipe or fitting ends, planing unit and heater surfaces

(b) Clamping the components to be joined; pipe support may be needed to ensure proper alignment

(c) Planing the pipe or fitting ends. Note: Faces of pipe ends must not be touched after planing

(d) Aligning the pipes or fittings

(e) Melting and jointing the pipe or fitting ends

(f) Holding the pipe or fitting ends under pressure for the cooling time in the machine

(g) Completing the cooling time out of the machine.

The Contractor shall ensure that the required gap spacing is constant over the total weld length and that the weld temperatures specified by the manufacturer are attained throughout the weld length.

Each joint shall be carefully examined to ensure that the welded joint is capable of withstanding the tensile force to which it will be subjected during pipe cracking/pipe reaming operation. In addition, all joints shall be watertight.

No separate payments shall be made for butt welding of the HDPE pipe as required in this Contract.

PZE 5.2.2 Electrofusion Welding of the HDPE Pipe

The HDPE pipe shall be joined by means of fusion couplings using fully trained operators in accordance with the pipe manufacturer's Code of Practice, WIS 4-32-08 (UK Water Industry), SANS 4427-3 and SANS 10268-2.

The couplings are to comply with SANS 4427 and no metallic parts of the heating element may be exposed at any place in the coupling and all coils are to be fully imbedded into the body of the fitting for protection purposes.

The Contractor is to pay particular attention to the following:

(a) The dimensional tolerances for the pipe and coupling (in accordance with SANS 4427-3).

(b) Scraping of the outer surface of the pipe in the welding area by means of a scraper tool to ensure the removal of the oxide layer. The use of hand scapers is not allowed. Note – the pipe surface should be prepared immediately before jointing. It is bad practice to prepare ends well in advance of jointing.

(c) Cleaning the pipe and coupling ends. Note that the coupling is only to be removed from its protective packaging immediately before welding. Any contaminated surface or coupling shall be cleaned with a suitable lint free cloth which has been soaked in a 90% isopropanol : 10% water mixture. No attempt shall be made to clean fittings of prepared pipe surfaces that have become heavily contaminated with mud or water. When contamination cannot be removed the fitting or prepared pipe surface shall be discarded. The faces of pipe ends must not be touched after planning.

(d) Clamps shall always be used to secure the pipe ends during the fusion cycle.

(e) Melt indicators on the coupling.

(f) Melt movement outside the confines of the coupling – if melt has exited beyond the ends of the fitting, the joint shall be cut out and a new joint made.

(g) Completing the cooling time out of the machine.

Where pipes have been installed and the ends cannot be prepared adequately (due to deep gouges, extreme contamination) for a fusion coupling, the end shall be cut off and a short 1m spool piece shall be butt welded onto the existing. Where it is not practical or feasible to butt weld a spool piece, the Contractor may request the Employer's Agent's approval to install a mechanical coupling.

Where it is not practical or feasible to butt weld due to unavoidable water leaking into the new pipe and hindering the welding process, the Contractor may request the Employer's Agent's approval to install a mechanical coupling.

PZE 5.2.3 Mechanical Couplings

Mechanical couplings shall comply with SANS 14236 for polyethylene pipes of nominal outside diameters not greater than 160 mm.

Where mechanical couplings are required on diameters greater than 160 mm, the couplings shall be subject to the Employer's Agent's approval and shall comply as a minimum with the following:

(a) Must resist tensile forces.

(b) Must accommodate gaps of up to 20 mm.

(c) Be manufactured in cast steel or ductile iron, with a minimum 300-micron fusion bonded epoxy coating.

(d) The rubber gasket shall be manufactured from high grade EPDM rubber to EN681-1 and be designed to accommodate any scratches or gouges in the outside wall of the pipe or slight variances in the pipe diameter.

(e) The grip ring shall be manufactured from dezinctified bronze, aluminium bronze or gun metal.

All mechanical joints and fittings shall be of approved types designed specifically for polyethylene pipe systems.

PZE 5.2.4 Flanged Fittings

Loose backing flanges for use with HDPE stub flanges shall comply with ISO 9624 and SANS 1123.

PZE 5.3 Launching And Receiving Trenches

The number of launching and receiving trenches required shall be left to the discretion of the Contractor but the details thereof are to be submitted to the Employer's Agent for approval. The length of a launching or receiving trench shall be such that the radius of curvature of the HDPE pipe liner as measured to the liner centreline is greater than or equal to 100 times the diameter of the pipe and the size of the launching and receiving pits shall be of suitable and minimal size to accommodate the necessary operations.

Due allowance shall be made when shoring the trench sides for any welding/jointing of the HDPE liner that may be required to be undertaken within the launching or receiving trench. Allowance shall also be made for proving of services, during excavation of the launching trench and subsequent slip-lining operation.

The position of each pit shall be sited so as not to interfere with vehicular and pedestrian access either in a roadway or to properties. Disruption to the normal activities which occur in the area surrounding the works shall be kept to a minimum. The excavated launching and receiving trench shall be adequately fenced off with appropriate barriers to prevent pedestrians from falling into the excavation.

All excavations, backfilling and reinstatement of the launching trenches shall comply with Standard Specifications SABS 1200 Part DB: Earthworks for pipe trenches and the project specifications.

PZE 5.5 Hydrants

All hydrants are to be replaced with new hydrant assemblies conforming to the specifications for hydrants. The construction of the hydrant tee is to be the same as the existing hydrants.

Hydrant tees must be fusion welded to the new HDPE pipe. The hydrant chamber shall be reused and rebuilt.

PZE 5.6 Road Reinstatement

SABS 1200 DB Clause 5.9 and PSDB 3.6 shall prevail.

PZE 5.7 Cement Stabilisation

All trenches across road surfaces are to be cement stabilised as per PSDB 3.5(c) for a depth of 1 m below formation level. An item had been allowed for in the Bills of Quantities. The cement stabilisation is to be carried out in accordance with the project specifications.

PZE 6 TOLERANCES

The tolerances of the relevant specifications shall apply.

PZE 7 TESTING

The new pipeline is to be pressure tested in accordance with SABS 1200L.

After the successful pressure test, the new pipeline is to be connected to the existing pipeline and the joints shall be left open for a minimum of 8 hours for visual inspection of the watertightness of the connections. Furthermore, all bolted connections are to be re-torqued a minimum of 8 hours after the test or before backfilling.

The Contractor shall allow in his rates for all inspections and tests and for the supply of all necessary equipment that may be required for these tests and/or inspection by the Employer's Agent.

PZE 8 MEASUREMENT AND PAYMENT

PZE 8.1 Trenchless Replacement of Existing Pipes .....Unit: m

The unit of measurement for the trenchless replacement of pipelines shall be the linear metre (m) of pipe lined along the length of the pipeline.

The rate shall include for the supply of all plant, labour, equipment, setting up of equipment, materials required for lining, all fittings (including any coupling used within the launching or receiving trench), liner insertion, welding of the liner and all cutting and wastage of materials. The rate shall also cover measures required for testing.

PZE 8.3 Launching and Receiving Trenches .....Unit: Sum

Items have been provided in the Bill of Quantities for all launching and receiving trenches.

The rates shall include for the supply of all materials, plant, labour and equipment, for the removal of roadway material, excavation, cement stabilised backfill, compaction of the backfill, permanent road reinstatement, repair and reinstatement of pipes damaged due to the existence of the launching/receiving pits, complete reinstatement of property to its original condition and the disposal of spoil and surplus material.

PZE 8.4 Road Reinstatement ..... Unit: m²

The Contractor shall be responsible for any temporary road reinstatement prior to final surfacing, and any claims for damages due to inferior temporary reinstatement shall be for the Contractors account.

Measurement shall be in square metres and must include for the supply of all labour and materials for:

(a) Trimming the edge of existing roadways
(b) Application of primer
(c) Application of tack coats
(d) Dealing with traffic where necessary
(e) The area shall be computed using the lineal length and the trench pay width

PZE 8.5 Site Establishment..... Unit: Sum

The rate shall include for all costs involved in moving the Contractors equipment onto site and the removal thereof on completion of the works. The rate does not include for moving the equipment from one area to another on site (this cost shall be included in the rates for pipe replacement).

PZE 8.6 Method Statement..... Unit: Sum

The Contactor shall submit to the Employer's Agent, prior to the commencement of work on any section, a detailed method statement on the pipe replacement procedure. The method statement shall include inter alia the following:

- Existing pipe diameter, material, depth and joint type
- pipe replacement procedure including the sequence of construction
- procedure for the installation and bedding of pipe in launching and receiving pits
- method for other connections
- rider pipe plans including methods and a list of equipment
- traffic accommodation plan.

An item has been provided in the Bill of Quantities for the provision of a detailed method statement.

PZE 8.7 CCTV Inspections ..... Unit: m
(refer PZC where necessary)

The rate for site establishment shall include for all costs involved in moving the CCTV equipment onto site and the removal thereof on completion of the works. The rate shall also include for moving the equipment from one area to another. The rate for inspections shall include for all plant, labour and materials required for the CCTV inspections of each pipe (measured per metre length inspected).

PSSC: SUB-CONTRACTORS

PSSC 1 VALUE OF SUB-CONTRACTED WORKS

The Main Contractor shall retain liability and responsibility for the management, scheduling, and quality control of all works performed by the sub-contractors. After appointment of the Main Contractor, the Main Contractor can approach potential sub-contractors to provide rates for the items proposed for subcontracting. The Main Contractor will be expected to conduct a competitive process to recommend a Sub-Contractor or Sub-Contractors to Johannesburg Water. Johannesburg Water will then evaluate all rates provided by the Sub-Contractor for fairness. Johannesburg Water will then either a) approve the appointment of the Sub-Contractor or Sub-Contractors or b) enter into negotiations with the Main Contractor and sub-contractor / s or c) request that the Contractor recommend a different sub-contractor.

PSSC 2 OVERHEAD, CHARGES AND PROFIT FEE FOR THE MAIN CONTRACTOR TO OVERSEE SUB-CONTRACTED WORKS

The Main Contractor shall retain liability and responsibility for the management, scheduling, and quality control of all works performed by the sub-contractors. This item will be calculated as a percentage of the sum of works allocated to the sub-contractors and shall include the process to appoint a sub-contractor as described in PSSC 1, as well as all costs and charges to manage all sub-contracted works. ..... Unit: %

PSSC 3 FIXED-CHARGE ITEMS FOR THE SUB-CONTRACTORS CONTRACTUAL REQUIREMENTS

The final amount will be determined by the process described under PSSC 1 ..... Unit: Prov Sum

PSSC 4 OVERHEAD, CHARGES AND PROFIT FOR THE MAIN CONTRACTOR TO PROVIDE FOR FIXED-CHARGE ITEMS FOR THE SUB-CONTRACTORS CONTRACTUAL REQUIREMENTS

This item will be calculated as a percentage of PSSC 3. ..... Unit: %

PSSC 5 TIME RELATED ITEMS FOR THE SUB-CONTRACTORS CONTRACTUAL REQUIREMENTS

The final amount will be determined by the process described under PSSC 1 ..... Unit: Prov Sum

PSSC 6 OVERHEAD, CHARGES AND PROFIT FOR THE MAIN CONTRACTOR TO PROVIDE FOR TIME RELATED ITEMS FOR THE SUB-CONTRACTORS CONTRACTUAL REQUIREMENTS

This item will be calculated as a percentage of PSSC 5. ..... Unit: %

PSSC 7 TRAINING FOR SMMES

This item will include for accredited and certified on-the-job training for SMMEs ..... Unit: Prov. Sum

PSSC 8 OVERHEAD, CHARGES AND PROFIT FOR THE MAIN CONTRACTOR TO PROVIDE FOR TRAINING FOR SMMES

This item will be calculated as a percentage of PSSC 7. .....Unit:%

PSSC 9 FOR CONTRACTOR TO MAKE DIRECT PAYMENT ON BEHALF OF SMME

The final amount will be determined by the process described under PSSC 1 ..... Unit: Prov. Sum

PSSC 10 OVERHEAD, CHARGES AND PROFIT FOR THE MAIN CONTRACTOR TO MAKE DIRECT PAYMENT ON BEHALF OF SMME

This item will be calculated as a percentage of PSSC 9. .....Unit:%

PSCP: CATHODIC PROTECTION AND PIPE CONDITION ASSESSMENT

PSCP 1 PIPELINE CONDITION ASSESSMENT AND CATHODIC PROTECTION (CP) INVESTIGATION

There are 3 rising mains related to this scope with the following characteristics:

- 1x DN1400 pipe, approximately 2 km long (for future Contract 2)
- 2x DN700 pipes, approximately 1.7 km long each (1x current Contract 1 and 1x future Contract 2)

In order to identify the nature of the cathodic protection system(s) and/or components that still exists, and the type of system required to protect the proposed pipelines from electrolytic corrosion, it is necessary for a certain amount of field work to be undertaken along the routes of these pipelines.

