Johannesburg Water SOC Ltd

Johannesburg Water

VOLUME 1

CONTRACT

PART 3:

SCOPE OF WORK

C3 PREAMBLE TO SCOPE OF WORK

GENERAL

This section specifies and describes the supplies, services and Engineering 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

These Project Specifications are set out in two portions:

Portion A: covers a general description of the project, the facilities available and the requirements to be met.

Portion B: covers variations to the standardized specifications and particular specifications which are applicable to the contract.

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.

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PORTION A: PROJECT DESCRIPTION AND GENERAL INFORMATION

PS 1 DESCRIPTION OF THE WORKS

PS 1.1 EMPLOYER'S OBJECTIVES

The primary objective of project is to construct 250mm diameter dedicated water pipeline to Phumlamqashi Informal Settlement. The secondary objective of the project is that optimum utilization shall be made of the resources within the local community and that these resources shall be improved and enhanced through their participation in the execution of the works. The project to be implemented has taken into cognizance the prescripts of EPWP and local SMMEs. Tenderer will be appointed for work in their CIDB grading category only.

PS 1.2 OVERVIEW OF THE WORKS

The project consists of the following:

- Installation of 250mmØ, 160mmØ, 110mm Ø uPVC Class 16 pipes, by open-trench method.
- Horizontal direction drilling for 110mmØ HDPE Class 16 pipes for road crossings.
- Installation of air valves and air valve chambers
- Construction of PRV chamber
- Installation of scour valves and scour valve chambers
- Locating, exposing and protection of existing services.
- Maintaining good public relations with Johannesburg Water's customers and public.
- CCTV inspection before and upon completion of all sewer installation.

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
- Excavation, trench preparation and compaction
- Supply, bedding and laying of pipes
- Backfilling of trenches and testing of installation
- Provision and installation of scour and air valves and chambers
- Reinstatement of surfaces to original condition
- Connections into existing networks
- Submission of EPWP statistics and supporting documentation

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 1.4 LOCATIONS OF THE WORKS

The works are located within the Lenasia South area with the boundaries of the City of Johannesburg Metropolitan.

PS 1.5 TEMPORARY WORKS

Temporary works shall:

The Contractor shall, as relevant:

a) provide temporary drainage works, temporary pumps 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 the approval of all authorities concerned.

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) include the works required to locate, verify and protect existing services within the works area;

g) be such to ensure no or limited interruption to vehicular and pedestrian traffic; and

h) be such that existing stormwater flow shall not be impeded during survey and construction activities.

Further the Contractor shall note that no stockpiling of materials, plant, excavated material or any other construction related infrastructure shall be allowed in locations that may interfere with the operations of the Employer and the public in general.

PS 2 ENGINEERING

PS 2.1 EMPLOYER'S DESIGN

The Contractor undertakes only construction on the basis of designs issued by the Employer. The Contractor is to follow the specification, the design and construction drawings as laid out by the Employer.

PS 2.2 DRAWINGS

PS 2.2.1 Volume 3

Drawings are included in Volume 3 of this Contract Document based on current available information. Such drawing may be updated (based on actual site situation uncovered during execution of the works) and re-issued during the Contract Period as required.

Drawings include:

a) Locality plans

b) Layout drawings

c) Longitudinal profiles, and

d) Typical construction details.

PS 2.2.2 Construction drawings

On the site hand over meeting 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 later shall be:

a) made available to the Employer's Agent or his duly authorised representative within 24hours on request;

b) submitted to the Employer's Agent with the Contractor's request for issue of the Practical Completion Certificate.

PS 2.2.3 Shop drawings

Where an item to be supplied in conformance with this Contract specification has not been designed by the Employer's Agent or Employer, the Contractor shall be required to supply the Employer's Agent with 3 copies of detailed shop drawings prior to delivery of materials, including an electronic copy in drawing format that is compatible with the software packages (AutoCAD or DXF) used by the Employer's Agent and/or Employer.

NOTA BENE: Only on approval of such shop drawings or an amended version thereof, shall the Contractor proceed with the manufacturing, supply and installation of the designed item.

PS3 PROCUREMENT

PS 3.1 PREFERENTIAL PROCUREMENT PROCEDURES

The Employer's promotes preferential procurement.

PS 3.2 SUBCONTRACTING

The commitment of the Employer to Government Policy concerning the empowerment of the EMEs shall be noted and adhered to by the main contractor. It is against this background that Johannesburg Water has made provisions under this contract to ensure that the main contractor impart skills to the local sub-contractors within the project area during the project implementation.

It is the intention of Johannesburg Water that the minimum targeted participation goal for the local sub-contractors is for but not limited to the full value of subcontracting works identified by the Employer as covered in the Bill of Quantities. The onus is upon the main 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 for Construction Works 2015 3rd Edition.

The identified scope of work by the Employer includes but not limited to the following:

- Site Clearance of the pipeline route.
- Trenching, bedding preparations and pipe laying
- Valve chamber building
- Reinstatement of surfaces to original condition.

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

1. Valid CIPC registration (i.e. CK, COR)
2. SA ID copies of owners
3. Active CIDB membership: **minimum grading 1CE**
4. Valid CSD compliance status
5. Valid EME affidavit
6. COIDA certificate
7. Company Profile including similar experience and skilled personnel CVs
8. Health and Safety Plan

The Contractor is:

to enter into contract with any (selected) sub-contractor(s) in accordance with the requirements of Clause 4.4 in the General Conditions of Contract for Civil Engineering Works (2015),3rd Edition. The number of sub-contractor(s) will be determined by the main contractor depending on the Subcontracting Scope of Work and the amount of work that is to be carried out under this Contract as outlined above and in the Bill of Quantities.

a) Required to utilise local subcontractors (or regional if he fails to find suitable subcontractors from within the project locality)
b) Responsible for all work executed (including QUALITY, CONTRACTUAL LIABILITIES) on his behalf or under his supervision and/or management by all sub-contractors, including nominated or selected sub-contractors.

Note:
- **Local** subcontractors are subcontractors from within the project suburb or ward.
- **Regional** subcontractors are subcontractors from within the region as per the City of Johannesburg's demarcation of the regions.

The Contractor shall be expected to enter into a contract with the nominated or selected subcontractor(s) in accordance with the requirements of Clause 4.4 the General Conditions of Contract for Construction Works 2015 3rd Edition. The Employer must be supplied with a copy of the contract/agreement for records.

***NOTA BENE**: The Employer's Agent shall not negotiate directly with sub-contractors and all problems relating to programming, workmanship, etc., as they are matters between the Contractor and his sub-contractors.*

In the execution of the Subcontract Work, the Contractor shall ensure that the Subcontractor(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 set out for the works arising out of the former's failure to comply with instructions issued to him in regard to these requirements.

PS 3.2.1 PERFORMANCE AND EXECUTION OF THE SUBCONTRACTED WORK

The main contractor must facilitate access to supply sufficient, suitable resources (e.g. equipment, labour, material) to execute the subcontracted portion where necessary.

The Contractor shall also ensure that the Subcontractor(s) shall execute the Subcontract Work in accordance with the Scope of Work and Programme to the reasonable satisfaction of the Employer.

PS 3.2.2 QUALITY OF THE SUBCONTRACT WORK

In accordance with the requirements of Clause 4.4 in the General Conditions of Contract for Construction Works (2015), 3rd Edition, it is the responsibility of the Contractor to ensure that the Subcontractor shall be capable of executing the Subcontract Work efficiently and in accordance with the Scope of Work.

PS 3.2.3 LAWS AND REGULATIONS

The Contractor shall ensure that the Subcontractor(s) complies with the paying all amounts due in respect of his employees and himself in terms of all relevant legislation and regulations including, but not confined to, the

- Income Tax Act, the
- Compensation for Occupational Injuries and Diseases Act,
- Unemployment Insurance Fund,
- Basic Conditions of Employment Act,

PS 3.2.4 RESOURCES TO COMPLETE SUBCONTRACT WORK

Although it is preferred by JW that the Contractor ensure that the Subcontractor(s) supply all required resources such as labourers, equipment, hand tools, power-driven tools if need be, which are required by him for the execution of the Subcontract Work, however the onus is upon the Contractor to determine the extent of resources the subcontractor shall supply to ensure that the works are completed on time. The agreement between the Contractor and subcontractor is the Contractor's responsibility and JW is indemnified from any agreements entered between Contractor and his Subcontractor (s)

PS 3.2.5 PAYMENT

The Contractor shall ensure that sub-contractor(s) are paid within stipulated time as per the Agreement with the subcontractor.

PS 3.2.6 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 3.2.7 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 also address late payment issues should it arise.

PS 3.2.8 PROVISIONAL SUM FOR LOCAL SUBCONTRACTIONG

a) 30% of value of works to be executed excluding Provisional Sums & VAT shall be set aside as Provisional Sum for Local SMMEs Subcontracting work.

b) The 10% of the Provisional sum mentioned in (a) above, shall be set aside for Preliminary and General Items of the Subcontractors and which will be limited to Supervision, Tools and equipment, OHS obligation, Comply to COVID 19 requirements and Environmental Management Plan obligations.

c) For all other facilities such as Site Camp, storage of tools etc. the Subcontractors will use the Contractor's facilities.

d) The remaining 90% of the Provisional Amount mentioned in (a) above, shall be for actual work.

e) The Employer's Agent will identify items in the Contractor's BOQ to be subcontracted and a separate BOQ for subcontracting will be prepared during work allocation.

f) In cases were the Subcontractors rates are high and subcontracting sum is more than what is allowed for in the Provisional amount, then the Contractor's rates will apply.

PS4 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 for Construction Works 2015 Third Edition (GCC 2015).

PS 4.1.2 Applicable Standardized Specifications

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

SANS Description

28 : Metal ties for cavity walls (1986)
227 : Burnt clay masonry units (2007)
282 : Bending dimensions and scheduling of steel reinforcement for concrete (2004)
523 : Limes for use in building (2007)
558 : Cast iron surface boxes and manhole and inspection covers and frames (1973)
674 : 2008
920 : Steel bars for concrete reinforcement (2005)
1024 : Welded steel fabric for reinforcement of concrete (2006)
1083 : Aggregates from natural sources - Aggregates for concrete (2006)
1090 : Aggregates from natural sources - Fine aggregates for plaster and mortar (2002)
1200 A : General (1986)
1200 AB : Employer's Agent's office (1986)
1200 C : Site clearance (1980)
1200 D : Earthworks (1988)
1200 DB : Earthworks (Pipe trenches) (1989)
1200 DK : Gabions and Pitching (1996)
1200 G : Concrete (Structural) (1982)
1200 GA : Concrete (Small works) (1982)
1200 GE : Precast Concrete (1984)
1200 L : Medium-pressure pipe lines (1983)
1200 LB : Bedding (Pipes) (1983)
1200 LC : Cable ducts (1981)
1200 LF : Erf connection (water) (1983)
1200 LG : Pipe jacking (1983)
1200 DM : Earthworks (Roads, Subgrade) (1981)
1200 LD : Sewers (1982)
1491-1 : Portland cement extenders Part 1: Ground granulated blast-furnace slag (2005)
1491-2 : Portland cement extenders Part 2: Fly ash (2005)
1491-3 : Portland cement extenders Part 3: Silica fume (2005)
1882 : Polymer concrete surface boxes, manhole and inspection covers, gully gratings and frames (2003)
50197-1/ EN 197-1 : Cement - Part 1: Composition, specifications and conformity criteria for common cement
5831 : Presence of chlorides in aggregates
5861-2 : Concrete tests - Sampling of freshly mixed concrete (2006)
5862-1 : Concrete tests - Consistence of freshly mixed concrete - Slump test (2006)

5863 : Concrete tests - Compressive strength of hardened concrete (2006)
5864 : Concrete tests - Compressive strength of hardened concrete (2006)
5865 : Concrete tests - The drilling, preparation, and testing for compressive strength of cores taken from hardened concrete (1994)
0268-1 : Welding of thermoplastics – Welding Processes
1476:2009: Fabricated flanged steel pipework

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,

These Specifications are not issued with this volume but are available at the Contractor's expense from Standards South Africa:

Physical Address	Postal Address	Telephone No.	Fax No.	Email Address
1 Dr Lategan Road, Groenkloof PRETORIA	Private Bag X191 PRETORIA 0001	012 428-7911	012 344 1568	sales@sabs.co.za

For "Workmen's Compensation Act" read "Compensation for Occupational Injuries and Diseases Act, 1993 (Act No.130 of 1993)" wherever it appears. For "Machinery and Occupational Safety Act" and "Mines and Works Act" read "Occupational Health and Safety Act, 1993 (Act 85 of 1993)" wherever they appear. For "maintenance period" read "Defects Liability Period in terms of Clause 1.1.1.13 of the General Conditions of Contract, 2015" wherever it appears

PS4.1.3 Other Standards

Other Standard Specifications applicable to this Contract shall be:

a) ASTM C.309 Type 1 (Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete)
b) WRC MSCC
c) City of Johannesburg Metropolitan Municipality, Public Road and Miscellaneous By-laws, Code of Practice for work in the road reserve (COP), Latest Version. NOTA BENE: Should any requirement of this COP conflict with any requirement of the standardised or particular specifications the requirements of the COP shall prevail. The COP is available at Johannesburg Roads Agency Offices, Wayleaves Department, Contact number: (011) 298 5000
d) CIDB
e) Occupational Health and Safety Act (1993)
f) Construction Regulations (2014)

PS4.2 Particular generic specifications

PS4.2.1 Minimum health and safety requirements

This section of the specifications is to be read in conjunction with the Contract Health and Safety specifications, included as Volume 2. The following requirements shall be deemed minimum compliance requirements to ensure the health and safety of the public and workers during the execution of the Contract:

PS4.2.1.1 Road safety equipment

The internal conduit survey unit shall be provided with:

a) an amber-flashing beacon, which shall comply with and be operated in accordance with any governing road vehicle lighting regulations or similar.

b) appropriate sized and quantity of road signs, including delineators and cones which shall be displayed at the works area in accordance with safety regulations or similar.

c) bright coloured overalls, fluorescent over-jackets and belts for each team member for use at all working times during the day or night.

PS4.2.1.2 Personal safety equipment

The internal conduit inspection unit shall be provided with:

a) oxygen deficiency and gas detector apparatus, which shall be regularly serviced and operable.

b) fresh air breathing apparatus, face mask and demand value, with a sufficient minimum compressed air supply, determined by the duration of manhole and/or conduit entry.

c) an approved full vertical lift safety harness.

d) personal equipment per member:
   i) safety helmet;
   ii) safety boots;
   iii) sewer wading boots; and
   iv) disposable protective gloves.

e) First Aid Kit suitable to cater for the number of team members.

f) facilities for washing, including:
   i) soft soap;
   ii) disinfectant; and
   iii) clean water.

g) radio equipment and cellular phone for on site and emergency communication.

h) fire extinguisher.

PS4.2.2 Traffic control

a) A traffic control plan shall include detailed diagrams showing the location of all traffic control devices and the length of time for all lane closures, as well as location of any flaggers, as necessary.

b) One lane of traffic in each direction must be maintained at all times and local streets may only be closed with prior approval of the Employer's Agent.

c) A written method of handling traffic for each different phase of the project shall be submitted and include both vehicular and pedestrian traffic.

d) The name and number of the Contractor representative responsible for traffic control shall be made available to solve traffic problems at each job site location.

PS4.2.3 Metric measurement

All survey recorded dimensions of infrastructure shall be in metric units, including for conduits, chambers and manholes.

PS4.2.4 Site preparation

Prior to any Works commencement the Contractor shall photograph or video tape entire work area. One copy of which shall be given to the Employer's Agent's authorized representative and one copy shall remain with the Contractor for a period of 12 months following the issue of a Completion Certificate. This record shall be used to establish accountability for damages during the execution of the Contract.

No alterations beyond what is required for Works are to be made. Contractor shall confine all activities to designated work areas, to the absolute minimum required.

PS4.2.5 Pipe handling and storage

Pipes shall be handled and stored in accordance with safe lifting practice. The lifting capacity of the equipment shall not be exceeded.

Where slings are used for lifting

a) timber, timber wedges or sand bags. Pipes shall be placed on timber bearers not more than 1.5m apart. Where pipes are stacked, timber bearers shall be placed between each layer of pipes.
b) Plastic pipes shall be stored away from contact with chemicals or ground contaminated with chemicals.
c) Care shall be taken to prevent scoring and scratching of plastic pipes.

PS4.2.6 Inspection of pipes and fittings

Pipeline rehabilitation components shall be checked for damage and flaws immediately before installation, where:

a) plastic pipes and fittings shall be checked for gouges, cracks, holes, flattening and indentations.

Damaged or flawed pipes and fittings can only be used if approved by the Employer's Agent. Pipes and fittings considered unsuitable for use by the Employer's Agent shall be removed from the site at the Contractor's expense. The Employer's Agent may approve the repair of any damage where the pipe or joint may be repaired without affecting its performance.

PS4.2.7 Cutting of pipes

Pipes shall at all times be cut square to the barrel of the pipe. For:

a) rubber ring and solvent cement jointed pipe, the deviation from square shall not be in excess of 5mm.

b) butt or electro-fusion jointed PE pipes the deviation from square shall not be in excess of 1mm.

Jagged edges shall be removed from pipe ends. Cut edges of rubber ring or solvent cemented plastic pipes shall be beveled in accordance with the manufacturer's instructions.

PS4.2.8 Acceptability of damaged pipe

Cuts or gouges that reduce the pipe wall thickness in excess of 10% is not acceptable and shall be cut out and discarded.

PS4.2.9 Pipe joining

PS4.2.9.1 Fusion butt-welding

a) Interpretation

This section shall cover the butt-welding plastic pipes, which shall involve the heating of two pipe ends to fusion temperature and then subsequently joining the two ends by the application of force.

b) Equipment

The basic parts of the equipment shall be:

i) Planing Tool: used to face pipe ends.

ii) Heating Plate: used to melt pipe ends

iii) Frame: holds on to the pipes to be joined. It has hydraulic cylinders which apply pressure to the pipe joints.

iv) Hydraulic unit: has the hydraulic pump, tank, pressure gauges, directional valves, pressure regulation valves.

v) Data logger: records pertinent process data such as time, pressure and temperature. The data logger ensures that every joint is made properly.

c) Site preparation

The technician shall ensure that the machine is situated in a dry area, before welding is commenced. The equipment shall not be exposed to rain.

No welding shall be executed during rain, unless an outdoor roofing structure is provided to protect the equipment and process from rain. The technician shall ensure that the equipment does not sit on wet ground.

d) Pipe preparation

Pipe ends to be joined shall be dry and free from foreign particles.

e) Pipe Welders

All pipe welders shall be SAPPMA or ISO approved.

PS4.2.9.2 Restrained joint couplings

a) Pipe may be joined using nonmetallic restrained type couplings. Pipe and couplings shall be designed as an integral system and shall be provided by a single manufacturer for maximum reliability and interchangeability. No external pipe-to-pipe restraining devices that clamp onto or otherwise damage the pipe surface as a result of point-loading shall be permitted.

b) Couplings shall be designed as minimum for use at the rated pressures of the pipe with which they are utilized.

PS4.2.9.3 Electrofusion belt jointing

a) The appearance of electrofusion belt shall meet the following requirements:

(i) The surface of the electrofusion belt shall be smooth and free from cavity, impurity or other defects that may have adverse effect on its function.

(ii) The heating wire shall be well embedded into the polyethylene and shall be free from breakage and short circuit.

(iii) Electrofusion belt side shall be cut properly

(iv) The electrofusion belt shall be normally black, other color is allowed when agreed upon by the Employer and supplier.

b) The dimension and tolerance on dimension of the electrofusion belt shall comply with Table below or as per manufacture's specifications

ID	Minimum Length L(mm)	Width W (mm)	Tolerance on width (mm)	Thickness (mm)	Tolerance on thickness (mm)	Width of heating wire mesh W1 (mm)	Tolerance on width of heating wire mesh (mm)
800	2712	300	+/-10	7	+/-2	100	+/-8
900	3026	300	+/-10	7	+/-2	100	+/-8
1000	3340	300	+/-10	7	+/-2	100	+/-8

c) Pipe jointing procedure (Electrofusion belt)

1. Place two pipes butt to butt and align them to make the axes of the two pipes as close as possible.
2. Put the electrofusion belt into the pipes at the jointing position and use electrofusion belt holder to push the electrofusion belt onto the inner wall of the pipes. The overlapping edge and the heating wire terminals shall be positioned at pipe top. The belt shall be equally shared by the two pipes in terms of length.
3. Fill in the space at the overlapping part of the belt with profile modeling PE wedge.
4. Use the electrofusion belt holder to push the electrofusion belt against the pipe wall and make spacing between electrofusion belt and the pipe as less as possible. All pressing shoes of the belt holder shall press and the belt uniformly and soundly.
5. Connect the welding control box to the heating element terminal of the electrofusion belt and apply current according to pipe manufacture's technical manual. The specification for current value and the voltage applying time shall be strictly followed. During welding, the current is allowed to decrease continuously and steadily; abrupt decrease or increase of electrical current is not allowed. The surface temperature of the welding zone of the belt shall be uniform along circumference. Careful inspection shall be conducted on the joint when abnormal phenomenon take place, and then proper measures shall be taken accordingly.
6. After welding, cool the joint down in the air for not less than 40 minutes. During cooling process the Electrofusion belt holder shall not be taken away and the joint shall not be subject to any external action. After cooling process is finished, disconnect the welding control box and move the specialty machine away.

Hand or reciprocating saw may be used to cut the pipe off at site. The exposed steel shall be sealed off with hand held extruder or EVA welding lance after pipe cutting.

PS4.2.10 Launch and reception pits

The required launch and receipt pits for pipe cracking shall be excavated and maintained to minimum dimensions. Said excavations shall be adequately barricaded, shored, braced and dewatered, as required, in accordance with the applicable portions of these specifications, including:

a) Excavation adjacent to the road pavement shall be performed in a manner to adequately support these facilities.

b) Pipe entry and receiving areas to provide a gradual entry of the pipe without stress to the pipe or joints and to allow free movement into the hole at an acceptable depth.

a) Where possible, with regard to size and structural integrity, associated structures are to be utilised for pits for pipe cracking equipment. Alternatively, pits are to be located where possible at property connections OR branch connections OR identified localised repairs positions.

b) Where approved by the Employer's Agent, channelling and walls of existing associated structures may be altered by the Contractor to insert and receive pipes during operations. Where a continuous length of pipe is to be towed in, such as pipe lengths welded together or a coiled pipe, the launch pit shall be of a size to permit insertion of the continuous pipe length without bending to a smaller radius of curvature than permissible by the manufacturer.

c) Where a continuous pipe length is to be used, the top of the pipe length to be inserted shall be protected from damage at the entry. The Employer's Agent shall approve the method of protection.

d) Pits shall be reinstated and cleared of all plant, material and debris prior to moving to other sites.

PS4.2.11 No surface disturbance

Pipes installed by means of bursting or pipe cracking shall be in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.

Contractor to maintain close observation to detect any settlement or displacement of surface and/or adjacent facilities: In the event of settlement or displacement the Contractor is to notify the Employer's Agent immediately, whilst maintaining safe conditions and prevent any further damage from occurring.

PS4.2.12 Damage to services or structures

The Contractor shall satisfy the Employer's Agent that pipe cracking operations shall not have a detrimental effect on adjacent services or structures.

Where the Employer's Agent determines that services adjacent to the existing pipe shall be damaged by pipe cracking, such services shall be exposed and protected.