Gathered information should be used to carry out an integrated design and then to prepare an estimate of the cost of the temporary and final CP system(s) and AC mitigation measures that may be required. The current extent and degree of deterioration of the existing pipelines (including its' existing lining and coating) must be ascertained in order to provide for suitable repair/replacement options based on the current integrity of the pipe.

Experienced, specialised CP consultants are required for the provision of professional services as outlined below.
Specific risks pertaining to site work:

- The bidder is expected to identify any potential risks during the site visit and provide for such in their pricing.
- The normal site operations should not be adversely affected in any way during the investigation activities.
- Access points (chambers, manholes, etc.) along the length of the pipe have not been identified or located by the works personnel.
- Uncertainty regarding the state of the currently, not in use pipes.
- Previously installed CP straps for continuity over pipe joints are no longer in place, rendering the pipeline non-continuous i.t.o conductivity.
- Other parallel pipelines may be found in the vicinity of the pipes being investigated and while the focus must not change, recommendations should be given by the successful bidder as to what should be done about the other pipes, also highlighting the risks if nothing is done.
- Some existing overhead powerlines in the immediate vicinity appear to not be in use as the pylons do not have any cables running between them.
- Locations (intervals) of existing pipe access points such as manholes/chambers are not clear but do exist.
- The pipes traverse a wetland as may be seen on the layouts provided.

The main objectives of the investigation stage are:

- To verify the current location and conduct a condition assessment of the 3 existing pipelines and ancillaries. This assessment is to include the extent and severity of any deterioration that has occurred on the coating, lining and pipe itself, to determine the current integrity of these existing pipes.
- To determine and assess the resistivity of the soils along the entire length of the existing pipelines.
- To ascertain the nature and magnitude of any stray currents that may prevail in the area traversed by the pipelines.
- To determine what existing Cathodic protection exists on the site, related to these pipelines and its current condition.

The main objectives of the design stage are:

- To document the information collected on site and package such as readable deliverables (referenced drawings/sketches, report/s, results and/data sheets.
- To use that information to determine:
  - whether or not a cathodic protection system(s) is required
  - whether the existing system is adequate and in working condition.
  - necessary AC mitigation measures.
  - to carry out the design of the required CP system and or recommended repair methodology of the existing system, in accordance with Johannesburg Water specifications and guidelines.
  - the current integrity of the existing pipe throughout its length.
- To provide sufficient information which shall include detailed specifications, diagrams, drawings, and Bills of Quantities, to enable the detailed design and drawings of the existing pipeline CP system and AC mitigation, to be carried out and for tender documents to be prepared by the Employer's Agent.
- To estimate the cost of implementing, operating and maintaining the cathodic protection system and AC mitigation measures.
- Options analysis of applicable repairs and/or replacement of the existing pipelines where defects have been identified, including firm recommendations, in order to render the pipelines operational with an increased lifespan.
- To document all the above in a formal report, with relevant supporting deliverables.

NOTE: The scope of work could be curtailed if the results of the field investigations indicate that no CP system(s) or AC mitigation will be required. In such event, there will be no need to carry out any designs, nor to prepare specifications, diagrams, sketches and the like.

PSCP 2 DETERMINATION AND CLASSIFICATION OF THE CORROSIVITY OF THE SOILS

- Soil Resistivity measurements are to be carried out at approximately 50 m intervals along the routes of the existing pipelines, or other interval that the consultant deems necessary.
- GPS coordinates, to an accuracy of < 1 m, shall be recorded at each location. These coordinates are to be tabulated as X and Y coordinates based on map datum WGS 084.
- An appropriate method (such as the Wenner-four-electrode method) is to be used to determine the soil resistivity at the average depth of the existing buried pipelines (approximately 3 m below ground level).
- The data shall be plotted to present a graphical representation with the X (horizontal) axis being the pipeline chainage/length and the Y (vertical) axis being the measured resistivity in Ohm m.
- The following classification can be used (as a guide), it being noted that stray currents can cause corrosion in soils of any resistivity.

Resistivity (Ωm)	Corrosivity
0 to 5	Very Corrosive - Cathodic Protection Required
5 to 10	Corrosive - Cathodic Protection Recommended
10 to 20	Moderately Corrosive – Cathodic Protection Recommended
20 to 100	Mildly Corrosive - Cathodic Protection Optional
More than 100	Negligible - Cathodic Protection not Required

PSCP 3 DETERMINATION OF THE MAGNITUDE OF STRAY CURRENTS (IF ANY)

Recordings shall be taken to ascertain whether stray currents are present. In the event that stray currents are present, a stray current survey shall be carried out using digital data recorders that shall be set up so that the data can be logged over a 48 hour period at each location and to be synchronized (loggers readings time-stamped) along the pipeline. The number of positions at which readings are to be taken will be at the discretion of the CP consultant but shall be conducted at no more than 1 000 m intervals along the pipelines routes.

The variation in any major voltage surges that are observed/measured shall be recorded.

In the case of the existing steel pipelines, a current drainage survey shall be carried out and the data recorded. The locations at which the surveys are to be undertaken will be at the discretion of the CP consultant.

PSCP 4 CONSIDERATION OF THE NEED OR OTHERWISE FOR AC MITIGATION MEASURES

The existing pipelines are in close proximity to power lines at certain points along its length. The investigation, design, specification and cost estimates are to make provision for any AC mitigation measures that may be required.

PSCP 5 PIPELINE CONDITION ASSESSMENT

In order to determine the extent and degree of deterioration as well as any current defects that may render the pipe unusable/problematic, a thorough inspection of such is required. There was report of an existing leak, in the DN1400 pipe, close to the existing Van Wyksrust pump station but the whole length of this pipeline and the DN700 pipes must be assessed to finalise what repair and/or replacement options are to be accommodated, by others during construction.

Leak detection survey to be conducted to determine internal pipe defects and inspection to be performed to ascertain external pipeline coating defects. Leak detection/internal pipe assessment may be carried out by physical inspections with photographic record, other appropriate methods or a combination of such for the full length of the pipes and not at limited or “hot spot” locations.

Selected inspection methods must provide the following outcomes as a minimum:

- The remaining protective coating and lining condition
- Areas of pitting / metal loss / holes
- Condition of all the field joints
- Steel wall thickness readings at key positions along the internal of the pipeline to determine integrity of the remaining steel
- Other tests to determine the remaining integrity of the pipeline

External pipe coating inspection may include AC attenuation, DCVG and CIPPS or similar, or a combination of such.

It will be necessary to conduct ground penetrating radar (GPR) survey to identify the location of the existing pipes including all existing buried services in close proximity to such.
This will ensure that no existing services are damaged and that no one is injured due to a service being damaged as a result of his work on site including future work.
A clearly defined sketch and/or drawing indicating the location of the pipe and services shall also be provided as a deliverable.

PSCP 6 DELIVERABLES FOR THE INVESTIGATION / DESIGN / REPORT STAGE

The deliverables to be provided on completion of the work on site shall be a comprehensive report covering all aspects of the investigation, the existing pipes condition assessment, the CP system(s) and AC mitigation measures design and cost estimates.

The report shall include:

- Details pertaining to the design of the CP system(s) and AC mitigation measures that will be required to protect the existing pipeline during and on completion of repairs/replacement of such systems and the pipe itself.
- Firm recommendations on the steps to be taken to repair the existing and/or implement new CP system(s) and AC mitigation measures.
- Monitoring and maintenance recommendations for the works personnel to ensure that the system and pipelines reach their expected lifespans.

- Detailed drawings, specifications and Bills of Quantities covering all of the requisite CP and ACM components in sufficient detail to enable tenderers for the future construction stage to obtain firm prices from specialist CP sub-contractors to supply, repair and/or install the complete CP system(s) and AC mitigation measures. In the event of it being necessary to make provision for certain items that cannot be determined until construction work is under way, a Provisional Sum(s) may be provided but this must be the exception and can only be done if approved by the Employer's Agent.
- Details pertaining to the repair and/or replacement of the pipes itself. These details are to include locations of the pipes, type and description of repairs and/or replacement, costing and firm recommendations of the most feasible option/s. Where ancillaries are also required to be repaired and/or replaced, the same details apply.

PSCP 7 OWNERSHIP OF DOCUMENTS AND COPYRIGHT

All documents and data produced as a result of work performed on the project shall remain the property of the Employer and shall not be traded or made available to any third party without prior written consent of the Employer.

PSCP 8 HEALTH AND SAFETY

Any person/s entering the property will be required to comply with the necessary Health and Safety specifications of the site, as defined by the Employer.
Inductions, medical examinations and/or training of staff where needed, shall be deemed to be included in the quoted amounts.

PSCP 9 TERMS AND CONDITIONS

The CP consultant:

- Will be deemed to have visited the site and assessed and made due and adequate arrangements with respect to access to the site and for carrying out all of the specified work.
- Will be held responsible for the accuracy and completeness of all the work carried out, and for compliance with acceptable standards and professional practice. In this regard, an experienced Professional person will be required to take responsibility for all work carried out and all documents submitted are to be signed accordingly by that person.
- Shall remain independent and shall not be commercially or contractually involved with the supplier and/or installer of any component(s) of the CP system(s) during any construction phase of such.

PSCP 10 PAYMENT

Interim payments for work done will not be made for the investigation / design / report stage. An invoice for payment covering all work carried out shall be submitted after all work on site has been completed and the signed report has been submitted. Approval of the invoice is subject to verification, by the Employers agent, that all deliverables have been accounted for

PSCP 11 PREPARATION

A clearly defined methodology of all steps involved in the preparation and investigation is to be provided as part of the submission. The methodology must also highlight the key areas of professional services (milestones) and the personnel conducting the tasks. The BoQ items are to be further described/detailed in this methodology for clarity in cost comparisons.

Final compensation for complying with all conditions, obligations and liabilities described in this document shall be deemed to be included in the prices and sums stated in the Bills of Quantities.

PSCP 12 INFORMATION REQUIRED

Specialists must submit the following information:

- Covering Letter.
- Details of similar projects which the Bidder has carried out during the previous five years (description included as indicated below).
- The CVs of the personnel that will be involved on the project and an organogram.
- Brief description of the proposed methodology and programme of work.
- Proof of SANAS Accreditation or similar as relevant to the sampling and testing required.
- Letter of Good Standing from the Compensation Commissioner.
- SARS Tax Clearance Certificate.
- SARS Tax Compliance Certificate.
- VAT Registration Certificate
- Company Profile.
- BBBEE Certificate or Exemption in terms of the Act.
- Central Supplier Database (CSD) Form/ Report.

The specialist is required to meet the minimum requirements for project experience and key personnel in order to be considered for appointment.

No.	Criteria	Description	Documentary Evidence	Submission Compliant (Yes/ No)
1	**Project Experience**	The company must have successfully completed a minimum of two (2) design projects with a minimum value of R 1 million per project for pipe condition assessment, corrosion and AC mitigation professional fees in the discipline of large bore pipelines.	The specialist must provide confirmation (i.e. contactable reference letters) in writing from their clients'. The reference letters must clearly detail the following: (1) **Nature (Scope) of work** on the project that was carried out successfully. (2) The estimated **Value** of corrosion management aspect.	Submission compliant: (Yes / No)
2	**Experience of Key Personnel**	The specialist must submit Curriculum Vitae (CVs) of key staff outlining their work experience in relation to the scope of work – refer to the Corrosion staff experience description below.	**Corrosion Specialist: minimum** of 8 years Cathodic Protection (CP) field experience of which: • 3 years must be in general corrosion prevention **and** • 3-4 years must be in CP and AC Mitigation design for large bore buried steel pipelines >350mm.	Submission compliant: (Yes / No)
			Cathodic Protection (CP) Technician: minimum of 5 years Cathodic Protection (CP) field experience of which: • 2-3 years must include AC Mitigation (ACM) field experience **and** • 2 years must be in general corrosion prevention	Submission compliant: (Yes / No)
			Cathodic Protection (CP) Tester: minimum of 3 years in Cathodic Protection (CP) **and** general corrosion prevention field experience.	Submission compliant: (Yes / No)
			CP Technical Assistants: minimum of 18-months Cathodic Protection field experience.	Submission compliant: (Yes / No)

The Key Persons are to be Principles or permanent employees of the firm, namely:

- Corrosion Specialist
- Cathodic Protection: Technician
- Cathodic Protection: Tester
- Cathodic Protection: Technical Assistant
  The following persons may be part-time employees or sub-contractors for the duration of the contract provided the relevant experience requirements are met.
- Coating Inspectors
  Highly skilled and experienced in corrosion, surface preparation, cleanliness, environmental conditions, test instruments, coating mixtures, and safety aspects of corrosion inspection of large bore steel pipes. The Coating Inspector(s) must be able to undertake unsupervised non-destructive and destructive inspections of liquid and non-liquid coatings applied to any substrate. They must have a minimum of three (3) years coating inspection experience relevant to this scope of work.

PSCP 13 CORROSION STAFF EXPERIENCEIPSCP

13.1 Key Persons

The Corrosion Consultant (Service Provider) shall ensure that there are always sufficient resources that are suitably qualified, experienced, and skilled to carry out and supervise all activities.

The Curriculum Vitae (CV) of the resources to be used on the project must be provided with the tender submission and these documents must clearly indicate the work experience and knowledge of these persons are suitable to carry the functions required in the tender.

Should a need arise during the contract for individuals to be replaced or added to the corrosion team, then the curriculum vitae of these individuals need to be submitted to the JW Corrosion Engineer for review and approval. Failure to meet this requirement will cause the work carried out by these non-vetted individuals to be rejected and fees or claims refuted by JW.rr

Corrosion Specialist

The project tactician who will lead the project management, consulting, design, engineering processes and third-party consulting teams.

Must have the following years' experience:
a **minimum** of 8 years Cathodic Protection (CP) field experience of which:

- 3-4 years must include CP and AC Mitigation (ACM) design for large bore buried steel pipelines (>350mm)
- A training / course certificate or letter is to be presented that demonstrates the CP Specialist has been trained in using the ACM modelling software (as per Eskom requirements) to achieve the nature (scope) of work under this tender.

- 3 years must be in general corrosion prevention

Relevant Experience in the discipline of Cathodic Protection and AC Mitigation on large pipeline networks

The Corrosion Specialist's experience relevant to this tender will be assessed in terms of the number of years spent productively in the relevant discipline and specifically in the designing of CP and AC mitigating systems. The Corrosion Specialist's CV is to contain the necessary details to permit this assessment to be made.

Relevant Experience in the discipline of General Corrosion Prevention

The Corrosion Specialist's general corrosion prevention involves work experience and knowledge regarding selecting protective coatings and linings, material selection or modifying the environment and will be assessed in terms of the number of years spent in the corrosion field. The CV is to contain the necessary details to permit this assessment to be made.

General

The Corrosion Specialist's CV is to reflect any projects undertaken for local government; state owned entities and or Department of Water Affairs regarding large bore buried pipelines.

Ambiguous, over generalized, outdated, or non-specific CV submissions must be omitted. The CV must clearly show the years relevant experience in all areas of pipeline condition assessment, cathodic protection, ac mitigation, general corrosion, and working on large, buried pipeline networks.

PSCP 14 FAILURE TO MEET THE MINIMUM WILL LEAD TO REFUSAL OF THE SPECIALIST.

Cathodic Protection (CP) Technician

The Cathodic Protection (CP) Technician will monitor and evaluate the design implementation, carry out the field engineering processes and relevant corrosion and ac mitigation investigations.

Must have the following years' experience:
a **minimum** of 5 years Cathodic Protection (CP) field experience of which:

- 2-3 years must include AC Mitigation (ACM) field experience.
- 2 years must be in general corrosion prevention

Relevant Experience in the discipline of Cathodic Protection on large pipeline networks

The Cathodic Protection Technician's experience relevant to this tender must be assessed in terms of the number of years spent productively in the relevant discipline of CP systems. The CP Technician's CV is to contain the necessary details to permit this assessment to be made.

Relevant Experience in the discipline of General Corrosion Prevention

The Corrosion Technician's general corrosion prevention engineering involves work experience and knowledge regarding selecting corrosion protective coatings and linings, material selection or modifying the environment will be assessed in terms of the number of years spent in the corrosion field. The CV is to contain the necessary details to permit this assessment to be made.

General

The CP Technician CV is to reflect any projects undertaken for local government, state owned entities and or Department of Water Affairs regarding large bore pipelines.

Ambiguous, over generalized, outdated, or non-specific CV submissions will be omitted during the evaluation process. The CV must clearly show the years relevant experience in all areas of cathodic protection, general corrosion prevention and working on large, buried pipeline networks.

PSCP 15 FAILURE TO MEET THE MINIMUM REQUIREMENTS WILL LEAD TO REFUSAL OF THE SPECIALIST.

Cathodic Protection (CP) Tester

The CP Tester must have a minimum 3 years Cathodic Protection and General Corrosion Prevention experience and will be responsible for observing, recording, or measuring the effectiveness of galvanic and or impressed current CP systems.

Relevant Experience in the discipline of Cathodic Protection on large pipeline networks

The Cathodic Protection Tester experience relevant to this tender must be assessed in terms of the number of years spent productively in the relevant discipline of CP systems. The CP Tester's CV is to contain the necessary details to permit this assessment to be made.

Relevant Experience in the discipline of General Corrosion Prevention

The Corrosion Tester's general corrosion prevention engineering involves work experience and knowledge regarding basic material selection and or modifying the environment and must be assessed in terms of the number of years spent in the corrosion field. The CV is to contain the necessary details to permit this assessment to be made.

General

The CP Tester CV is to reflect any projects undertaken for local government, state owned entities and or Department of Water Affairs regarding large bore pipelines.

Ambiguous, over generalized, outdated, or non-specific CV submissions must be omitted in the evaluation process.

PSCP 16 **FAILURE TO MEET THE MINIMUM REQUIREMENTS WILL LEAD TO REFUSAL OF THE SPECIALIST.**

Cathodic Protection (CP) Technical Assistants

The Cathodic Protection Technical Assistants are to have a minimum of 18-months field experience, in the discipline relevant to this tender.

Ambiguous, over generalized on non-specific CV submissions must be omitted from the evaluation process.

PSCP 17 **FAILURE TO MEET THE MINIMUM REQUIREMENTS WILL LEAD TO REFUSAL OF THE SPECIALIST.**

Duties

The employer reserves the right to suspend the work on this project at the completion of any of the stages. In this event the work will be deemed to be concluded and no additional fees will be payable. The duties to be performed by the Key Persons are of a resident nature (within 100 km radius from JW Headquarters in Newtown, Johannesburg) as daily input may be required from the Service Provider's local office during the project.

Failure to meet the minimum requirements, as set out above, may lead to rejection of the service provider by the Employer and the Contractor would be required to source a compliant service provider at the tendered rates.

PORTION 4: PROJECT SPECIFICATION FOR REQUIRED MECHANICAL EQUIPMENT

Mechanical Project specifications:

PSX1.1 - Screening channel equipment

PSX1.2 - Wash water supply system

PSX1.3 - Pumps, Valves and Pipework

PSX1.4 - Pump station mechanical ancillaries.

PSX 1 MECHANICAL PROJECT SPECIFICATION

The scope of this Contract is described in general terms under the appropriate headings in C3 Scope of Work. This section of the Specification provides details of the mechanical plant and equipment required to complete the installation.

Specific attention is drawn to the Mechanical Particular Specifications that are to be read together with this Mechanical Project Specification. This Project Specification supplements the Particular Specifications and should any requirement of the Project Specification conflict with any requirement of the Particular Specifications, the requirements of the Project Specifications shall prevail.

The prices tendered shall be deemed to cover everything necessary for the equipping and commissioning of the proposed new and refurbished plant, including pipework and appurtenances.

PSX 1.1 Inlet Channel Screening Equipment

PSX 1.1.1 General

This specification must be read in conjunction with the Mechanical Particular Specification.

The drawings accompanying this document show the layout of the proposed inlet channels and the required positions of the screening equipment. The drawing applicable to these installations are:

- BW1400-RHD-C1-01-D-C-0102

All the necessary controls for the screening equipment are to be housed in the panels to be supplied and installed under other sections of this Contract and are fully described elsewhere. The prices tendered are to include for the complete installations including all necessary power and control cabling between the panels and the screening equipment all of which electrical and electronic requirements are specified and scheduled elsewhere.

The prices tendered are to include for the complete installation and shall include for the detailed designs and preparation of drawings for verification by the Employer's Agent, factory testing, installation, commissioning, and site testing.

PSX 1.1.2 Scope

The scope of work for the relevant mechanical equipment is the design, supply, delivery, transport, handling (double handling if required), storage, erection, installation, commissioning, testing, adjustment, handing over in complete working order and upholding during the Defects Liability Period for:

- 3 off automatic primary front rake screens
- 1 off primary screens belt conveyor
- 2 off automatic secondary front rake screens
- 1 off secondary screens screw conveyor
- 2 off (duty/standby) secondary screens wash compactors
- 1 off primary screens belt conveyor
- Wash water booster system including, 2 off (1 duty / 1 standby) wash water booster pumps, 1 off 4 750 m³ wash water storage tank, pipework, valves, and associated equipment.
- 2 off final effluent pumps
- 4 off 6 m3 skips and dolleys with a rail system as shown
- 5 off channel mounted penstocks for screen channel isolation

The scope of work will also include:

- Removal of the existing screens and conveyor.

PSX 1.1.3 Automatic Primary Front Rake Screens

The primary screens makes up the first of a two-stage screening arrangement, they are to be installed in each of the 2 existing channels and the new bypass channel. 3 screens will be required. Approximate dimension of the screens are shown on drawing BW1400-RHD-C1-01-D-M-0141.

The new screens shall conform to the requirements herein and to Particular Specification M01, and to the following requirements:

Bar openings	:	50 mm
Channel dimensions	:	1100 mm width, 3160 mm height
Screen field height	:	1600 mm
Screening medium	:	Raw domestic/industrial sewage
Maximum head loss	:	80 mm
Channel flow	:	maximum 800 l/s at 850 mm depth
Estimated screenings	:	Peak 1 m^3/day
Approximate screen angle	:	10 degrees
Approximate screen length	:	7000 mm
Fabrication materials	:	as per Particular Specification M01.

Prior to fabrication, physical measurements must be made onsite for final sizing of the screens.