Services or structures identified by the Employer's Agent, as being damaged by pipe cracking operations shall be repaired at the Contractor's expense.

PS4.2.13 Encountering of water during operations

The Contractor is to provide and maintain a water removal system that has sufficient capacity to remove all encountered water, during operation, in particular during pipe cracking. Such system(s) shall ensure that soil particle removal is kept at a minimum.

PS4.2.14 Post inspection of pipe cracking technology implemented and associated works

The Contractor shall inspect the pipes installed by pipe cracking methods within 7 days after fully completing works, including new installations, and property and lateral connections. Any and all damages to the Works, irrespective of the cause, where such survey is executed outside the aforementioned time span shall be repaired at the expense of the Contractor.

The survey shall capture the full extent of the rehabilitative Works, ensuring that:

a) the full length of new installation works is captured;

b) a measurement of the installed pipe circumference is taken every 10m and at intermittent locations where the installed pipe is deformed;

c) all localized repair sites are captured;

d) all associated structure connections are captured;

e) all launch and receipt pit sites are captured; and

f) any and all defective work is captured, i.e. pipe deformations, pipe tears, non-connected property and branch connections.

PS4.2.15 Testing of pipe cracking method implemented and associated works

The Contractor shall be required to test the replacement pipe at various staged tests:

a) First test: a tensile strength test shall be performed on minimum 10% of all site performed joints, where the pipe shall be exposed to pulling and shearing forces during installation. Similarly a compression resistant test shall be performed on minimum 1 or 10% (whichever is greater) of all site performed joints, where the pipe shall be exposed to pushing and shearing forces during installation.

b) Second test: a pressure test, shall be performed before the pipe is tied in. The purpose of this test shall be to check the integrity of joints that have been made, and to verify that the replacement pipe has not been damaged during installation.

Additional acceptance testing following the applicable test procedures shall be performed by the Contractor, if required.

Any detects or poor workmanship shall be corrected at the Contractor's expense.

PS4.2.16 Acceptance of pipe cracking method implemented and associated works

The Employer or Employer's Agent or their duly authorized representatives shall only accept pipe cracking technology implemented and associated works if the complete installed pipe length section has been pressure tested.

Additionally all test results as required for the applicable technology application shall be submitted to, and approved by, the Employer's Agent prior to the acceptance of the works.

PS4.2.17 Site restoration

Following all Works completion, the Contractor shall disassemble all equipment and restore the site to original condition. Any noticeable surface defects, due to the executed Works, shall be repaired by the Contractor.

All excavations shall be backfilled and compacted to minimum density of 95% MOD ASSHTO, unless otherwise instructed by the Employer's Agent.

PS4.2.27.2 Valve Chambers step irons

Manhole step irons shall conform to the applicable standard SANS requirements, but shall be:

a) spaced at 300mm centres;

b) distanced not exceed 600mm between the top of casting and the first step; and

c) plastic or similar approved.

PS4.2.28 Chamber bedding

a) Precast chamber

Precast chambers bases shall be bedded on granular material or acceptable undisturbed foundation material.

b) Cast-in-place chambers

Concrete bases shall be poured on granular material or acceptable undisturbed foundation material.

PS4.2.29 Watertight testing

Valve chambers shall be watertight structures, including any repair or rehabilitation portions. On completion of all chamber repairs and/or rehabilitations and proper elapsed curing time for the waterproofing materials, the manholes shall be visually inspected. The inspection shall be

performed at the discretion of the Employer's Agent or his duly authorised representative during the warranty period following a rainfall sufficient to increase the flow in super-imposed stormwater drainage and raise the ground water table above the problem areas. All leakage problems determined by this inspection shall be corrected by the Contractor within an agreed upon time, to the satisfaction of the Employer's Agent or his duly authorised representative, at no additional cost.

PS4.2.29.3 Testing

All sampling and testing of material in accordance with manufacturers specifications.

PS4.2.29.4 Jointing of pipes and fittings

Jointing of the replacement pipe, existing and new fittings shall be:

a) in accordance to manufacturer's recommendations to provide a leak proof joint;

b) sufficiently strong to undergo the loading of the installation process; and

c) subject to acceptance by the Employer's Agent prior to insertion.

PS4.2.29.5 Property or branch connection excavation

a) Property or branch connections shall be exposed and disconnected from the existing pipe prior to commencement of bursting. Property or branch connections to be redirected to temporary water line.

b) All excavations for property or branch reconnections shall be the minimum necessary to execute the operations. Care shall be taken to prevent material entering the live existing system when performing the disconnection and/or connection.

PS4.2.29.6 Reconnection of property and branch connections

Property connections shall not to be out of service for more than 8 hours, unless otherwise agreed in writing with the property owner or occupier. If this is not possible, temporary connections are to be made at convenient locations as approved by the Employer's Agent.

All connections shall be by means of approved fittings, in accordance with the manufacturer's instructions, for:

a) PVC pipes and fittings, using either, solvent-cement joints, push-on joints, threaded joints, clamps or flanged joints.

b) HDPE pipe and fittings, using fusion jointing techniques, clamps or flange joints (either installing flange ended fittings, HDPE flange adapters and mechanical couplings)

All polyethylene electro-fusion fittings shall be made in accordance with an appropriate and approved specification. If applicable, the grade of polyethylene of the fitting shall be the same as the replacement pipe

NOTA BENE: The replacement pipe shall be left for the manufacturer's recommended time, but normally not less than 4 hours, prior to service reconnections. This period shall allow for pipe shrinkage due to cooling and pipe relaxation due to the tensile stresses induced in the pipe during installation.

PS4.2.29.8 Annular gap sealing for burst pipes

All annular gaps between the replacement pipe and the bore or existing pipe, in excess of 10mm, shall be grouted. This compound shall be as approved by the Employer's Agent, but not have such rapid setting characteristics.

PS4.2.30 Localized pipe replacement or repair

PS4.2.30.1 Coupling clay and PVC or PE pipes

The Contractor shall ensure couplings between clay and PVC or PE pipes are durable and watertight SABS approved. All metal components of couplings shall be denso (or similar approved) wrapped to prevent corrosion.

PS4.2.31 Concrete, formwork and reinforcement

NOTA BENE: All in situ concrete work (mass and reinforced) shall comply with SANS 1200G (”8.Measurement and Payment" is not applicable) supplemented by the clauses in this section. Where:

- SANS 1200G and the clauses in this section are in conflict, the clauses in this section shall take precedence.
- the term "plain concrete" appears in SANS 1200G it shall be read as "mass concrete".

PS4.2.31.1 Cement

Cement shall be Portland cement (or similar approved) complying with the requirements of SANS 50197-1/EN 197-1 or SANS 5831.

Samples of cement from any one, or from every consignment, may be required by the Employer’s Agent or his duly authorized representative for test purposes. Cement in any consignment from which a sample may have been taken for testing shall not be used until it has been approved. Allowance shall be made for possible delay in that tests may take 10 days to carry out.

Bags of cement shall be stacked in a waterproof, solidly constructed shed with a central door and a floor rendered damp-proof with a tarpaulin. The bags of cement shall be closely stacked (but not against walls) in order to reduce air circulation in such a manner that the cement is used in the order in which it was received, i.e. first in first out.

Unless otherwise specified in the these documents the use of ordinary Portland cement blended with ground granulated blast furnace slag complying with SANS 1491, or ordinary Portland Cement blended with Pulverised Fly Ash complying with SANS 50197-1/EN 197-1 will be allowed in certain instances as an alternative, after acceptance of tender offer, but only with the approval of and at the sole discretion of Employer’s Agent. If not so specified in the documents the Contractor must demonstrate a saving in favour of the Employer together with this alternative.

PS4.2.31.2 Sand (Fine aggregate)

The fine aggregate shall comply with the requirements of SANS 1083. Other aggregates may be approved if they have a satisfactory history and/or test results.

No aggregate may be used until it has been approved. Samples having a mass of 25kg (16,5l) of the aggregate proposed to be used may be required by the Employer’s Agent or his duly authorized representative for test purposes. Samples having a mass of 25kg shall be forwarded every 3 months during concreting work and also if the source of supply is changed. Allowance must be made for possible delay in that the tests may take 14 days to carry out.

PS4.2.31.3 Stone (Coarse aggregate)

a) The coarse aggregate shall comply with the requirements of SANS 1083. No aggregate may be used until it has been approved. Samples having a mass of 25kg (16,5l) of the aggregate it is proposed to use may be required by the Employer’s Agent or his duly authorized representative for test purposes. Samples shall be forwarded every 3 months during concreting work and also if the source of supply is changed. Allowance must be made for possible delay in that the tests may take 14 days to carry out.

NOTA BENE: Certain fine grained sand and stone originating from the Beaufort Series and Karoo Systems which are known by reputation, local experience or tests, to exhibit excessive

shrinkage when used in concrete, may be deemed unacceptable by the Employer's Agent or his duly authorized representative.

b) A certificate of proof is required from the Contractor that the aggregates are not alkali-reactive. The cost of testing and certification are to be borne by the Contractor.

PS4.2.31.4 Concrete

Concrete shall be of the classes given in the following table. The proportions of the ingredients and the nominal size of the coarse aggregate for each class shall be as laid down therein:

Class	Cement	Aggregate			Strength (MPa)
	Part	Fine	Coarse	Size	
		Part	Part		
A	1	4	8	50	10
B	1	3	6	38	15
C	1	3	6	19	15
D	1	2	4	38	25
E	1	2	4	19	25
F	1	1 1/2	3	19	30
G	1	1	2	19	40

The strength given in the above table shall be the minimum required at 28 days. Unless otherwise specified Class B concrete shall be used for mass concrete and Class E concrete for reinforced concrete.

Maximum concrete slumps acceptable for different types of construction concrete are as follows:

a) Vibrated reinforced concrete = 50mm
b) Un-vibrated reinforced concrete = 75mm
c) Mass concrete = 75mm

When so required by the Employer's Agent or his duly authorized representative, and whilst concreting is in progress, the consistency of the mixture shall be ascertained by means of the slump test as later described herein.

PS4.2.31.5 Volume batching

The coarse and fine aggregate shall be measured by volume and, unless otherwise directed, cement shall be measured by mass: the volume of a 50 kg bag of cement shall be taken as 33l. Suitable measuring boxes for the coarse and fine aggregates shall be provided to the approval of the Employer's Agent or his duly authorized representative.

The proportions given above are approximate only, and should the Employer's Agent or his duly authorized representative consider that the voids in the coarse aggregate require more or less matrix than is formed by the proportions specified, he may vary the quantities of coarse and fine aggregates to obtain the required density and workability of the concrete, provided that the proportion of cement to the total volume of the aggregate shall not be less than that specified.

When the sand is not completely dry, allowance must be made for bulking due to the moisture content. The amount of bulking shall be determined by the Contractor in the presence of the Employer's Agent or his duly authorized representative.

The amount of water shall never exceed 34litres to every bag of cement used, including the water contained in the sand.

Effective screens shall be provided to protect the mixing of concrete during windy weather.

PS4.2.31.6 Weigh batching

The proportioning of the coarse and fine aggregates by mass shall be permitted, providing the method used is approved by the Employer's Agent or his duly authorized representative.

a) All requests received by the Employer's Agent or his duly authorized representative to make use of weigh batching shall be submitted to the Structural Engineer for approval.

b) If the weigh batching process is preferred to volume batching, the proposed mix proportions are to be equivalent to the relevant volumetric mixes as documented previously herein and be based on a minimum cement content.

c) The following procedures must be complied with:

i) The Contractor must timeously obtain written approval for the use of weigh batching and submit all information as set out below, with his application.

ii) The mix transformation from volume to weigh batching shall be carried out at an approved laboratory.

iii) Weigh batching equipment must be calibrated and a certificate of accuracy must be submitted before such equipment may be used. On contracts of long duration and/or requiring large quantities of concrete, new calibration certificates may be required every four months.

iv) The cement to aggregate ratio by volume for the following mixes will apply:

- Class C (15 MPa) - c/a = 1:9
- Class E (25 MPa) - c/a = 1:6
- Class F (30 MPa) - c/a = 1:4.5
- Class G (40 MPa) - c/a = 1:3

v) The following cement/water ratios by mass must also be complied with:

- Class C (15 MPa) - c/w = 1.30 to 1.35
- Class E (25 MPa) - c/w = 1.65 to 1.80
- Class F (30 MPa) - c/w = 1.90 to 2.05
- Class G (40 MPa) - c/w = 2.30 to 2.50

PS4.2.31.7 Ready mixed concrete

Any application to use ready mixed concrete shall be submitted by the Contractor at an early stage for approval by the Structural Employer's Agent. Only suppliers on the Employer's approved list will be considered.

New applications must be submitted to the Employer, well in advance.

PS4.2.31.8 Strength concrete

The Contractor shall be responsible for the design of strength concrete and for the measurement of the constituent materials to produce concrete that complies with the specified requirements.

a) Trial mixes

The Contractor shall ensure that samples of the constituent materials of the concrete, together with evidence that they comply with the provisions, are supplied for approval in good time and provide the Employer's Agent or his duly authorized representative with:

i) a statement from an approved independent laboratory of the results of tests; or

ii) an authoritative and acceptable report, or record of the previous use of and experience with, the material concerned.

The cement, types of aggregate and their origins shall not be changed throughout the duration of the Contract without giving prior notification to the Employer's Agent who shall verify that the above requirements are complied with and that the important qualities of the concrete shall not be impaired.

b) Consistency

Unless otherwise indicated by the general workability of the concrete, method of transportation, conditions of placement or otherwise specified by the Employer's Agent, the suggested slump values, for different mixes of concrete shall be as specified in this document.

c) Workability

Ensure that the concrete is of such workability that it can be readily compacted into the corners of the formwork and around reinforcement without segregation of the materials and without excessive "bleeding" of free water at the surface.

PS4.2.31.9 Expansion alkali-aggregate reaction

The use of some local aggregates may lead to an expansive alkali-aggregate reaction if the concrete in the structure will be exposed to continual dampness, or will be subject to alternate wetting and drying.

Alkali reactive aggregates, i.e. certain granites, quartzites and Malmesbury hornfels (shale), shall not be used in conjunction with high alkali cement for concrete in any part of the works. Where a high alkali cement shall be one in which the equivalent alkali content exceeds 0,60% by mass of the cement.

If the Contractor chooses to use one of the aggregates stated above in lieu of stone as described in this document he shall:

a) ensure that no high alkali cement is delivered to the site. Any such high alkali cement shall be rejected and the cost of its removal and replacement with cement having an acceptable alkali content shall be borne by him.

b) provide certificates stating the alkali content of each delivery of cement to the site, based on tests carried out at a laboratory approved by the Employer's Agent. The cost of testing, including sampling, transporting of samples and issuing of certificates, shall be borne by him.

c) be entitled to use an approved brand of cement as a means of ensuring that the permissible alkali content is not exceeded. Where he shall make allowance for the higher price of such approved brand, if he chooses to use this method.

PS4.2.31.10 Pumping of concrete

The placing of concrete by pumping in any section of the works shall be subject to the written approval of the Employer's Agent or his duly authorized representative. The Contractor shall furnish full details regarding the mix proportions of the concrete that he intends to place by pumping.

PS4.2.31.11 Admixtures to concrete

The use of admixtures in concrete shall only be considered should special circumstances warrant this and only with the prior written approval of the Employer's Agent. The Contractor shall provide the following information:

a) the trade name of the mixture, its source and the manufacturer's recommended method of use;

b) typical dosage rates and possible detrimental effects of both under and over dosage; and

c) the expected average air content of freshly mixed concrete containing an admixture which causes air to be entrained when used at the manufacturer's recommended rate of dosage.

PS4.2.31.12 Slump test

The apparatus and the method of determination of the slump of freshly mixed concrete shall comply with SANS 5862-1.

a) Apparatus

i) A mould in the form of a frustum of a cone and having the following nominal internal dimensions:

- Bottom diameter : 200mm
- Top diameter : 100mm
- Height : 300mm

The mould shall:

- be of a metal (other than brass or aluminum) of side thickness at least 1.6 mm and shall have a smooth internal surface.
- have suitable base plate and handles to facilitate lifting it from the test specimen in a vertical direction.

ii) The tamping bar shall have a nominal diameter of 16mm, a length of 600mm and with sharp corner rounded off at one end.

b)Procedure:

The test shall be carried out in an area that is free from vibration and shocks. Ensure that the internal surfaces of the mould are free from set concrete and are clean and dry.

Place the mould with the bottom on a smooth, horizontal, rigid, non-absorbent surface and hold the mould firmly in place while it is being filled as follows:

i) in four layers, each thickness approximately one-quarter of the height of the mould. Tamp each layer with 25 strokes uniformly spaced over the cross-section of the mould. Tamp the bottom layer throughout its depth and ensure that when tamping the second and subsequent layers the strokes penetrate into the underlying layer.

ii)after the top layer has been tamped, strike off the concrete level so that the mould is exactly filled. Clean off any concrete that may have leaked out between the mould and the supporting base-plate surface. Remove the mould from the concrete immediately by slowly and carefully raising it in a vertical direction. This will allow the concrete to subside.

Immediately measure the slump, to the nearest 5mm, by determining the difference between the height of the mould and the height of the specimen.

Regard the test as invalid, if a slump specimen collapses or shears off laterally, discard the result and repeat the test.

PS4.2.31.13 Concrete cubes

The apparatus for making and testing of concrete cubes shall comply with SANS 5863.

a) Apparatus

Cubic metal moulds shall:

- be steel;
- be machined and adequately strengthened to resist distortion;
- have an internal distance between faces of 150mm;
- be constructed so as to facilitate the easy removal without damage of the moulded specimen; and
- have a metal base plate which shall be attached to the mould by springs or screws.

When assembling the mould for use, the joints between the sections of the mould, the contact surfaces between the bottom of the mould and the base plate, and the internal faces of the assembled mould shall be thinly coated with a grease or oil that will prevent leakage of water through the joints and adhesion of the concrete to the mould.

The tamper must be a steel bar of length 400mm and mass 1.8kg, and having a 25mm square ramming face.

b) Sampling and making cubes

Sampling shall comply with SANS 5861-2.

One set of 3 cubes shall be required for every 40m3, or part thereof, of concrete cast. The sample taken from a batch of concrete and sufficient to make 3cubes shall be placed in a tray or on a platform and mixed thoroughly.

The moulds shall each be filled in 3 layers of approximately 50mm thick concrete. Each layer shall be compacted with the tamping rod, with at least 35 blows to give full compaction of the concrete.

After the top layer has been compacted, strike off the surface of the concrete with a trowel, level with the top of the mould.

Any small hollows shall be filled in with additional concrete. Cement/sand slurry shall not be worked into the surface.

At this stage, the identity of each sample shall be placed on the moulded cube, by means of a label of absorbent material and not by scouring of the surface of the concrete.

c) Curing cubes on site

Cover the test cubes in their moulds with an impervious sheet or wet sacking and store indoors in a place that is free from vibration, excessive draughts, cold and direct sunlight.

After 24 hours the cubes shall be demoulded, remarked with a waterproof crayon or marker and placed in a curing tank for 7 days before being transported to the laboratory.

The Contractor shall supply the curing tank which shall incorporate a thermostat to control the water temperature at 22 to 25°C and shall be kept within a building.

d) Testing of cubes

The testing of all concrete cubes shall be done in accordance with SANS 5863 by a laboratory approved by the Employer's Agent.

A suitable testing machine of sufficient capacity having an accuracy and repeatability that comply with the requirements for Grade A machines of BS 1610 "Method for the load verification of testing machines" shall be used to test the compressive strength of each cube.

The Contractor is responsible for the provision of the cube moulds and for timeous delivery of the cubes to the laboratory.

PS4.2.31.14 Concrete quality

Should the Contractor dispute any results obtained from concrete test cubes, the concrete represented by the cubes shall be considered acceptable if the Contractor, at his own cost, proves to the satisfaction of the Employer's Agent that the estimated actual strength of cores taken from the structure (by an approved independent testing laboratory and determined in accordance with SANS 5865 is not less than the specified strength. If the concrete fails to meet the strength criteria stipulated, the Employer's Agent may at his sole discretion and in addition to the options listed in SANS 1200G:

a) accept the concrete subject to approved remedial measures being undertaken by the Contractor at his own cost; or
b) permit the concrete to remain, subject to reduced payment for lower strength concrete.

PS4.2.31.15 Concreting

It is essential that the Contractor representative who has charge of the construction of all concrete work, whether reinforced or not, shall be skilled in this class of work, and shall personally supervise the whole construction, paying special regard to:

a) the quality, testing and mixing of the materials;
b) the laying of the material in place and the thorough compaction of the concrete to ensure solidity and freedom from voids;
c) the construction and removal of formwork; and
d) the sizes and positions of the reinforcement.

Particular care shall be taken to work concrete against formwork and around reinforcement. Internal vibrators may be used with the approval of the Employer's Agent or his duly authorized representative but external vibrators which act only on the formwork WILL NOT be permitted.

Concrete to be reinforced shall be deposited in such quantities as will permit of it being properly compacted around the reinforcement.

The placing of concrete shall be completed within ½ hour after mixing or within ½ hour after agitating and within 2,5 hours after mixing in the case of ready mixed concrete. Under no circumstances shall concrete be incorporated into the work after it has attained its initial set.

Care shall be taken to prevent, as far as possible, the formation of laitance or scum. Laitance is to be understood to mean the scum of strengthless and inert material which forms on the surface of concrete.

Concrete shall not be dropped into position from a height greater than 2.5m unless prior approval is obtained from the Employer's Agent.

If an inclined chute is used for transporting concrete, it shall be of such slope as will ensure a continuous flow of concrete without the use of an excessive quantity of water and without segregation of the aggregates. The chute must be flushed out and properly cleaned before and after each working period. All waste from flushing shall be discharged outside the formwork.

In beams, each portion of a successive layer shall be placed as soon as the concrete below has been properly worked around reinforcement and against formwork. Concreting shall be carried forward in irregular steps, that is to say, one layer shall not be completed over the whole section before the succeeding layer is commenced. Concreting of slabs and beams shall, as far as possible, be carried forward in one operation. When concreting has to be interrupted the concrete shall be left with a level, rough top surface with ends vertical. The concrete shall not be merely sloped down.

On resuming concreting, the old surface shall be roughened and all laitance thoroughly and carefully removed before any new concrete is deposited. This must be carried out by brushing the surface of the concrete while it is still green. Great care must be taken to avoid any weakness at the junction of old and new concrete and the old surface shall be coated with a thin layer of cement and sand mortar, in the same proportions as that of the adjoining concrete.

While the concrete is setting it shall not be disturbed or shaken by traffic, either on the concrete itself or upon adjoining formwork.

No holes in concrete elements shall be patched or filled in without inspection, instruction and approval of the Employer's Agent or his duly authorized representative.

No concreting shall be carried out when the air temperature is below 4°C when it is rising and 8°C when it is falling.

Before concreting is commenced the Contractor shall give the Employer's Agent or his duly authorized representative 24 hours notice of his intention to do so. On sites further than 200km from the Employer's Agent or his duly authorized representative, 48 hours notice must be given.

Concrete surface beds, excluding heavy industrial floors etc. shall be Class C concrete and shall be laid in suitable size panels not exceeding 20m2 in area and with the length of any panel not exceeding 4.5m.

Where concrete beams are supported on concrete columns, the columns are to be concreted up to the underside of such concrete beams and then concreted up to the top of the beams, integral with the beams.