PSX 1.1.4 Primary screens belt conveyor

Screenings from the primary screens will be deposited on a heavy-duty belt conveyor. The conveyor shall conform to the requirements of Particular Specification M16, and to the following requirements:

Approximate belt width	:	600 mm
Approximate length	:	13.5 m
Covers	:	not required
Platforms and walkways	:	a provisional sum has been included to cater for walkways as required during construction design
Weight meters	:	not required
Fabrication materials	:	as per Particular Specification M18.

The discharge point of the conveyor shall be adequately designed to discharge the screens into a 6 m3 waste skip adjacent to the screening area. The new 6 m³ waste skip shall be supplied with a skip trolly and rail system to allow for the waste skip to be moved away from under the discharge chute of the belt conveyor and removed by a skip trailer or truck.

PSX 1.1.5 Automatic Secondary Front Rake Screens

The secondary screens make up the second set of a two-stage screening arrangement, they are to be installed in each of the 2 existing channels. 2 screens will be required. Approximate dimension of the screens are shown on drawing BW1400-RHD-C1-01-D-M-0141.

The new screens shall conform to the requirements herein and to Particular Specification M01, and to the following requirements:

Bar openings	:	20 mm
Channel dimensions	:	1100 mm width, 3160 mm height
Screen field height	:	1600 mm
Screening medium	:	Raw domestic/industrial sewage
Maximum head loss	:	80 mm
Channel flow	:	maximum 800 l/s at 850 mm depth
Estimated screenings	:	Peak 3.5 m3/day
Approximate screen angle	:	10 degrees
Approximate screen length	:	7000 mm
Fabrication materials	:	as per Particular Specification M01.

Prior to fabrication, physical measurements must be made onsite for final sizing of the screens.

PSX 1.1.6 Secondary Screens Screw Conveyor

Screenings from the secondary screen will be transported to a duty/standby wash compactor arrangement. A typical layout of the screw conveyor is shown on drawing BW1400-RHD-C1-01-D-M-0141. The screw conveyor shall conform to Section M1.10.2 of Particular Specification M01 and the following requirements:

Approximate trough width	:	350 mm
Approximate length	:	8 m
Covers	:	hinged transparent UV protected plastic
Platforms and walkways	:	a provisional sum has been included to cater for walkways as required during construction design.
Estimated screenings	:	3.5 m^3/day
Fabrication materials	:	as per Particular Specification M01

The screw conveyor shall be configured such that it could discharge into either the duty standby wash compactor. It is envisaged that this would be achieved by manual removing of a section of the conveyor trough over the first wash compactor, thereby discharging into the first wash compactor. If that section of the trough is not removed, discharge would be to the second wash compactor.

PSX 1.1.7 Secondary Screens Wash Compactor

Screenings from the secondary screen will be transported to 2 wash compactors. The typical layout of the wash compactors is shown on drawing BW1400-RHD-C1-01-D-M-0141. The new wash compactors must conform to clause M01.11 of the Particular Specification M01 and to the following requirements:

Maximum loading	:	2 m^3/hr
Washing	:	Dedicated washing zone and separate high pressure spray zone
Fabrication materials	:	as per Particular Specification M01

Filtrate from the wash compactors shall be returned to upstream of the secondary screens using PVC pipework.

PSX 1.1.8 Wash water booster pump installation

Wash water will be supplied to the wash compactors by a wash water booster pump and tank installation. The typical layout of the installation is shown on drawing BW1400-RHD-C1-01-D-M-0141. The installation shall comprise the follow component:

Pumps	:	2 off (duty/standby) centrifugal end suction pumps.
		Approximate rating (5 l/s at 3 bar), to be sized on wash compactor requirements.
Storage tank	:	5,000 liter heavy duty polyethylene.
Pipework	:	304SS
		Estimated diameter DN65

Valves	:	Float valve for tank inlet Suction isolation valves to each pump – DN65 PN10 Discharge isolation valves from each pump – DN65 PN10 NRV on discharge of each pump – DN65 PN10 Isolation valve to supply to each wash compactor – DN65 PN10

PSX 1.1.9 Secondary screens belt conveyor

Screenings from the secondary screens wash compactors will be deposited onto a heavy-duty belt conveyor. The conveyor shall conform to the requirements of Particular Specification M16, and to the following requirements:

Approximate belt width	:	600 mm
Approximate length	:	4 m
Covers	:	not required
Platforms and walkways	:	a provisional sum has been included to cater for walkways as required during construction design
Weight meters	:	not required
Fabrication materials	:	as per Particular Specification M18.

The discharge point of the conveyor shall be adequately designed to discharge the screens into a 6 m3 waste skip adjacent to the screening area. The new 6 m³ waste skip shall be supplied with a skip trolly and rail system to allow for the waste skip to be moved away from under the discharge chute of the belt conveyor and removed by a skip trailer or truck.

PSX 1.1.10 Channel Mounted Penstocks

Channel mounted penstocks shall be provided for upstream and downstream of the screens. The positions are shown on drawing BW1400-RHD-C1-01-D-C-0101. Penstocks shall comply with the Particular Specification M34. Dimensions of penstocks are to be confirmed based on sited measurements during construction and is estimated as:

Number required	:	5 off
Width	:	1,000 mm
Gate height	:	2,000 mm
Gate lifting height	:	2,000 mm
Invert top of frame	:	4,600 mm

PSX 1.1.11 Measurement and Payment

The tendered rates or sums shall cover the cost of design, drawings, manufacture, supply, testing at the manufacturers works, delivery to site, off-loading, installation, site testing, setting into operation, the supply of O & M manuals, commissioning and maintenance during the warranty period of all equipment specified and also for anything not specifically mentioned but obviously required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and any work or material required for the proper installation of such equipment) to enable the equipment to be installed and/or function safely and correctly as specified. No claims whatsoever for extras will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned.

Measurement and payment will distinguish between:

- Manufacture, supply, delivery to site – payment will be limited to 80% of the BoQ item.
- Installation – balance of 20% of the BoQ item.

PSX 1.2 Wash Water Supply System

PSX 1.2.1 General

A new temporary wash water supply pump station shall be provided under this contract to provide final effluent from the final effluent pump station to the Van Wyk Rust PS. A long-term solution that provides final effluent to the Van Wyk Rust PS be provided from the Maturation ponds is due to be implemented under a future contract. The final effluent pump station is shown as location 18 in drawing BW1400-RHD-C1-00-D-C-0001. Two pumps, 1 duty 1 standby, shall be provided and shall be mounted on a skid which shall be mounted adjacent to the intake chamber of the final effluent pump station. The feed line from the supply pumps to Van Wyksrust pump station shall be approximately 110mm diameter and shall be a combination of HDPE (buried section) and MSG (exposed section mainly over the river crossing).

PSX 1.2.2 Scope

The scope of work for the relevant mechanical equipment is the design, supply, delivery, transport, handling (double handling if required), storage, erection, installation, commissioning, testing, adjustment, handing over in complete working order and upholding during the Defects Liability Period for:

- 2 new self-priming final effluent pumps including, suction and discharge pipework system, valves, pipework and associated ancillary equipment.
- 1 skid for mounting of the pumps and fixing of suction and discharge pipes and valves.

The supply pipework from the common discharge manifold of the pumpsets to the wash water storage tank at Van Wyksrust PS is included under the civil scope of work section of this document.

PSX 1.2.3 Pump, pipework and valve requirements:

The pumps supplied under this Contract shall be of the self-priming centrifugal type and shall comply with the requirements of Standard Specification M18 and to the following supplementary requirements.

Pump function	:	Deliver final effluent to the Van Wyk Rust PS
No. of pump sets required	:	2 (1 Duty, 1 Standby) including motors
Drive	:	Fixed speed
Pressure gauges required	:	YES
Base plate coating	:	Hot dip galvanised.
Duty point definition per pump	:	7.5 l/s @ 25 m
Priming lift	:	Self-priming
Type of liquor to be pumped	:	Final effluent
Nature of liquid to be pumped	:	Newtonian
Pipework	:	304SS
		Estimated diameter DN100
Valves	:	Float valve for tank inlet
		Suction isolation valves to each pump – DN100 PN10
		Discharge isolation valves from each pump – DN100 PN10
		NRV on discharge of each pump – DN100 PN10

PSX 1.2.4 Measurement and Payment

The tendered rates or sums shall cover the cost of design, drawings, manufacture, supply, testing at the manufacturers works, delivery to site, off-loading, installation, site testing, setting into operation, the supply of O & M manuals, commissioning and maintenance during the warranty period of all equipment specified and also for anything not specifically mentioned but obviously required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and any work or material required for the proper installation of such equipment) to enable the equipment to be installed and/or function safely and correctly as specified. No claims whatsoever for extras will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned.

Measurement and payment will distinguish between:

- Manufacture, supply, delivery to site – payment will be limited to 80% of the BoQ item.
- Installation – balance of 20% of the BoQ item.

PSX 1.3 Main Pump Pumping Installation

PSX 1.3.1 General

The pump station, albeit currently defunct, is fitted with 6 pumpsets, pipework and valves and deliver flow to 2 rising mains. The pump station was also equipment with forced ventilation, drainage pump, penstocks and lifting equipment. All equipment is to be replaced under this contract.

The rising mains are also to be returned to service and the scope thereof is included under the civil section of this document.

The drawings accompanying this document show the layout of the pump station and the provisional positions of the pumps, pipework and valves and penstocks.

The drawings applicable to this installation are:

- BW1400-RHD-C1-02-D-M-0241
- BW1400-RHD-C1-02-D-M-0242

The final layout will be adjusted to best suit the equipment accepted.

The prices tendered are to include for the complete installation and shall include for the detailed designs and preparation of drawings for verification by the Employer's Agent, factory testing, installation, commissioning, and site testing.

PSX 1.3.2 Scope

The scope of work for the relevant mechanical equipment is the design, supply, delivery, transport, handling (double handling if required), storage, erection, installation, commissioning, testing, adjustment, handing over in complete working order and upholding during the Defects Liability Period for: 6 new solids handling horizontal spindle centrifugal pumps including and directly coupled 4-pole premium efficiency motor and mounted on a fabricated steel base.

- Valves in the pump station comprising and the adjacent chamber
- Valves and air-valves for rising mains
- Pipework and pipework supports for the pump station

The scope of work will also include:

- Removal of the existing equipment including pumps, valves and pipework and transport to client's stores.

PSX 1.3.3 Pump requirements:

The pumps supplied under this Contract shall be of the solids handling horizontal spindle centrifugal type and shall comply with the requirements of Standard Specification M18 and to the following supplementary requirements.

Pump function	:	Deliver screened sewage to the HoW.
Pump Type	:	Solids handling horizontal spindle centrifugal.
No. of pump sets required	:	6 (4 Duty, 2 Standby) including motors.
Drive	:	Variable speed
Pressure gauges required	:	YES (suction and delivery per pumpset)
Base plate coating	:	Hot dip galvanised.
Duty point definition per pump	:	390 l/s @ 19 m head & 257.5 l/s @ 27.5 m head @ approximately 1480 rpm
Priming lift	:	Flooded suction
Type of liquor to be pumped	:	Screened raw sewage (containing solids)
Nature of liquid to be pumped	:	Newtonian

PSX 1.3.4 Valves, Pipework, Supports and Fittings

All the existing valves shall be removed and replaced with news valves that conform to clause M20 of the Standard Specification. Valves shall comprise:

Pump station:

- 6 off DN450 PN10 knife gate valves (pump suction)
- 6 off DN400 PN10 knife gate valves (pump delivery)
- 6 off DN400 PN10 swing check valves.

The following valves at the discharge of the pump station chamber:

- 3 off DN600 PN10 knife gate valves
- 2 off DN200 PN10 sewage air valves
- 2 off DN200 PN10 air valve isolation knife gate valves

The following valves on the rising mains are to be replaced:

- 2 off DN700 PN10 knife gate valves
- 6 off DN350 PN10 knife gate valves

Tenderers are required to price for the supply and installation of the pumpsets and valves within the pump station as indicated on the drawings and Bills of Quantities. A provisional sum has been included in the Bills of Quantities for the supply and installation for pipework, pipework supports, and special fittings required to accommodate the installation of the new pumps.

PSX 1.3.5 Measurement and Payment

The tendered rates or sums shall cover the cost of design, drawings, manufacture, supply, testing at the manufacturers works, delivery to site, off-loading, installation, site testing, setting into operation, the supply of O & M manuals, commissioning and maintenance during the warranty period of all equipment specified and also for anything not specifically mentioned but obviously required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and any work or material required for the proper installation of such equipment) to enable the equipment to be installed and/or function safely and correctly as specified. No claims whatsoever for extras will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned.

Measurement and payment will distinguish between:

- Manufacture, supply, delivery to site – payment will be limited to 80% of the BoQ item.
- Installation – balance of 20% of the BoQ item.

PSX 1.4 Pump Station Mechanical Ancillaries

PSX 1.4.1 General

All pump station ancillary equipment shall be replaced since they have been vandalised or stolen.

PSX 1.4.2 Scope

The scope of work for the relevant mechanical equipment is the design, supply, delivery, transport, handling (double handling if required), storage, erection, installation, commissioning, testing, adjustment, handing over in complete working order and upholding during the Defects Liability Period for:

- 2 off pump station sump drainage submersible pumps rated at 1.5 kW, 40 m3/hr at 6 m, and pipework.
- Building ventilation fan and ducting.
- Building hoists including 3 ton overhead electric hoist and crawl trolley.
- Pump station sump wall mounted penstocks, 3 off 650 x 650 mm, with 4 m spindles.

The scope of work will also include:

- Removal of the existing equipment and transport to clients stores.

PSX 1.4.3 Sump drainage pumps and pipework

The pump station well is located below ground and requires a collection sump fitted with submersible pumps to pump out water from ingress, wash down and maintenance. The operation of the submersible pump shall be float controlled with an operating duty of 40 m3/h at 6 m head.

The pumps supplied under this Contract shall be of the submersible centrifugal type and shall comply with the requirements of Standard Specification M18 and to the following supplementary requirements.

Pump function	:	Remove drainage water from pump station
No. of pump sets required	:	1 duty pump, a standby
Drive	:	Fixed speed
Duty point definition per pump	:	40 m3/h at 6 m
Priming lift	:	Flooded suction
Type of liquor to be pumped	:	Sewage
Nature of liquid to be pumped	:	Newtonian

The pump shall be supplied with pipework to convey the fluid into the main pump station sump. Each pump shall discharge through a separate galvanised pipe estimated at DN80 and shall be fitted with a ball type non-return valve. The installation shall include a suitably rated flexible connection between the pump and discharge pipework. The estimated length of pipework for each pump is 7 m.

PSX 1.4.4 Building Ventilation

A new ventilation system shall be installed for the pump station system. It is expected that the ventilation system shall comprise a 0.37 kW extraction fan and 24 m of fabricated steel ducting. A provisional sum has been included in the Bills of Quantities for the supply and installation of the ventilation system.

PSX 1.4.5 Building Hoist and Crawl Beam

The contract includes replacement and/or refurbishment of the building crawl beam and new lifting equipment comprising a 3-ton hoist with electrically controlled lifting and crawl. A provisional sum has been included in the Bills of Quantities to cater for the lifting equipment and crawl beam.

PSX 1.4.6 Wall Mounted Penstocks

The existing sump wall mounted sluice penstocks shall be removed and replaced with new wall mounted penstocks. comply with the requirements of Standard Specification M34.

Number required	:	3 off	
Dimensions opening	:	610 x 610 mm	
Spindle length	:	2 off at 5.0 m,	1 off at 7.3 m

PSX 1.4.7 Measurement and Payment

The tendered rates or sums shall cover the cost of design, drawings, manufacture, supply, testing at the manufacturers works, delivery to site, off-loading, installation, site testing, setting into operation, the supply of O & M manuals, commissioning and maintenance during the warranty period of all equipment specified and also for anything not specifically mentioned but obviously required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and any work or material required for the proper installation of such equipment) to enable the equipment to be installed and/or function safely and correctly as specified. No claims whatsoever for extras will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned.

Measurement and payment will distinguish between:

- Manufacture, supply, delivery to site – payment will be limited to 80% of the BoQ item.
- Installation – balance of 20% of the BoQ item.

PORTION 5: PROJECT SPECIFICATION FOR REQUIRED ELECTRICAL AND CONTROL WORK

PSY 1 ELECTRICAL AND CONTROL PROJECT SPECIFICATIONS

PSY 1.1 Introduction

The scope of this Contract is described in general terms under the appropriate headings in C3 Scope of Work. This section of the Specification provides details of the electrical and control equipment required to complete the installation.

Specific attention is drawn to the Electrical and Control and Instrumentation Particular Specifications that are to be read together with this Project Specification. This Project Specification supplements the Particular Specifications and should any requirement of the Project Specification conflict with any requirement of the Particular Specifications, the requirements of the Project Specifications shall prevail.

This part contains the specific requirements for the project regarding work that is to be carried out at the Olifantsvlei Wastewater Treatment Works for the electrical, work required for the following systems:

- Complete reestablishment of the electrical systems for the Van Wyksrust Pump Station.
- Reestablishment of the medium voltage reticulation required to supply the Van Wyksrust pump station.
- Complete reestablishment of the control and instrumentation systems for the Van Wyksrust Pump Station.

PSY 1.2 Scope of Work

PSY 1.2.1. Van Wyksrust Pump Station – Electrical Reestablishment

The electrical work to be carried out at the Olifantsvlei Waste Water Treatment Works for the Van Wyksrust pump station comprises in general, the following:

- Supply, delivery, installation, testing and commissioning of a new 630kVA, 11/0.4kV, ONAN transformer for the pump station.
- Supply, delivery, installation, testing and commissioning of a new 500kVA, 400V back-up generator for the pump station, including change over panel.
- Supply, delivery, installation, testing and commissioning of a new MCC (motor control centre) for the pump station.
- Supply, delivery, installation, testing and commissioning of five (5) local control panels, for the screening drives.
- Supply, delivery, installation, testing and commissioning of six (6) local control panels, for the main pump drives.
- Supply, delivery, installation, testing and commissioning of eleven (11) local control panels, for the pump station auxiliary drives.
- Connection of the new MCC to the new PLC panel.
- Supply, delivery, installation and testing of the low voltage and control cabling for the Van Wyksrust pump station.

- Supply, delivery, installation, testing and commissioning of two (2) 30m high mast lights.
- Supply, delivery, installation, testing and commissioning of the earthing and lightning protection systems for the pump station.
- Supply, delivery, installation, testing and commissioning of the small power and lighting requirements for the pump station.
- Trenching of approximately 300m, including backfill and compaction.
- Supply, delivery and installation of cable racking and support systems for the pump station.
- Testing and commissioning of the complete electrical and automation installation.
- Supply owner and maintenance manuals for all new equipment.

PSY 1.2.2. Reestablishment of Medium Voltage (MV) Reticulation to the Van Wyksrust Pump Station

This part includes the work required for the replacement of the MV switchgear and MV reticulation at Olifantsvlei Waste Water Treatment Works (WWTW's) to supply the Van Wyksrust pump station.

The electrical work to be carried comprises in general, the following:

- Supply, delivery, installation, testing and commissioning of the Van Wyksrust Substation MV switchgear and battery tripping unit (BTU), consisting of :2 x Incomer panels, 1 x transformer circuit breaker and 1 x BTU.
- Supply, delivery, installation, testing and commissioning of the Substation C 11kV Ring Main Unit (RMU), including 2 x 630A isolators and 1 x 200A feeder circuit breaker.
- Civil works – Substation building modification required for the installation of the above listed MV switchgear.
- Supply, delivery, installation and testing of following MV cables
- 1000 m of 185 mm2 SWA XLPE MV cable between the Distribution sub and Substation C.
- 190 m of 70 mm2 SWA XLPE MV cable between Substation C and the Van Wyksrust Pump Station Substation.
- Trenching of approximately 840m of cable trench, required to install the new MV cabling detailed above. Trenching will include backfill, compaction, supply and installation of cable protection tiles and the supply and installation of cable route markers for the new cabling installed.
- Supply, delivery, installation, testing and commissioning of an 11kV "Fox" conductor overhead line system, including earthing system, between Substation C and the Van Wyksrust Pump Station Substation.
- Removal of existing MV switchgear, RMU's and MV cabling, transport to designated store.

PSY 1.2.3. Van Wyksrust Pump Station – Control and Instrumentation Reestablishment

The scope of supply of the instrumentation part of this contract shall be the manufacturing, supply, delivery, safe storage on site before installation, installation and commissioning of the process monitoring instrumentation systems listed in this tender document and on the relevant drawings. The instrumentation equipment shall include the following:

- The supply, delivery and installation of the PLC hardware as specified.
- The supply, installation and commissioning of five screen differential ultrasonic level meters.
- The supply, installation and commissioning of two ultrasonic level meters.
- The supply, installation and commissioning of two pressure meters.
- The supply, installation and commissioning of two clamp on type flow meters.
- The supply, installation and commissioning of two ultrasonic parshall flume flow meters.
- The supply, installation and commissioning of two capacitive level switches.
- The supply, installation and commissioning of eight thermal flow switches.
- The supply, installation and commissioning of instrument junction boxes (IJBs) for all instruments supplied.
- The manufacture, supply and installation of support steel work for field junction boxes (FJBs) and instrument control panels (ICPs).
- The supply, delivery, installation, splicing and termination of communication fibre-optic cables.
- The supply, delivery, installation and testing of network equipment and panels.
- The supply, delivery, installation and testing of a VHF/UHF radio booster system.
- The supply, delivery, installation and testing of an intruder detection system for the pump station perimeter fence.

PSY 2 VAN WYKSRUST PUMP STATION MCC INSTALLATION

PSY 2.1 Scope of Work

This specification covers the design, supply, installation, testing and commissioning of a MCC, complete with sub-circuit wiring, to be installed at the Van Wyksrust Pump Station. The scope of work shall include the removal and transport of the existing MCC to designated storage on site.

The motor sizes indicated in the motor schedule are provisional. The Contractor shall confirm the final sizes of all the motors in order to correctly rate the power circuits (isolator, circuit breaker, overload, etc.) of each of the motor starters should it be required.eMCC Manufacturing

The new MCC shall be supplied, delivered to site, and installed on position in the positions indicated. The new MCC shall be manufactured in accordance with the requirements of the following particular specifications:

- E04: Low Voltage Motor Control Centres

The new MCC's shall be front access arrangement. Form 3b shall be preferred. The Contractor shall ensure that, if this is not achievable, that a suitable alternative form is agreed with the Engineer, before construction of the MCC commences.

PSY 2.2 MCC Wiring

The motor starter circuits shall be wired according to the schematic drawings provided. The Contractor shall generate the detailed schematics for each of the starters and other equipment to be installed in the MCC's. The control centre shall include no interconnections between control units.

Terminal blocks shall be provided for each motor starter mounted on DIN rails in the respective wire way where all the incoming field cables and outgoing PLC I/O interfacing cables shall be wired to.

PSY 2.3 Cubicle Identification Labels

Cubicle identification labels shall be suppled as per the Johannesburg Water standard.

PSY 2.4 Quality Control

The Contractor shall submit complete QA/QC documentation for approval by the Employer's Agent, before manufacturing of the MCC shall begin. The documentation will be approved by the engineer, who will indicate hold points, tests, and inspections to be carried out in the presence of the Employer's Agent. At least three (3) days' notice shall be given to the engineer for the witnessing of tests, inspections, etc.

The MCC shall go through a quality inspection and factory acceptance testing (FAT) before being taken to site. This inspection will include physical inspection of the structure and electrical conductors and general wiring. The quality inspection shall include general electrical tests of the power circuit phasing, control circuit wiring, and device electrical operation.