NOTA BENE: Any finish applied to the surface of concrete floors, is to be understood as being additional to the thickness of the concrete described or shown on the drawings.

PS4.2.31.16 Curing of concrete

After the concrete has been placed, all exposed surfaces shall be kept continuously damp for at least

10 days by methods as may be approved by the Employer's Agent or his duly authorized representative, such as covering with approved building paper, or by means of wet canvas, wet sacks, wet sand, by continuous hosing or ponding with water.

PS4.2.31.17 Concrete lintels (cast in-situ)

Concrete lintels cast in-situ shall be of Class E concrete, reinforced with steel reinforcement as well as of depths specified in the table hereunder. Each lintel shall be the full thickness of walls into which they are cast and 450mm longer than width of openings.

Clear or daylight span	Depth in brick courses	Reinforcement
< 1m	3	Nil
≥ 1m ≤ 1.5m	3	One 12mm diameter mild steel rod, 40mm up from bottom, for each half brick width of soffit.
> 1.5m ≤ 2m	4	One 16mm diameter mild steel rod, 40mm up from bottom, for each half brick width of soffit.
> 2m	To detail	To detail.

PS4.2.31.18 Building on concrete footings and beams

No brickwork, stone walling or other structure shall be built on concrete footings until at least 3 days after placement of the concrete in the case of mass concrete footings and after 7 days in the case of reinforced concrete footings or as may otherwise be directed by the Employer's Agent or his duly authorized representative.

No brickwork, stone walling or other structure shall be built on reinforced concrete beams or similar members until the formwork and all propping or supports have been removed.

PS4.2.31.19 Slip joints between concrete and brickwork

Slip joints shall be provided between brickwork and concrete slabs and beams by levelling up and trowelling smooth the bearing surfaces of brickwork with 3:1 cement mortar and covering the bearings before the concrete is cast, with two layers of one side smooth tempered hardboard, with the smooth sides in contact.

The ends and sides of beams and edges of concrete slabs shall be separated from the brickwork with 13 mm thick bitumen impregnated softboard or expanded polyethylene strips placed vertically against the brickwork before the concrete is cast.

Similar slip joints shall be provided between brickwork and concrete lintels cast in situ, but without softboard or expanded polyethylene strips at ends.

PS4.2.31.20 Movement joints

All movement joints are to be filled in with approved bitumen impregnated softboard or expanded polyethylene strip unless otherwise specified or detailed on drawings. Form similar movement joints where pathways adjoin structures externally.

PS4.2.31.21 Cutting, punching or hacking concrete

No reinforced concrete shall be cut or hacked without the approval of the Employer's Agent or his duly authorized representative.

PS4.2.31.22 Forming key to concrete for plaster and other finishes

Where rough formwork has been used, surfaces of concrete to receive plaster and other finishes, shall, immediately after the formwork has been removed, be well wetted and wire brushed whilst the concrete is still green and then slushed over with 2:1 cement grout to form a key for the finish, all to the approval of the Employer's Agent or his duly authorized representative. The slushing is to be allowed to set hard before the finish is applied.

Where smooth formwork is used, surfaces of the concrete to receive plaster and other finishes shall be hacked, on the distinct understanding that hacking of concrete shall be at no extra cost.

Surfaces of concrete receiving plaster or other finishes shall not be plastered or finished until the Employer's Agent or his duly authorized representative has signified his opinion that the surfaces are suitable to receive plaster or other finishes.

PS4.2.31.23 Sleeves pieces

Where it is necessary to leave plugs or holes in beams, slabs or any other reinforced concrete, all such plugs or holes must be situated in positions approved by the Employer's Agent or his duly authorized representative before concreting. Where it is necessary to carry pipes, bolts, wires or any other fittings through reinforced concrete members, approved pipe sleeves must be provided and placed in position before concreting.

All necessary bolts, plugs, brackets, cramps, etc. shall be cast into the concrete as the work proceeds.

PS4.2.31.24 Ties

Where brickwork abuts against concrete, the brickwork is to be tied to the concrete with galvanized hoop-iron ties 1.6mm thick by 3mm wide and approximately 600mm long to every third course of brickwork with one end of each tie cast approximately 150mm deep into the

concrete. Where such fixing is impossible, i.e. where steel formwork is used, the ties are to be gun-nailed against concrete with steel nails not less than 38mm long.

PS4.2.31.25 Bagged finish to concrete

Concrete surfaces to receive bagged finish shall be prepared by removing sharp projections and making good defects with 3:1 cement mortar. Finish by rubbing over the whole area with wet rough sacking and cement grout to obtain an even surface.

PS4.2.31.26 Power floated finish

Power floated finish to floors or slabs means that surfaces shall be floated mechanically to a smooth and even finish before the concrete has set. Small areas inaccessible to the machine are to be floated by hand. Under no circumstances is cement mortar to be added while floating the concrete.

PS4.2.31.27 "No-fines" concrete

"No-fines" concrete, for grading flat concrete roofs and the like to falls, shall be in the proportion of 12 parts 19 iron cubical stone to 1 part cement mixed with 20l water per bag of cement and be laid to falls of not less than 15mm per linear metre for mastic asphalt and not less than 20mm per linear metre for sheet roof covering. For heavy load applications special mix designs may be required.

a) Fillets against upstands

Form triangular fillets, size 75 x 75mm, in corners with walls, kerbs, etc. neatly mitred at angles, stopped where necessary and finished smooth ready to receive waterproofing.

b) To raised floors, bases and other

"No-fines" concrete for raised floors, bases, etc. shall be in the proportions specified. Finish smooth with 3:1 sand/cement screed to receive waterproofing.

PS4.2.31.28 Cellular concrete

Cellular concrete, for grading flat concrete roofs and the like to falls, shall be laid in situ in required layers; the bottom layer having a density of 400kg/m3, dressed to falls by varying the thickness, and a 20mm thick top layer having a density of 960kg/m3.

PS4.2.31.29 Formwork

Formwork shall include all shuttering, casing and centering of material required for the laying and forming of concrete floors, slabs, beams, lintels, walls, steps, columns, piers, pilasters and any other concrete work requiring moulds or forms and shall embrace all cleats, battens, fillets, wedges, struts, trestles, braces, props, shores and other requirements of material for keeping all in correct position. All materials used for formwork must be suitable and substantial and all joints must be tight enough to prevent leakage of liquid matrix.

All formwork must be designed by the Contractor and if requested to do so, he must submit fully detailed and dimensioned working drawings to the Employer's Agent or his duly authorized representative for checking purposes. Acceptance of the proposals shall not relieve the Contractor of his responsibility for the safety and stability thereof nor for any loss or damage arising out of defective design, materials and/or workmanship.

The formwork must be so constructed that its partial removal can be carried out to the satisfaction of the Employer's Agent or his duly authorized representative and in such stages as are required by the working conditions. As far as possible, wedges and clamps must be used in preference to nails. All formwork in its various sections for floors, beams, etc. must be so arranged that the whole may be raised or lowered either independently or together with other sections by means of wedges or other approved methods.

Immediately before concreting is begun, the formwork in contact with the concrete must be thoroughly cleaned, wetted and kept damp whilst the concrete is being placed.

Great care must be taken to keep the formwork wedged up to its correct height and this must be checked by taking levels immediately before concreting is commenced and immediately after it has been completed.

All beams shall have a camber of 6mm to every 3m of length.
The minimum periods that the formwork to the various parts of the structure is to remain in position after concreting shall be as stated in the following table:

Description	Normal cement		Rapid hardening cement	
	Weather		Weather	
	Normal	Cold	Normal	Cold
Beam sides, walls, unloaded columns	2 days	4 days	1 days	2 days
Slabs with props left under	4 days	7 days	2 days	4 days
Beam soffits with props left under including ribbed slabs	7 days	12 days	3 days	5 days
Removal of slab props	10 days	17 days	5 days	9 days
Removal of beam props	14 days	28 days	7 days	12 days

When determining the stripping time for formwork the weather shall be considered to be "normal" when the temperature is above 18°C and "cold" when the temperature is between 5°C and 10 °C, these being the average daily temperatures of the atmosphere adjacent to the concrete. When the average daily temperature lies between the above values for "normal" and "cold" weather the minimum period for stripping of formwork shall be determined by the Employer's Agent or his duly authorized representative.

Notwithstanding the above minimum periods, formwork may be struck immediately, once the concrete in the various parts of the concrete work has attained the crushing strengths required by the Employer's Agent or his duly authorized representative. The crushing strengths must be determined by proper tests, which shall be carried out by the Contractor.

No formwork of any nature shall be struck, either after the elapse of the minimum periods stated in the above table or on the attainment of the required crushing strengths of the concrete, without the prior consent of the Employer's Agent or his duly authorized representative. Such consent shall not absolve the Contractor of his responsibility for the safety of the works.

In structures having either in whole or in part, two or more reinforced concrete floors, props shall be provided under the soffits of any beam or slab of any floor which is being used to support the formwork and wet concrete of the floor above, all to the approval of the Employer's Agent or his duly authorized representative. The props shall not be removed until the formwork supporting the concrete of the floor above has been struck.

Under no circumstances shall steel formwork be oiled where concrete is to receive plaster.

PS4.2.31.30 Smooth formwork

Smooth formwork shall be any material approved by the Employer's Agent or his duly authorized representative which is to be used to leave concrete surfaces smooth when removed and where no other finish is to be applied.

PS4.2.31.31 Reinforcement rods

a) Mild steel

Mild steel shall comply with the requirements of SANS 920, Type A or B.

b) High tensile steel

High tensile steel shall comply with the requirements of SANS 920, Type C or D.

PS4.2.31.32 Concrete reinforcement

a) Rod reinforcement

Bending and hooking of rods shall be done in accordance with SANS 282. Rods shall be bent cold in an effective bending machine, or properly designed rod-bender using a steady pressure and not by hammering.

Diameters, lengths and positions of rods as shown on the drawings must be strictly adhered to. Joints in rods in beams, stairs, etc. will be permitted only where shown on drawings.

Before being placed in position, the rods shall be thoroughly cleaned of all grease, dirt, bituminous material, scale and loose rust.

All distribution rods shall be straight and shall extend at least 150mm into beams or other support. Unless otherwise shown on the drawings, all joints in reinforcing rods shall be lapped 40 times the diameter of the rod. The laps shall be securely tied with 1.25mm diameter annealed mild steel binding wire.

Reinforcement for piles, column footings, columns and walls shall be tied at every intersection, or as directed or shown on drawings, with similar binding wire. Reinforcement in beams shall be tied at alternate intersections in a diamond pattern, unless circumstances demand every intersection.

Great care must be taken to retain the reinforcement in its correct position during the entire period of concreting. Blocks of fine concrete, size approximately 40 x 40mm, or plastic spacers, shall be provided on the formwork to soffits of beams to ensure than the rods are retained in position and that the correct concrete covering to the main reinforcing rods is provided. The blocks shall be of thickness required and shall be placed under the main reinforcing rods at approximately 600mm centres.

Reinforcement in the top of slabs and the like shall be retained in position by means of cradles (stools), formed of steel reinforcing rod as follows:

- R10 for height range 100-300mm and maximum width of 300mm.
- R12 for height range 310-500mm and maximum width of 45 mm.

Recommended spacing of supports for horizontal bars in slabs:

- not further than 600mm apart (cradles ±1000 mm c/c in both directions) for bar diameters up to 12mm.
- not further than 1,000mm apart (cradles ±1 500 mm c/c in both directions) for bar diameters of 16mm and over.

Stools are to be placed on the bottom layer of reinforcement, securely retained in position and with correct concrete cover as specified. Cradles are to be securely wired to the slab

reinforcement with binding wire. Beam rods in different layers shall be separated by means of steel spacer bars of suitable diameters and lengths.

Double mats in concrete walls shall be kept in their respective positions by means of suitable steel clips.

Recommended spacing of supports for vertical bars in walls:

- 1,000mm centres in both directions for bars up to 12mm diameter; and
- 1,500mm centres in both directions for bars of 16mm diameter and over.

Supports can be spaced more closely by the design Employer's Agent, depending upon the circumstances.

All stirrups shall be properly fastened to the rods so as to retain their relative positions during the entire period of concreting.

Welding of main rods will not be permitted unless approval has been given by the Employer's Agent or his duly authorized representative. Spot welding in lieu of wiring may be used to secure rods and stirrups in position.

The concrete covering the main reinforcement, unless otherwise specified, shall not be less than that stated in the following table:

Position	**Amount of cover**
Soffit of slabs	**The diameter of the main rods, but never less than 15mm (mm)**
End of beams	40
Soffits of beams	40
Sides of beams	40
Sides of columns	40
Slab underground	40
Concrete walls	25
Walls exposed to ground	40
Ground beams	40
Foundations	75
Water retaining structures and within 1 km from coast	50

In cases not included in the above table the cover shall be not less than 25mm. Depending on the condition of exposure and fire resistance requirements, concrete cover can be varied by the Employer's Agent but in no case shall the concrete cover be less than the diameter of the rod to be covered.

The cover shall be measured from the face of the concrete to the outside of main reinforcement nearest the face of the concrete, and shall exclude plaster and similar finishing materials.

Three samples of each diameter of reinforcing rods, each approximately 600mm long, must be taken from each consignment of rods of similar diameter, for testing. If any sample is found unsatisfactory, the whole consignment of rods from which the samples were taken shall be rejected.

Top reinforcement in cantilever slabs to be kept in position with a first row of stools or chairs 300mm from the beam or support, and thereafter at a maximum of 40 bar diameters under each bar.

The cover blocks, spacers, bars and stools or chairs are to be placed and/or wired in position by the steel fixer.

b) Welded steel fabric reinforcement

All welded steel fabric reinforcement shall comply with the requirements of SANS 1024. The preferred dimensions are as follows:

1	2	3	4	5	6
Fabric Reference number	**Nominal pitch of wires**	**Nominal diameter of wires**		**Nominal mass***	
	Longitudinal (mm)	**Cross (mm)**	**Longitudinal (mm)**	**Cross (mm)**	**kg/m2**
617	200	200	10.0	10.0	6.17
500	200	200	9.0	9.0	5.00
395	200	200	8.0	8.0.	3.95
311	200	200	7.1	7.1	3.11
245	200	200	6.3	6.3	2.45
193	200	200	5.6	5.6	1.93
100	200	200	4.0	4.0	1.00
772	100	200	10.0	7.1	7.72
655	100	200	9.0	7.1	6.55
517	100	200	8.0	6.3	5.17
433	100	200	7.1	6.3	4.33
341	100	200	6.3	5.6	3.41
289	100	200	5.6	5.6	2.89
278	100	300	6.3	4.0	2.78
226	100	300	5.6	4.0	2.26
133	100	300	4.0	4.0	1.33

*These mass values are based on the wires having mass of 0,00785 kg/mm2 per metre of length.

The actual mass of the fabric should not differ from the nominal value by more than 6%.

PS4.2.32 Precast concrete

PS4.2.32.1 Materials

Cement, water, aggregates and reinforcement shall be as described under the concrete section.

PS4.2.32.2 Concrete, formwork and reinforcement

PS4.2.32.3 Concrete

Concrete shall be as described under the applicable concrete section(s). Unless otherwise specified a Class E concrete shall be used but with coarse aggregate of an appropriate size.

PS4.2.32.4 Mould units

The whole of this work is to be carried out by a specialist, who has appropriately skilled workers in this class of work.

All materials and finishes are to be to the approval of the Employer's Agent or his duly authorized representative.

The moulds are to be properly constructed in the best and most up to date practice, made up in suitable sections with all necessary reinforcement, cramps, bands, bolts, etc. for fastening together and are to be constructed so that castings can be easily removed and the moulds re-used without distorting.

Those sections of the moulds which will produce the finished faces of the units are to be specially prepared, perfectly smooth, except where the finish is of exposed aggregate, true to shape and coated with a suitable solution which will prevent units adhering to the moulds, while not in any way discolouring the finished surfaces.

All cast units are to be properly cured and no units are to be fixed or built in until 28 days after casting.

Units are to be properly protected from the elements while curing and are to be kept wet for at least 10 days after casting by frequent spraying with clean water.

Form all necessary checkings, mortices, lugs, etc. for cramps and dowels when casting.

PS4.2.32.5 Terrazzo blocks

Precast terrazzo work shall be generally as prescribed for precast concrete above. The coarse aggregate of the mix of which blocks are to be formed shall be of 10mm stone. The finish to exposed faces shall be 10mm thick.

PS4.2.32.6 Smooth finish

Where described as "finished smooth from the mould" such surfaces shall have a layer composed of 1 part (volume) cement and 4 parts (volume) clean fine sand, packed against the faces of the mould before placing the concrete backing. The concrete backing shall be deposited into the moulds in a wet state (not dry pressed) whilst the facing is still wet.

Projections shall be rubbed off and faces shall be of even colour and free from blemishes, cracks and other imperfections. Salient angles shall be arris rounded.

PS4.2.32.7 Sizes

Sizes given are approximate; the Contractor shall be responsible for ascertaining the exact sizes based on actual measurements.

PS4.2.32.8 Reinforcement

Unspecified reinforcement required for manufacturing, handling and erection purposes and for reinforcing projecting and other unwieldy portions of blocks shall be provided by the Contractor at his discretion, but such action shall be highlighted to the Employer's Agent.

PS4.2.32.9 Bedding, joint and pointing

Blocks shall be bedded and jointed solidly in cement mortar composed of 3 parts (volume) of sand and 1 part (volume) of cement and shall be pointed with slightly keyed joints.

PS4.2.33 Masonry

(Including brickwork and stone masonry)

NOTA BENE: Where sizes in descriptions are given in brick units, "one brick" shall represent the length and "half brick" the width of a brick.

PS4.2.33.1 Lime

Lime shall be hydrated bedding mortar lime in accordance with the requirements of SANS 523.

PS4.2.33.2 Cement

Cement shall be as specified in the concrete section.

PS4.2.33.3 Sand

Sand shall comply with the requirements of SANS 1090, unless specialist advice is obtained. A sample of 25kg must be delivered to an approved laboratory for testing purposes.

PS4.2.33.4 Burnt clay bricks

a) Burnt clay bricks shall comply with the requirements of SANS 227, and shall be equal in all respects to the selected samples.

b) Clay bricks for foundations shall be as described in (a) above, but extra hard burnt.

c) Where bricks with holes are used, the holes in such bricks must only be filled in solid with mortar where specifically specified.

d) All bricks that do not carry the SABS Mark, must be tested by an approved laboratory.

PS4.2.33.5 Firebricks

Firebricks shall be of well burnt refractory fireclay, resistant to spalling and cracking and of same size as ordinary bricks.

PS4.2.33.6 Local stone

Local stone shall be from an approved quarry, free from defects and to the satisfaction of the Employer's Agent or his duly authorised representative.

PS4.2.33.7 Freestone

All freestone shall be the best and most durable of its kind, free from vents, loose beds, oxide veins and other imperfections to the satisfaction of the Employer's Agent or his duly authorised representative and shall be set on its natural quarry bed.

PS4.2.33.8 Mortar tests

a) Sampling

The frequency of sampling will be decided by the Representative/Agent. Sufficient mortar shall be taken from each of the points of laying to prepare a composite sample to make a set of three mortar cubes.

b) Moulding

Cube moulds with a nominal size of 100mm, that comply with SANS 5863 must be used.

Fill each mould with mortar in three equal layers and compact each layer by means of a tamper. The tamper must be made of hard wood with a flat tamping surface with nominal dimensions of 50 x 25mm and shaped to provide a round stem of approximately 25mm diameter and long enough to afford sufficient hand grip. Immerse the tamper in water for 15 minutes before use.

Each layer of mortar must be compacted by means of 8 evenly spaced pressing strokes of the tamper. After the final layer has been tamped, the excess mortar must be struck off level with the top edges of the moulds.

c) Curing

Cover the test cubes (in their moulds) with an impervious sheet followed by wet matting, sacks or similar material, and store them in a place free from vibration, excessive draughts and direct sunlight.

After 24 hours mark each cube so that it can be identified. After 48 hours the cubes shall be removed from their moulds and placed into water in a curing tank at 22 to 25 °C for a minimum period of 7 days before they are transferred to the approved testing laboratory. Ensure that loss of moisture is prevented during transportation and that they are well protected against damage.

d) Testing of cubes

The testing of all mortar cubes will be done by a laboratory approved by the Employer's Agent and in accordance with SANS 5863.

PS4.2.33.9 Cement mortar

Cement mortar shall be composed of 6 parts (by volume) of sand and 1 part (by volume) of cement. The material shall be mixed dry until of uniform colour and then water added and the mixture turned over until the ingredients are thoroughly incorporated. Cement mortar shall be produced in such quantities as can be used before commencing to set as no cement mortar that has once commenced to set shall be used in any way.

Care shall be taken in mixing cement mortar to remove from the mixing machine or platform any old mortar that has already set as such mortar may not be incorporated into any new batch.

Mortar should achieve the minimum required strength (in MPa) for the classes of mortar as set out in the National Building Regulations.

PS4.2.33.10 Compo mortar

Compo mortar shall be composed of 6 parts (by volume) of sand — depending on the quality of the sand available, 1 part of lime and 1 part of cement (by volume). The lime and sand shall be mixed dry, then mixed wet, before the cement is added, approximately ½ hour before using and the adding of the necessary additional water as required.

Compo mortar shall be produced in such quantities as can be used before commencing to set, as no compo mortar that has once commenced to set shall be used in any way.

Mortar should achieve the minimum required strength (in MPa) for the classes of mortar as set out in the National Building Regulations.

PS4.2.33.11 Brickwork

Brickwork shall be:

a) wherever practicable, built in English bond. No false headers shall be used and none but whole bricks employed, except where legitimately required to form bond.

b) built level and plumb with mortar as specified.

c) laid on a solid bed of mortar and all joints thoroughly grouted up solid throughout the whole width of each course.

d) carried up in a uniform manner, no one portion being raised more than 1.2m above another at any one time.

Clay bricks shall be well saturated with water, in the stack or dump, approximately 2 hours before being used. The tops of walls left unfinished shall be well wetted before work recommences.

NOTA BENE: Cement or concrete bricks shall not be wetted.

All rough and fair cutting, cutting of splays, skewbacks, chamfers, etc. shall be properly performed.

Form or leave all necessary openings for pipes etc. and make good after pipes etc. are fixed in position.

PS4.2.33.12 Brickwork in cement mortar

a) All brickwork below damp course level, all isolated piers three bricks wide and under, half brick thick walls and chimney stacks above ceiling level, shall be built in cement mortar as specified.

b) Brick arches and brick lintels shall be built in cement mortar as specified, but in the proportion of 3:1.

NOTA BENE: This clause is essential where compo mortar has been specified.

PS4.2.33.13 Mortar joints

Mortar joints to brickwork generally shall be 10mm in thickness with level bedding joints.

The joints in brickwork:

a) receiving plaster, tiling or similar finishes shall be raked out whilst the mortar is soft to form key for the plaster or mortar backing. The depth of the raking out shall depend on the condition of the bricks; i.e. the rougher the bricks on face the shallower the raking out and the smoother the bricks the deeper the raking out.

b) shall be flushed off where walls are to be bagged, in readiness for the bagging.

PS4.2.33.14 Grout in joints in brick foundation walls

All joints in brick foundation walls shall be grouted in solid with 3:1 liquid cement mortar to obviate any crevices for ant (termite) tracks.