The MCC shall go through a similar quality inspection upon arrival on the site and before physical interconnection with any site services.

The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the MCC meets operating specifications.

PSY 2.5 Drawings

The Contractor is required to produce the detailed individual wiring diagrams for each starter in AutoCAD format fully in compliance with the Employer's Agent's requirements. All drawings are to be submitted for approval prior to the start of manufacture. Typical schematic drawings of circuits are attached in the annexures.

PSY 2.6 Manufacturing

The MCC's shall be manufactured by an approved supplier with proven track record within the business. A set of workshop drawings must be presented for approval prior to the commencement of manufacturing of the MCC's.

PSY 3 SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF 630KVA 11/0.4KV ONAN TRANSFORMER

PSY 3.1 Scope of Work

This specification details the equipment and procedures required for supply, delivery, installation, testing and commissioning of Van Wyks Pump Station 630kVA 11/0.4kV transformer.

PSY 3.2 Supply of Transformer

The transformer shall be supplied, delivered to site and installed in the positions indicated. The new transformer shall be manufactured in accordance with the requirements of the following particular specifications:

- E15: ELECTRICAL TRANSFORMERS

PSY 3.3 Quality Control

The Contractor shall submit complete QA/QC documentation for approval by the Engineer, before manufacturing of the transformer shall begin. The documentation will be approved by the engineer, who will indicate hold points, tests and inspections to be carried out in the presence of the Engineer. At least three (3) days' notice shall be given to the engineer for the witnessing of tests, inspections, etc. Cubicle Identification Labels.

The transformer shall go through a quality inspection and factory acceptance testing (FAT) before being taken to site. cThe manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the transformer meets operating specifications.

PSY 3.4 Drawings

The Contractor is required to produce the detailed wiring and general arrangement diagrams for the transformer in AutoCAD format fully in compliance with the Engineer's requirements. All drawings are to be submitted for approval prior to the start of manufacture.

PSY 3.5 Manufacturing

The transformer must be manufactured by an approved supplier with proven track record within the business. The transformer shall be as per specification in the appendices, and adhere to the industry norms. Any deviations must be approved by the engineer and the client prior to manufacture.

PSY 4 SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF 11KV SWITCHGEAR

PSY 4.1 Scope of work

This specification details the equipment and procedures required for supply, delivery, installation, testing and commissioning of Van Wyks Pump Station 11kV substation board.

PSY 4.2 Supply of 11kV Switchgear

The MV switchgear shall be supplied, delivered to site and installed in the positions indicated. The new MV switchgear shall be manufactured in accordance with the requirements of the following particular specifications:

- E13: ELECTRICAL MEDIUM VOLTAGE SWITCHGEAR

PSY 4.3 Cubicle Identification Labels

Cubicle identification labels shall be suppled as per the JW standard.

PSY 4.4 Quality Control

The Contractor shall submit complete QA/QC documentation for approval by the Engineer, before manufacturing of the MV Switchgear shall begin. The documentation will be approved by the engineer, who will indicate hold points, tests and inspections to be carried out in the presence of the Engineer. At least three (3) days' notice shall be given to the engineer for the witnessing of tests, inspections, etc.

The MV board shall go through a quality inspection and factory acceptance testing (FAT) before being taken to site. This inspection will include physical inspection of the structure and electrical conductors and general wiring. The quality inspection shall include general electrical tests of the power circuit phasing, control circuit wiring, and device electrical operation. The MV board shall go through a similar quality inspection upon arrival on the site and before physical interconnection with any site services.

The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the MV Switchgear meets operating specifications.

PSY 4.5 Drawings

The Contractor is required to produce the detailed wiring diagrams for all MV panels in AutoCAD format fully in compliance with the Engineer's requirements. All drawings are to be submitted for approval prior to the start of manufacture.

PSY 4.6 Manufacturing

The MV equipment must be manufactured by an approved supplier with proven track record within the business. The MV equipment shall be as per specification in the appendices, and adhere to the industry norms. Any deviations must be approved by the engineer and the client prior to manufacture.

PSY 5 SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF 11KV RING MAIN UNIT

PSY 5.1 Scope of Work

PSY 5.2 This specification details the equipment and procedures required for supply, delivery, installation, testing and commissioning of Substation C 11kV Ring Main Unit (RMU).

PSY 5.3 Supply of 11kV RMU

The 11kV RMU shall be supplied, delivered to site and installed in the positions indicated. The new RMU shall be manufactured in accordance with the requirements of the following particular specifications:

- E19: ELECTRICAL 11kV RING MAIN UNIT

PSY 5.4 Cubicle Identification Labels

Cubicle identification labels shall be suppled as per the JW standard.

PSY 5.5 Quality Control

The Contractor shall submit complete QA/QC documentation for approval by the Engineer, before manufacturing of the RMU shall begin. The documentation will be approved by the engineer, who will indicate hold points, tests and inspections to be carried out in the presence of the Engineer. At least three (3) days' notice shall be given to the engineer for the witnessing of tests, inspections, etc.

The RMU shall go through a quality inspection and factory acceptance testing (FAT) before being taken to site. This inspection will include physical inspection of the structure and electrical conductors and general wiring. The quality inspection shall include general electrical tests of the power circuit phasing, control circuit wiring, and device electrical operation.

The RMU shall go through a similar quality inspection upon arrival on the site and before physical interconnection with any site services.

The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the RMU meets operating specifications.

PSY 5.6 Drawings

The Contractor is required to produce the detailed wiring diagrams for the RMU in AutoCAD format fully in compliance with the Engineer's requirements. All drawings are to be submitted for approval prior to the start of manufacture.

PSY 5.7 Manufacturing

The RMU must be manufactured by an approved supplier with proven track record within the business. The RMU shall be as per specification in the appendices, and adhere to the industry norms. Any deviations must be approved by the engineer and the client prior to manufacture.

PSY 6 MV CABLING

PSY 6.1 Scope of Work

This specification covers the supply of 11kV XLPE power cables. Refer to the Cable Schedule attached in the appendices and the Bill of Quantities for the requirements of the cables to be supplied.

PSY 6.2 Supply of Medium Voltage Cables

The medium voltage cables shall be manufactured in accordance with the requirements of the following particular specifications:

- Specification E12: MEDIUM VOLTAGE CABLES

PSY 7 MEDIUM VOLTAGE CABLE INSTALLATION

PSY 7.1 Scope of Work

This specification covers the installation requirements of electrical equipment under this contract.

PSY 7.2 Medium Voltage Cable Installation Requirements

All medium voltage cable installation and the additional requirements detailed below shall be supplied, installed and commissioned between the new MV equipment installed on the plant by the Contractor.

The electrical installation shall be completed in accordance with the requirements of the following particular specifications:

- Specification E06: MEDIUM AND LOW VOLTAGE CABLE INSTALLATION
- Specification E02: CABLE RACKING

The Contractor shall supply and install medium voltage power cables. Refer to the cable schedules attached in the appendices for the details.

PSY 8 11kV OVERHEAD LINE DESIGN AND INSTALLATION

PSY 8.1 Scope of Work

This specification covers the design, supply and installation requirements of the 11kV overhead line equipment, including earthing system, to be installed between Substation C and the Van Wyksrust Pump Station.

PSY 8.2 11kV Overhead Line Supply & Installation Requirements

The overhead line system design, supply and installation shall be completed in accordance with the requirements of the following particular specifications:

- Specification E20: ELECTRICAL OVERHEAD LINES UP TO 22kV

PSY 9 LV CABLING

PSY 9.1 Scope of Work

This specification covers the supply of 600/1000V PVC insulated power and control cables. Refer to the Cable Schedule attached in the appendices and the Bill of Quantities for the requirements of the cables to be supplied.

PSY 9.2 Supply of Low Voltage Cables

The low voltage cables shall be manufactured in accordance with the requirements of the following particular specifications:

- E05: LOW VOLTAGE CABLES

PSY 10 LOW VOLTAGE CABLE INSTALLATION

PSY 10.1 Scope of Work

This specification covers the installation requirements of electrical equipment under this contract.

PSY 10.2 Low Voltage Cable Installation Requirements

All low voltage cable installation and the additional requirements detailed below shall be supplied, installed, and commissioned between the new circuits installed on the MCC and the respective equipment by the Contractor.

The electrical installation shall be completed in accordance with the requirements of the following particular specifications:

- E06: MEDIUM AND LOW VOLTAGE CABLE INSTALLATION
- E02: CABLE RACKING

The Contractor shall supply and install low voltage power and control cables. Refer to the cable schedules attached in the appendices for the details of the cables to be supplied and installed.

The Bill Of Quantities will indicate required lengths and sizes of cable and racking. Sizes and quantities indicated in the Bill Of Quantities are there to ensure sufficient funds are available for racking. These quantities must not be used for placing of orders. The contractor must submit cable racking layouts for approval by the Engineer before any racking is ordered.

PSY 11 LOCAL START/STOP ISOLATOR PUSHBUTTON STATIONS

PSY 11.1 Scope of Work

This specification covers the supply of the local start/stop isolator pushbutton stations.

PSY 11.2 Supply of Local Start/Stop Isolator Pushbutton Stations

The local start/stop isolator pushbutton stations shall be manufactured in accordance with the requirements of the following particular specifications:

- E03: LOCAL START/STOP ISOLATOR PUSHBUTTON STATION EQUIPMENT

For standardisation purposes, all new components and wire colours to be provided by the Contractor shall be similar to the components and wiring in the existing local start/stop isolator pushbutton stations.

PSY 12 EARTHING AND EARTH BONDING

PSY 12.1 Earth Bonding of Metal Structures and Equipment

In general, unless otherwise specified, all bonding shall be done by means of a 16 mm², green PVC insulated, hard drawn, stranded copper conductor and crimping lugs or ferrules. The earth bonding from steel structures to the main substation earth bar shall be done by means of a 70 mm2, Kwena type earth wire.

PSY 12.2 Earthing and Lightning Protection Requirements

The earthing and earth bonding of structures and equipment shall be completed in accordance with the requirements of the following particular specification:

- E11: GENERAL ELECTRICAL EARTHING AND LIGHTNING PROTECTION

PSY 13 ELECTRICAL AND CONTROL PROJECT SPECIFICATIONS

PSY 13.1 Scope of Work

This specification details the equipment and procedures required for supply, delivery, installation, testing and commissioning of a standby generator system for the Van Wyksrust Pump station.

PSY 13.2 Supply, Installation and Commissioning of Standby Generator

The 500kVA, 400V standby generator shall be supplied, delivered to site and installed in the positions indicated. The new generator shall be manufactured in accordance with the requirements of the following particular specifications:

- E14: ELECTRICAL SUPPLY AND INSTALLATION OF A STANDBY GENERATOR

PSY 13.3 Quality Control

The Contractor shall submit complete QA/QC documentation for approval by the Engineer, before manufacturing of the generator shall begin. The documentation will be approved by the engineer, who will indicate hold points, tests and inspections to be carried out in the presence of the Engineer. At least three (3) days' notice shall be given to the engineer for the witnessing of tests, inspections, etc.

The generator shall go through a quality inspection and factory acceptance testing (FAT) before being taken to site. This inspection will include physical inspection of the equipment and electrical conductors and general wiring. The quality inspection shall include general mechanical and electrical tests of the generator system, and equipment operation. The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the RMU meets operating specifications.

PSY 13.4 Drawings

The Contractor is required to produce the detailed general arrangement, connection and wiring diagrams for the standby system in AutoCAD format fully in compliance with the Engineer's requirements. All drawings are to be submitted for approval prior to the start of manufacture.

PSY 13.5 Manufacturing

The generator must be manufactured by an approved supplier with proven track record within the business. The generator shall be as per specification and data sheets in the appendices, and adhere to the industry norms. Any deviations must be approved by the engineer and the client prior to manufacture.

PSY 14 ELECTRICAL/AUTOMATION INTERFACE

PSY 14.1 Scope of Work – Van Wyks Pump Station MCC

The new pump station MCC shall be interfaced with the new PLC to be located in the pump station.

PSY 15 PROJECT SPECIFICATION: supply of BATTERY TRIPPING UNIT

PSY 15.1 Scope of Work

This specification covers the supply of the battery tripping unit for the Van Wyksrust Substation.

PSY 15.2 Supply of Battery Tripping Unit

The battery tripping unit shall be manufactured in accordance with the requirements of the following particular specifications:

- E24: ELECTRICAL BATTERY TRIPPING UNIT

PSY 16 SUPPLY OF MOTORS

PSY16.1 Scope of Work

New electrical motors shall be supplied under this project. This specification covers the supply of any new electrical motor to be supplied.

PSY16.2 Supply of Electrical Motors

The motors to be supplied shall be manufactured in accordance with the requirements of the following particular specifications:

- E01: ELECTRICAL MOTORS

PSY 17 BUILDING SMALL POWER AND LIGHT FOR THE VAN WYKSRUST PUMPSTATION

PSY 17.1 Scope of Work

The Contractor is required to refurbish the small power and lighting installation for the pump station buildings.

PSY 17.2 Supply and Installation of Building Small Power and Lighting

The building small and lighting shall be completed in accordance with the requirements of the following particular specification:

- E08: ELECTRICAL WIRING
- E09: ELECTRICAL BUILDING INSTALLATION

PSY 18 VAN WYKSRUST PUMP STATION PLC

PSY 18.1 Scope of Work

Supply and install a new PLC automation system for the Van Wyksrust Pump Station. The PLC shall be complete with a floor-standing, bottom-entry enclosure, 24V DC power supply, circuit breakers, surge protection, UPS, etc. and wired it to the relevant I/O. The contractor shall ensure that there is sufficient space for all terminals, fused terminals, circuit breakers, surge protection, etc. There shall also be sufficient space to ensure that all spare slots in the PLC racks can be equipped and wired in future if required. The PLC panels must be equipped with a true online UPS.

The PLC hardware to be supplied under this contract is listed in the table below.

Table: Van Wyksrust Pump Station PLC Hardware

Item	Description	Reference	Qty
1	M580 processor level 2 for DIO & RIO	BMEP582040	1
2	High power AC power supply	BMXCPS3500	1
3	PLC 12 slots Ethernet backplane	BMEXBP1200	1
4	64 Digital Inputs 24VDC Positive Logic	BMXDDI6402K	3
5	16 Digital input relay sub-base for DDI6402K 230VAC Isolated (1x10HE)	ABE7S16E2M0	12
6	3 Meters connecting cable for DDO3202K and DDI6402K (2x10HE)	BMXFCC303	6
7	32 Digital Outputs Transistor Positive Logic	BMXDDO3202K	1
8	16 Digital output relay sub-base for DDO3202K 230VAC Isolated (1x10HE)	ABE7R16S210	2
9	3 Meters connecting cable for DDO3202K and DDI6402K (2x10HE)	BMXFCC303	1
10	8 Analogue Inputs Isolated	BMXAMI0810	3
11	Connecting cable for AMI0810 (no sub-base)	BMXFTW308S	3
12	Modbus TCP with IP Forwarding	BMENOC0321	1

Item	Description	Reference	Qty
13	5 Protected Covers	BMXXEM010	1
14	4GB Memory card for M580 CPU	BMXRMS004GPF	1
15	M580 processor level 2 for DIO & RIO	BMEP582040	1
16	High power AC power supply	BMXCPS3500	1

PSY 18.2 PLC Manufacturing

The new PLC shall be manufactured in accordance with the requirements of the following particular specifications:

- VOLUME 3: PLC PANELS
- VOLUME 5: CLEAN POWER AND SURGE PROTECTION
- VOLUME 7: NETWORKING

PSY 18.3 PLC Wiring

The PLC circuits shall be wired according to the schematic drawings generated by the Contractor.

PSY 18.4 Quality Control

The contractor shall submit complete QA/QC documentation for approval by the Employer's Agent, before manufacturing of the PLC shall begin. The documentation will be approved by the engineer, who will indicate hold points, tests, and inspections to be carried out in the presence of the Employer's Agent. At least three (3) days' notice shall be given to the engineer for the witnessing of tests, inspections, etc.

The PLC shall go through a quality inspection and factory acceptance testing (FAT) before being taken to site. This inspection will include physical inspection of the structure and general wiring. The quality inspection shall include control circuit wiring and device operation.

The PLC shall go through a similar quality inspection upon arrival on the site and before physical interconnection with any site services.

The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the PLC meets operating specifications.

PSY 18.5 Drawings

The Contractor is required to produce the detailed individual wiring diagrams for each PLC panel in AutoCAD format fully in compliance with the Employer's Agent's requirements. All drawings are to be submitted for approval prior to the start of manufacture.

PSY 19 INSTRUMENTATION

PSY 19.1 Scope of Work

This specification covers the supply of instrumentation for the Van Wyks Pump Station.

PSY 19.2 Instrumentation Supply

The instrumentation shall be supplied in accordance with the requirements of the following particular specifications:

- VOLUME 6: CABLING
- VOLUME 8: FLOW MEASUREMENT
- VOLUME 9: LEVEL MEASUREMENT
- VOLUME 19: FIELD JUNCTION BOX
- VOLUME 23: PRESSURE MEASUREMENT
- VOLUME 25: LABELLING

Ultrasonic Level Meters

Supply and install two pump station sump ultrasonic level meters. Connect these ultrasonic level meters to the new Van Wyksrust Pump Station PLC panel

Ultrasonic Level Meters – Screen Differential

Supply and install four pump station screen differential ultrasonic level meters. Connect these ultrasonic level meters to the new Van Wyksrust Pump Station PLC panel

Open Channel Flow Meters

Supply and install four open channel flow meters for the two screen inlet flows, the bypass channel flow and the overflow channel flow. Connect these flow meters to the new Van Wyksrust Pump Station PLC panel.

Clamp On Flow Meters

Clamp on type flow meters shall be supplied and installed for the pump station main discharge pipes. Connect these flow meters to the new Van Wyksrust Pump Station PLC panel. The process information for the flow measurements is included in the table below.

Description	Pipe Diameter	Pipe Material	Nominal Flow (m^3/hr)	Maximum Flow (m^3/hr)
Pumps 1-3 Discharge Flow				
Pumps 4-6 Discharge Flow				

Pressure Meters

Supply and install two compactor pressure meters, to measure hydrostatic level. Connect these pressure meters to the new Van Wyksrust Pump Station PLC panel.

Level Switches

Supply and install two capacitive level switches for the main pump station sumps. Connect these level switches to the new Van Wyksrust Pump Station PLC panel.

Flow Switches

Supply and install eight thermal flow switches for the main pump station pumps and the wash water pumps. Connect these flow switches to the new Van Wyksrust Pump Station PLC panel. The process information for the flow measurements is included in the table below.

Description	Pipe Diameter	Pipe Material	Nominal Flow (l/s)	Low Flow (l/s)
Main sump pumps discharge				
Wash water pumps discharge				

PSY 19.3 PLC Wiring

The PLC circuits shall be wired according to the schematic drawings generated by the Contractor.

PSY 19.4 Quality Control

The contractor shall submit complete QA/QC documentation for approval by the Employer's Agent, before procurement of the instrumentation shall begin. The documentation will be approved by the engineer, who will indicate hold points, tests, and inspections to be carried out in the presence of the Employer's Agent. At least three (3) days' notice shall be given to the engineer for the witnessing of tests, inspections, etc.

PSY 19.5 Drawings

The Contractor is required to produce the detailed individual wiring diagrams for each instrument in AutoCAD format fully in compliance with the Employer's Agent's requirements. All drawings are to be submitted for approval prior to the start of procurement.

PSY 20 VAN WYKSRUST PUMPSTATION PLC UNINTERRUPTIBLE POWER SUPPLY (UPS)

PSY 20.1 Scope of Work

The supply, installation and commissioning of a UPS for the Van Wyksrust Pump Station PLC. The UPS must be a transformer-based unit (not transformerless) and must have a 3kVA rating. The applicable PLC circuits must also be equipped with proper surge protection.

PSY 20.2 Supply and Installation of UPS

The UPS to be supplied shall be manufactured in accordance with the requirements of the following particular specification.

- E16 : ELECTRICAL UNITERUPPTIBLE POWER SUPPLY UNIT

PSY 21 FIELD JUNCTION BOXES FOR INSTRUMENTS

PSY 21.1 Scope of Work

Supply and install instrument junction boxes (IJBs) for the level, pressure and flow meters mentioned in items above. The junction boxes will contain the transmitters, terminals, circuit breakers for local isolation, surge protection, etc.

PSY 21.2 Supply and Installation of Field Junction Boxes

The field junction boxes must comply with all the requirements of the attached specification:

- Automation and Control Standards, Volume 19, Field Junction Boxes

PSY 22 INSTRUMENTATION CABLING

PSY 22.1 Scope of Work

This specification covers the supply and installation of instrumentation cabling. Refer to the Cable Schedule attached in the appendices and the Bill of Quantities for the requirements of the cables to be supplied.

PSY 22.2 Supply and Installation of Low Voltage Cables

The control and instrumentation cables shall be manufactured and installed in accordance with the requirements of the following particular specifications:

- Automation and Control Standards, Volume 6, Cabling

The instrumentation racking will follow the same routes as the electrical racking.

The Bill Of Quantities will indicate required lengths and sizes of cable and racking. Sizes and quantities indicated in the Bill Of Quantities are there to ensure sufficient funds are available for racking. These quantities must not be used for placing of orders. The contractor must submit cable racking layouts for approval by the Engineer before any racking is ordered.

PSY 23 DATA COMMUNICATION AND NETWORKING

PSY 23.1 Scope of Work

This specification covers the supply and installation of the data communication and network requirements.

All data communication cabling and equipment must comply with the following specifications listed below:

- Automation and Control Standards, Volume 5, Clean Power and Surge Protection
- Automation and Control Standards, Volume 6, Cabling
- Automation and Control Standards, Volume 7, Networking

In addition, the Fibre-optic cables in this Contract shall comply with the following minimum requirements:

The fibre-optic cables will be buried within 110mm sleeves.

All fibre-optic cables will be single mode fibre (SM) for use with 1000BASE-LX gigabit Ethernet for distances up to 10km.

A length of free cable shall be provided at each end of a cable pull. Loops of cable (commonly called service loops) shall be provided at all intermediate pulling points, such as in manholes and pull boxes where manholes and pull boxes are required to be installed by the Engineer. Service loops of 3 m length that are easily accessible and clearly marked with the prescribed cable number shall be provided at all fiber cable patch panels. The cables' minimum bending radii shall not be exceeded.

Intermediate patch and splice panels shall not be allowed unless approved by the Engineer. Cables that are found to be damaged either due to defective manufacturing, delivery or installation practice shall be replaced in their entirety at the cost of the contractor.

All fiber-optic cables will contain at least 12-cores.

Fiber-optic cables shall be tested on delivery to site as specified in:

- Automation and Control Standards, Volume 6, Cabling

Approximate distances have been measured to each remote location for tender purposes and have been included in the bill of quantities. The contractor shall verify and confirm these cable lengths on site, after the tender has been awarded, before cutting cable lengths to the exact installation size.

Cable lengths in the Bill Of Quantities are merely there to ensure the availability of sufficient capital for the project. These quantities must not be used for placing orders. All cable installations shall be re-measured for payment after installation.

All data communications cables (each fibre-optic cable, each patch lead, each copper cable and all equipment) will be named according to the cable block diagram and naming list as provided by the Engineer during construction. All equipment labels, cable markers and cable route markers must comply with the following specifications:

- Automation and Control Standards, Volume 6, Cabling
- Automation and Control Standards, Volume 3, PLC Panels

PSY 23.2 Fibre-optic Cables

Supply and install one fibre-optic cable from the existing Substation F network panel to the new splice panel in Substation G.