PS4.2.33.15 Brickwork thicknesses

Walls built in two or three half brick thicknesses shall only be built where bonded brickwork (as specified) proves impractical or where required due to the prescribed bond of faced brickwork, all tied together with metal ties in accordance with SANS 28, of the Butterfly Types only, of sufficient length to allow not less than 75mm of each end to be built into brickwork. Ties shall be evenly spaced at not more than 1m apart to every third course and staggered.

PS4.2.33.16 Brickwork in linings

Brick linings to concrete shall be tied thereto with 4mm diameter galvanized crimped wire ties bent at ends and of necessary length to allow 75mm to be cast into concrete and 75mm of the other end to be built into brickwork and evenly spaced at not more than 1m apart to every third course and staggered.

PS4.2.33.17 Half brick thick walls

Half brick thick walls shall be built in cement mortar (as specified) and reinforced with 75mm wide brick reinforcement (as specified), 1 row to every 8 course in height, and built 100mm into main connecting walls. The reinforcement shall be lapped 150mm at end joints, where these are necessary, and 75mm at angles.

Brickwork shall be built level and plumb.

PS4.2.33.18 Beam filling

Beam filling shall be half brick thick, built up in mortar as used in the walls below, cut in between roof timbers and carried hard up to underside of roof covering and flushed up with mortar.

PS4.2.33.19 Reinforced brick lintels

Reinforced brick lintels shall be built with sound machine made bricks in 3:1 cement mortar with all vertical and horizontal joints filled solid with mortar throughout the required number of courses and to a distance of at least 330mm on either side of the clear opening.

The number of courses in lintels over the various size openings shall be as specified in the table hereunder and reinforcing steel wires or rods shall be built into the first horizontal joint over the bottom course to the number specified in the following table:

Clear or daylight span	Number of courses	Reinforcement
< 1m	4	One row 75mm wide brick reinforcement as described below, for each brick width of soffit.
≥ 1m ≥ 1.5m	6	Ditto
> 1.5m ≤ 2m	7	Three 6.3mm diameter mild steel rods for each half brick width of soffit.
> 2m ≤ 3m	8	Ditto

Brick reinforcement shall be of hard drawn mild steel comprising two 2.8mm diameter main wires spaced 75mm apart and 2.5mm diameter cross wires spaced at not exceeding 300mm apart, welded to main wires.

The reinforcing wires and rods shall be of length at least equal to the width of the clear opening plus 330mm at each end. The reinforcement shall be evenly spaced in the brick joints with the outer wires or rods having at least 20mm cover from face of brickwork.

Brick lintels in 270mm thick cavity walls shall be built with inner face of outer thickness, for a depth of three courses above soffit, covered with sheeting as for damp course, the full length of lintels, and space between the two thicknesses for the depth of the sheeting filled in solid with Class E concrete.

Where cavities continue above lintels, the sheeting shall be taken up and turned on to top of first course of brickwork to inner thickness of wall above the concrete filling in lintels. The sheeting is not required in lintels protected from the weather.

The lintels, except where built over pressed steel door frames and the like, shall be supported on temporary turning pieces of suitable and substantial construction left in position for at least 14 days for long spans (1 to 3m).

PS4.2.33.20 Hollow tile lintels

Hollow tile lintels shall be formed with approved 300 x 220 x 110mm burnt clay hollow tiles each having not more than 3 cavities. The tiles shall be set end to end and the cavities filled up solid with Class E concrete.

Lintels shall have bearings of not less than 220mm on walls at ends.

The lintels over the various size openings shall be reinforced as specified in the following table:

Clear or daylight span	Reinforcement

≤ 1m	One12mm diameter mild steel rod in upper and lower cavities
> 1m ≥ 1.5m	One16mm diameter mild steel rod in upper and lower cavities

The reinforcing rods shall be placed 12mm from top and bottom edges of concrete filling to upper and lower cavities respectively.

Lintels over openings not exceeding 1m wide in 1 brick thick walls shall be on flat and in all other cases shall be on edge using 2 or more lintels in walls 1 brick thick and over, built side by side, to make up the thickness of walls.

Lintels in 270mm thick cavity walls shall be in two 110mm thicknesses with inner face of outer thickness covered with sheeting as for damp-course, the full length and depth of lintel, and the space between the two thicknesses filled in solid with Class E concrete. Where cavities continue above lintels the sheeting in lintels shall be taken up and turned on to top of first course of brickwork to inner thickness of wall.

Lintels shall be made not less than 21 days before building in and shall be cured for at least 14 days by being kept damp in a shaded position.

The lintels shall be hoisted into position and bedded and grouted in solid in cement mortar.

PS4.2.33.21 Pre-stressed lintels

Pre-stressed lintels shall be vibrated concrete reinforced with stressed high tensile steel wires, or of burnt clay blocks with similar reinforcing wires embedded in grooves in the blocks in 1:3, cement:sand mortar, or of other approved form of construction.

Concrete in lintels shall attain a crushing strength of at least 34MPa at 28 days for ordinary and at 7 days for rapid hardening cement.

The reinforcing wires shall be of ductile high tensile steel wire not less than 4mm diameter and of tensile strength of at least 1,350MPa and shall be stressed to not less than 850MPa.

The lintels may be in a single width to the thickness of wall or may be in two widths, placed side by side, and shall have a depth of not less than 60mm. Top surface of lintels shall be suitably roughened, indented or shaped to give a good bond between the lintels and the mortar for the first course of brickwork above,

Lintels shall have bearings of not less than 225mm on walls at each end.

The number of reinforcing wires in lintels for the various wall thicknesses and spans shall be not less than specified in the table hereunder, and brick courses over lintels of the number indicated in the table and for the full length of lintels shall be built in 3:1 cement mortar with all joints filled solid with mortar:

Nominal wall thickness (mm)	**Clear or daylight span**	**Number of wires (in total number of lintels used)**	**Number of brick courses over lintel**
90 - 110	≤ 1.8m	2	3
90 - 110	> 1.8m ≤ 3m	3	4
180 - 230	≤ 1.8m	6	4
180 - 230	> 1.8m ≤ 3m	6	5
270	≤ 1.8m	7	4
270	> 1.8m ≤ 3m	7	5
340	As described for 1 of 230mm plus 1 of 110 mm, or 3 of 110 mm		

Lintels in 270mm thick cavity walls shall be in 2 widths with joint between the two arranged directly over the window or frame below, and the brickwork above shall be built in 2 x ½ brick thickness with inner face of the outer thickness covered with sheeting as for damp-course, the full length and depth of lintels, and taken down between the 2 widths of pre-stressed lintels. The cavity to height of lintel courses shall be filled with Class E concrete, and where cavities continue above the lintel courses the sheeting shall be taken up and turned on to top of first course of brickwork to inner thickness of wall above the lintel course. The sheeting is not required in lintels protected from the weather.

PS4.2.33.22 Bagged finish to brickwork

Bagging to walls is to be carried out after the mortar in joints has set. The wall surfaces shall be rubbed over with wet rough sacking until all joints and crevices are filled up and an even surface is obtained. Cement grout shall be added if necessary to fill up the joints and crevices.

PS4.2.33.23 Raking out for and pointing flashings

Brick joints shall be raked out where required for fixing cover flashings and flashings, which shall be pointed in 3:1 cement mortar.

PS4.2.33.24 Mastic pointings

Where steel door and window frames are specified to be pointed with mastic compound they shall be pointed all round externally with an approved waterproofing compound of such composition that it will not stain surrounding surfaces and that it will adhere steadfastly, remain plastic without sagging or running, be capable of accommodating any normal movement of the joint sealed, and will receive paint without "bleeding". The pointing material shall be forced into the joints, which shall have been previously prepared to receive same, by means of a pressure gun or by other suitable method, all in accordance with the manufacturer's instructions.

PS4.2.33.25 Building in

Ends of timbers, holdfasts, cramps, gratings, air bricks, dowels, etc. shall be built-in in cement mortar.

Door and window frames, lift door frames and the like shall be set up in position for building in and securely strutted to prevent distortion whilst the brickwork, lintels, etc. are being built.

Pressed steel door frames and lift door frames shall be grouted in solid at back with cement mortar as the work proceeds. Wood slips, fixing bricks, hoop iron roof ties, etc. shall be built in as the work proceeds.

PS4.2.33.26 Securing of roofs

Roof trusses shall be fixed at each support to walls with ties of 1.6mm thick galvanised hoop iron, 32mm wide, built 750mm deep into brickwork or embedded 300mm deep into concrete or wrapped around bottom layer of reinforcing in a reinforced concrete beam and wrapped over truss and fixed with four galvanised nails, 40mm long

PS4.2.33.27 Bedding

All door, window and similar frames shall be bedded and pointed in 1:3 (cement:sand) cement mortar. All wall and floor plates shall be set true and level and bedded in 1:6 (cement:sand) cement mortar.

PS4.2.33.28 Pointing of brickwork

Clean and point at the end of each working day all exposed masonry work including nail holes, existing brickwork shall be pointed, thus Pointing, repairing eroded and cracked mortar joints, shall be executed on existing and new brick where and when shown by the Employer's Agent or his duly authorized representative. All disintegrated joints (erosions and/or cracks) shall be

cleaned of all existing mortar for the full depth of the deterioration but not less than to a depth of 25mm. All joints shall be:

a) brushed and washed (under pressure) clean prior pointing;

b) kept wet during pointing; and

c) pointed to the full depth of the cut, tooled to match existing.

Steel door and window frames shall be carefully pointed all round and made perfectly watertight.

Joints greater than 25mm shall be stage-pointed.

PS4.2.33.29 Faced brickwork

Faced brickwork shall be built fair and pointed with a keyed or recessed joint as specified. Keyed joint shall mean that the joints are to be pointed with a round jointing tool, well pressed into the joints as the work proceeds.

"Recessed joint" shall mean that the joints are to be square recessed to a depth of approximately 6mm formed with a rectangular jointing tool well pressed into the joints as the work proceeds.

Facing bricks shall be sorted by the brick manufacturer at his yard or by the Contractor on the site to ensure that proper mixing of the bricks within the colour range of each type of facing brick being used is obtained. Sudden changes in the general colour of face work in any 1 type of facing brick shall not be acceptable.

PS4.2.33.30 Fibre cement sills

Sills shall where in any way possible be in single lengths, cut between reveals, fitted with fixing lugs and solidly bedded in 1:3 (cement:sand) cement mortar with a slight projection beyond the finished wall face below.

Internal sills shall be level. External sills shall be set sloping on cut brickwork.

PS4.2.33.31 Installation of electrical service

The installation of electrical services, where such service is being provided, the Contractor shall embed in the concrete, as the work proceeds, all conduits, boxes, etc., which will be fixed in position by the electricians, and must reduce all required chases and holes in walls for conduits and form recesses in walls for distribution boards, all in the positions directed. Alternatively, distribution boards may be built into walls as the work proceeds, providing prior approval are obtained from the Employer's Agent.

The Contractor shall afford every facility and shall render reasonable assistance to the electricians in carrying out their work and shall make good where necessary, in all trades, after installation has been completed.

Chases, holes and recesses required in walls shall be cut and formed as follows:

- vertical chase for single conduit.
- vertical chase for two conduits.
- vertical chase 150mm wide and 110mm deep for conduits.
- vertical chase 250mm wide and 110mm deep for conduits.
- vertical chase 380mm wide and 110mm deep for conduits.
- vertical chase 560mm wide and 110mm deep for conduits.
- horizontal chase for single conduit.

• Holes 25mm diameter, or knocking out bricks and filling space and making good after a pipe has been fixed through a wall.

Recesses for distribution boards shall be:

Width (mm)	Height (mm)	Depth (mm)
330	330	110
455	330	110
635	330	110
610	660	110
610	910	110

PS4.2.33.32 Cable sleeves

Provide under buildings where required 100mm diameter vitrified clay, pitch fibre or plastic pipes as sleeves for electric cable taken up to floor level in cable duct or switch cupboard with easy bends. The pipes shall be as specified for drainage including laying and jointing.