Supply and install one fibre-optic cable from new splice panel in Substation G to the new network panel in Substation C.

Supply and install an aerial type fibre-optic cable from Substation C network panel to Van Wyksrust pump station PLC Panel, attached to the electrical overhead line system.

PSY 23.3 Fibre-optic Splicing

All fibre-optic cable shall be terminated on patch panels at each end.

Eight cores (4 pairs) shall be terminated on a patch panel.

The remaining fibers will be neatly coiled in the patch panel as spares.

PSY 23.4 Fibre-optic Area Switches

An area switch shall be provided in each PLC cubicle.

The area switch shall consist of a switch, 2 x 1000BASE-LX SFP modules, 2 x 3m single mode fibre patch leads, at least 6 x 10BASE-T/100BASE-TX RJ45 copper ports, 1 x 3m certified Cat-6 patch lead and a power supply.

The contractor is primarily responsible for all fibre-optic and data communication testing and commissioning work. All testing and commissioning work shall be documented in detail in the prescribed formats and the results shall be verified and approved by the Engineer.

The fibre-optic cables must be tested and commissioned after installation. The commissioning of the data network can commence after the fibre-optic cables are commissioned.

PSY 24 PERIMETER INTRUSION DETECTION SYSTEM

Supply, install and commission an intruder detection system for the Van Wyksrust Pump Station perimeter fence. The system will consist of wall mounted and buried fibre optic system picking up seismic and acoustic energies, with a control unit located in the pump station, connecting to the main site security control system

PSY 25 SECURITY RADIO SYSTEM BOOSTER

Undertake a security radio system survey in the area of Substation C to Van Wyksrust Pump Station, identifying poor coverage areas. Supply, installation and commissioning of a radio booster system ensuring full coverage across the specified area.

PSY 26 DOCUMENTATION

PSY 26.1 Hardware Supply

User manuals - for all equipment supplied by the contractor must be included in the documentation.

Three copies of all documentation must be provided.

PSY 26.2 Shop Drawings

Before MCC, PLC Panel, instrument control panels, instrument junction boxes or field junction box manufacturing can start, the successful tenderer must submit detailed panel layout drawings for approval by the engineer.

PSY 26.3 Recommended Spares

The tenderer will be required to provide a recommended list of instrumentation spares, including PLC equipment and data communications equipment including, but not limited to, at least one type of each PLC I/O module processor and power supply, spare Ethernet Switch etc., for at least the following three years' maintenance. The tenderer must allow a corresponding cost for these spares in the BOQ.

PSY 27 TRAINING

The tenderer must allow an amount to cover the cost of training of up to two Johannesburg Water personnel by the supplier (not only the contractor) on new instrumentation supplied on this contract. Training will be by the supplier at the supplier's premises or on site. If no training is required, then this amount will not be claimed.

Johannesburg Water (SOC) Ltd

CONTRACT NO: JW14466

OLIFANTSVLEI WASTEWATER TREATMENT WORKS INFRASTRUCTURE RENEWAL PLAN REFURBISHMENT OF VAN WYKSRUST PUMP STATION

VOLUME 2

PART 4: SITE INFORMATION

Employer:		Contractor	
Witness:		Witness:	

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C4 SITE INFORMATION

C4.1 GENERAL

This section describes the site at the time of tender to enable the tenderer to price his tender and to decide upon his method of working and programming and risks.

C4.2 SITE LOCATION AND DESCRIPTION

The Olifantsvlei Wastewater Treatment Works is located South of the N12 highway and West of the R553 Golden Highway, approximately 3km Southwest of the Moroka Bypass.
The GPS coordinates of the entrance to the Works are 26° 19' 05.16" S, 27° 54' 12.31" E.

The following site conditions shall be taken into consideration in the design and selection of equipment:

Altitude above mean sea level	1 548 m
Peak temperature	40ºC
Average maximum temperature	35ºC
Minimum temperature	-5ºC
Relative humidity	71% at 13ºC
Lightning	Severe
Corrosion	Severe
Atmosphere	Dusty

The surrounding area is densely covered with grass, shrubs and various weed species. The topography of the pump station area is primarily flat with a gradient, rising approximately 1.0 m from the west to east of the area and is located adjacent the “vlei” wet land area.

C4.3 ACCESS TO SITE AND RESTRICTIONS

Any permission as may become necessary shall be the responsibility of the Contractor to obtain.

Having been granted access to works areas by the Employer, and other service authorities, the Contractor shall adhere to any agreed conditions of access and ensure the works area is left in a condition similar to when it was first accessed.
The Treatment Works is a fully functional Plant and as such its operation must not be jeopardised at any time.

The Contractor may not operate any valves, sluice gates or any other equipment currently in use on the works without written permission from the treatment works manager.

The Contractor shall provide temporary access to the works as may be required by him and to the approval of the Employer’s Agent.

Access to the Site is by means of existing roads through the existing access gates, which is controlled by a security company approved by Johannesburg Water. Access from within the boundary of the treatment works to the remote Van Wyksrust pump station is normally via a gravel road that traverses the wetland. At times of high rainfall, the river level may increase, and the road may become flooded

which limits access to the pump station. An alternative route to the pump station would be to enter from the side of the R554 and via a dirt track that leads to the pump station.

No restriction on access to the site of works will be placed on persons or vehicles involved with the execution of the works. All traffic must be restricted to the maximum speed of 40 km/h and vehicles must be driven with extreme caution.

The Contractor shall be required to report daily to management personnel of the treatment works. Work permits shall be completed and shall be area specific.

As the Contract shall require the removal of equipment from the treatment works site, the Contractor shall acquire permits as required by the Employer for the equipment removed from Site.

The Contractor's staff shall be identified by either clothing bearing the contracting companies name or an identification tag, which shall be displayed when entering the site of works.

Movement within the works is restricted to avoid damage to the existing services, structures, trees and, where practical, to the gardens. The making good of any damage caused by non-observance of such restrictions will be for the Contractor's account.

Access is to be made available to Johannesburg Water's employees to any portion of the Site whenever required.

C4.4 EXISTING SERVICES, SERVITUDES AND WAYLEAVES

The existing treatment works must remain in operation during the execution of the contract. The Employer must have access to the works at all times. If the work to be done requires the treatment works to be out of operation for a short period, prior arrangements must be made at least one week in advance with the Employer's Agent.

The positions of known services cannot be guaranteed. On establishing on Site, the Contractor must determine the positions of all existing services in the various areas of work. The Contractor must take precautions to prevent any damage to existing services and infrastructure. Damages which might occur will be repaired at the cost of the Contractor.

It is envisaged that no permits or wayleaves will be required.

For detailed specification the Contractor shall refer to clauses PS 1.5 (Temporary Works), PS 4.4 (Existing services), and PS 4.8 (Permits and wayleaves), Part 3: Scope of Work.

C4.5 SECURITY

The Employer has appointed a security company which controls the access through the main access gate to the treatment works and regular patrols within the boundaries of the treatment works. The Contractor shall be responsible for the security of his personnel, materials, equipment and construction plant on and around the site of the Works and for the security of his camp (if applicable). The Employer in this regard will consider no claims.

Refer to clause PS 6.1 (Security)

Employer:		Contractor	
Witness:		Witness:	

C4.6 NATURE OF GROUND AND SUBSOIL CONDITIONS

It shall be the Contractor's responsibility to acquaint himself with the conditions of the site. A geotechnical study has been done and is available upon request. There are indications of a high water table (say between 1 and 2 m below ground level) in the vicinity of Van Wyksrust pump station that will have an impact on the construction activities especially where excavations are concerned.

C4.7 GEOTECHNICAL REPORT

A geotechnical report is available on request. It shall be the Contractor's responsibility to acquaint himself with the conditions of the site when submitting his or her rates.

In general, the upper soil horizon (to a depth of 0.8 m below current ground level) primarily consists of fill material, characterized as matrix-supported silty sand with abundant gravel and cobbles of varying hardness and origin. A transported horizon was encountered across the site underlying the fill material. The transported material is described as a structureless clayey sand with abundant powder ferricrete, appears medium dense. The material quality is non-classifiable according to COTO, (2020), (worse than G9 quality). This material is therefore considered only suitable for use as general fill (not structural/engineered fill) and for landscaping purposes.

A high water table (say between 2 and 2.6 m below current ground level) was encountered, which will have an impact on construction related activities. The contractor is to make adequate provision for dealing with water (redirection, dewatering, isolation, etc) and any other unknown ground conditions that may influence methodology.

Subsoil drains, pumping of groundwater, isolation, etc. to allow for drier working conditions within the pumpstation, during construction of the bypass facility and other excavations should be provided for but additional temporary measures may also be required, at the discretion of the contractor.

For excavation stability, a safe batter slope of 1:2.5 may be adopted for depths up to 3 m. Requirements for bracing/shoring/lateral support of adequate strength shall be designed and installed to ensure trench wall stability. Such safe working conditions remain the responsibility of the Contractor.

In addition, a dolomite investigation is underway. The findings of this investigation will lead to a specific classification and designation being allocated to the site, with certain related requirements and/or limitations. Such restrictions may affect the scope of work (extent of scope, methodologies and/or procedures) that is required to be undertaken by the contractor.

C4.8 HYDROLOGICAL REPORT AND FLOODLINES

There is limited information available with regard hydrological and floodline aspects. Refer to clause PS 8 (Environmental Management).
A 1:100 year schematic floodline (Figure 1) and wetland buffer (Figure 2) are available.

Employer:		Contractor	
Witness:		Witness:	

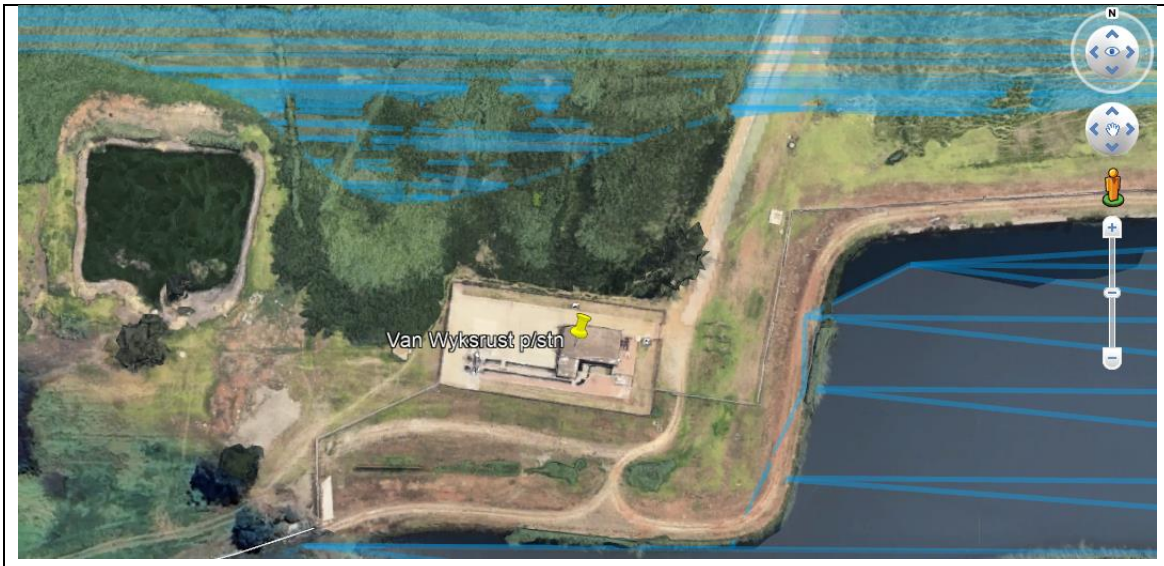

Figure 1: Schematic 1:100 year floodline

Figure 2: Schematic wetland buffer