PS4.2.33.33 Patching brickwork

Patching of existing walls and closing of openings shall be as shown. All brick shall be keyed to the existing or stepped every course with all surfaces flush with the existing surface and all joints kept on line.

PS4.2.33.34 Protect face brickwork

All face brickwork, stonework, tiling, etc. liable to damage shall be covered up and protected during the progress of the remaining work and any damage done shall be made good to the satisfaction of the Employer's Agent or his duly authorized representative.

All face brickwork, stonework, tiling, etc. shall be cleaned down as the work proceeds and shall be covered up with paper, pasted on, or by other approved means where necessary to prevent soiling of the surfaces during the progress of the remaining work. At completion of the works the coverings shall be removed and the surfaces again cleaned down to the satisfaction of the Employer's Agent or his duly authorized representative.

PS4.2.33.35 Cleaning

On completion of the work all masonry must be carefully cleaned down, removing all large particles of mortar with a putty knife or chisel. If acid is required for the removal of mortar stains (see note below), it shall be hydrochloric (muriatic) and not stronger than one volume of the commercial acid to nine volumes of water. Before the acid solution is applied, the surface should be thoroughly soaked with clear water; otherwise the mortar stain may be drawn into the pores causing a permanent dulling of the rich natural masonry colors. The acid solution should be applied with a long-handled stiff fiber brush, with proper precautions as to covering of clothing, hands and arms to prevent burns. It should not be placed over an area greater than 1.5 to 2.0m2 before the wall is again thoroughly washed down, or preferably hosed, with clear water immediately after cleaning. It is important to remove all trace of the acid before it attacks the mortar joint. All frames, trim, sills, or other installations adjacent to the masonry must be carefully protected against contact with the acid solution.

All paving shall be thoroughly cleaned off after laying to remove all traces of mortar and other substances, covered up and protected from damage during the progress of the works and again
cleaned off at completion.

Any detergent or other materials used in the cleaning down of face brickwork etc. shall be of such nature that it will not harm adjoining paint and other finishings in any way.

NOTA BENE: Whenever possible, smooth, light colored units should be scrubbed with warm water and soap powder in lieu of acid cleaning.

PS4.2.34 Plastering

PS4.2.34.1 Lime

Lime shall be hydrated plaster lime complying with the requirements of SANS 523.

PS4.2.34.2 Cement

Cement shall be as specified.

PS4.2.34.3 Sand

Sand for plaster shall be as specified.

PS4.2.34.4 Form key to concrete for plaster finish

All surfaces of concrete receiving plaster or similar finishes shall be well wetted and wire brushed immediately after the formwork has been removed and slushed over with 2:1 cement grout to form key for the finish, all to the approval of the Employer's Agent or his duly authorized representative. The slushing shall be allowed to set hard before any finish is applied

Where smooth formwork has been used, particular care shall be taken in forming the key for plaster as described in applicable concrete specifications.

PS4.2.34.5 Lime plaster

a) One coat work on walls

Lime plaster for 1 coat work on walls shall be composed of 4 parts (volume) of sand and 1 part (volume) of lime. The material shall be mixed dry until of uniform colour, water shall then be added and the mixture turned over until the ingredients are thoroughly mixed.

Lime plaster not used on the day it is mixed, shall be kept moist until required for use by covering with wet sacks or by other approved means.

b) Two coat work on walls

The rendering coat shall be of compo plaster well scratched over to form key for the setting coat. The setting coat shall be composed of 1 part hydrated putty plaster lime, complying with the requirements of SANS 523 and 1 part fine washed sand, to which retarded hemi-hydrate hardwall finishing gypsum plaster shall be added in the proportion of 1 part of gypsum plaster to 4 parts of sand, all proportioned by volume.

The gypsum plaster shall not be added to the mixture until the setting coat is to be applied and shall then be thoroughly incorporated into the mixture and used immediately.

c) Two coat work on metal lathing

The rendering coat shall be of compo plaster to which sisal shall be added in the proportion of 4kg of sisal to 1m3 of plaster. The rendering coat shall be well scratched over to form a key for the setting coat.

PS4.2.34.6 Compo plaster

Compo plaster shall be composed of 10 parts (volume) of sand, depending on the quality of the sand available, 1 part (volume) lime and 1 part (volume) cement.

The lime and sand shall be mixed dry until of uniform colour and then mixed wet. Approximately ½ hour before use, add the cement and any additional water as may be required and remix until thoroughly mixed.

Compo plaster shall be produced in such quantities as can be used whilst remaining workable as no compo plaster that has become unworkable shall be used in any way.

PS4.2.34.7 Cement plaster, one coat work on brickwork:

Cement plaster for 1 coat work on brickwork shall be composed of 4 parts of sand to 1 part of cement for internal work and 5 parts of sand to 1 part of cement for external work, all measured by volume, and mixed as described for cement mortar in sub-clause 4.2.19.9 (Cement mortar).

PS4.2.34.8 Thickness of plaster

Plaster on walls shall be not less than 12mm or more than 20mm in thickness and plaster on concrete ceilings and beams shall not be less than 9mm or more than 16mm in thickness.

PS4.2.34.9 Application of plaster

Walls shall be well wetted before plastering is commenced.

The surfaces of plastered walls internally shall be steel trowelled to a smooth, even and true finish, unless otherwise specified.

All external plaster shall be finished to a true and even surface with a wood float, unless otherwise specified. All plaster surfaces shall be free from blemish.

Plaster shall be returned into reveals and soffits of openings and all angles shall be true and straight with salient angles slightly rounded.

The rendering coat of plaster in two coat work shall be approved by the Employer's Agent or his duly authorized representative before the setting coat is applied and notice shall be given to him when the plaster is ready for inspection.

All cracks, blisters and other defects shall be cut out, made good and the whole left perfect at completion.

PS4.2.34.10 Granolithic finish

Granolithic finish to floors, treads of steps, thresholds and similar horizontal surfaces shall be not less than 25mm thick, composed of 2 parts (volume) granite, or other approved hard stone chippings, or approved hard coarse sharp washed granitic or quartzitic river sand, graded up to a maximum size of 5mm, 1/6 part clean pit sand screened through a 2.4mm mesh sieve and 1 part (volume) of cement, and hand or mechanically steel trowelled to a true and smooth surface.

The material must test between 30 and 35MPa. No dry cement powder or grout shall be applied to the surface.

The granolithic shall be laid before the concrete subfloor has matured otherwise the exposed surface of the concrete shall be thoroughly cleaned with a wire brush and a coat of neat cement grout applied immediately before the granolithic is laid.

The granolithic shall be laid in panels not exceeding 20m^2 in area and joined to lines of panels with V-joints as directed. The length of any panel shall not exceed 4.5m and wherever possible the joints between the panels shall coincide with any joints in the concrete sub-floor.

Where granolithic is to be tinted, it shall be laid in two thicknesses in one operation, the lower thickness being brought up to within 6mm of the finished level and the upper thickness, into which the requisite quantity of approved colouring material has been mixed, shall be laid. NO DUSTING OF COLOURING MATERIAL SHALL BE ALLOWED.

Granolithic finish to stair risers, sides of kerbs and other vertical surfaces shall be not less than 12mm thick.

Exposed salient angles of granolithic shall be neatly rounded to approximately 20mm radius.

All granolithic work shall be carried out by experienced workmen and shall be protected from injury caused by rain or other extremes of weather for 12 hours after being laid, and against drying out too rapidly whilst hardening by covering with wet sacks or other suitable material and shall be protected from other injury and discoloration during the progress of the remaining work.

Edges of granolithic floors adjoining other floor finishes, edges of margins, etc. shall be true and sharp, all protected by fixing temporary wood strips which shall remain in position until laying of the adjoining flooring material is commenced.

PS4.2.34.11 Reedings to steps and upper surfaces

The treads of steps and upper surfaces of external thresholds finished with granolithic or sand-cement finish shall be rendered non-slip by reeding same near front edge for a width of 100mm and stopped 100mm from ends.

PS4.2.34.12 Polishing of granolithic

All tinted granolithic finishes to floors, steps, thresholds, skirting, etc. shall at completion of all other work be twice polished with wax floor polish of an approved type.

PS4.2.34.13 Screeding to floors

Concrete sub-floors finished with wood mosaic, semi-flexible tiles and fully flexible vinyl sheeting and tiles and similar finishes shall be screeded with 1:3 (cement:sand) cement plaster of thickness required, but in no case less than 12mm, all steel trowelled to true and smooth surfaces. The sand used in the plaster shall be of such fineness as will allow for the screed being trowelled to a surface suitable to receive the finishes.

The screeding shall be laid before the concrete sub-floors have matured, otherwise the exposed surfaces of the concrete shall be thoroughly cleaned with a wire brush and a coat of neat cement grout applied immediately before the screeding is laid.

The screeding shall be laid in good time, but no finishes are to be laid if the screed exceeds 70% moisture content when measured with a hygrometer.

No traffic shall pass over nor shall any building operations take place on the screeding unless a proper protective covering is first provided.

NOTA BENE: A similar process shall be applicable where manholes or chambers are screeded.

PS4.2.34.14 Sand-cement finish

Sand-cement finish to treads of steps, thresholds, etc. shall be of 1:2 (cement:sand) cement plaster not less than 20mm thick and steel trowelled to true and smooth surfaces. Finishes to risers of steps, sides of kerbs and other vertical surfaces shall be not less than 12mm thick. Exposed salient angles shall be neatly rounded to approximately 20mm radius.

PS4.2.34.15 Natural aggregate concrete floor hardener

a) Definition

All natural aggregate hardeners for concrete floors shall consist of a factory prepared blend of clean, properly graded and oven dried natural aggregate, Portland cement and chemical aids, all suitable for monolithic application to the surface of newly placed concrete. Where required the hardener may contain certain compatible pigments for tinted floors.

b) Quality testing

i) Sampling:

A minimum of 1% of every 5 tons of production shall be sampled and factory tested for water demand, compressive strength and proportioning.

ii) Compressive strength and water demand

Mix with sufficient water to give a slump of 20 to 25mm in a 35 x 90 x 75mm high slump cone filled in three layers; tamping each layer with 15 strokes of a 16mm diameter rod, shall give the following minimum compressive strengths when tested in a 70mm mortar cube vibrated for 3mm on a vibrating table and stored in a curing room or tank at 22 to 25°C and not less than 90% humidity:

- at 7 days : 50 MPa
- at 28 days : 70 MPa

iii) Test records:

Each quality test record shall be so referenced that the batch numbers on bags of the product may be traced back to the relevant quality control report. Such reports shall be available for inspection by the Employer's Agent or his duly authorized representative for up to 1 year after manufacture.

c) Curing

As an integral part of this hardener, a membrane curing compound, which must be both compatible with the floor hardener offered and comply with the ASTM C.309 Type 1 specification for moisture retention, shall be used.

PS4.2.34.16 Ferrous aggregate concrete floor hardener

The ferrous aggregate hardener for concrete floors shall be a factory prepared blend of clean, properly graded ferrous metal aggregate, Portland cement and chemical aids for application and hardening, ready to apply as a dry shake to the surface of newly placed concrete before finishing.

The ferrous aggregate shall be guaranteed to be free of matter deleterious to concrete, such as oil and non-ferrous particles and shall be treated for rust inhibition. Where required it may contain compatible pigments for tinted floors.

PS4.2.35 General product requirements

PS4.2.35.1 Local content

Preference shall be given to materials fully manufactured in South Africa with South African raw materials.

PS4.2.35.2 Site service

The manufacturer shall be expected to supply samples free of any other additional charge, and the services of a qualified technical representative on all of the building sites pertaining to the particular contract in order to train the placing team in the correct application methods of the product during initial placing upon 1 week's notice.

Circumstances may necessitate follow-up inspections.

PS4.2.35.3 Shelf life

The shelf life of the offered product shall be stated and the expiry date displayed on each bag. The Contractor shall ensure that the product supplied will survive the Contract Period, or replace the product at his cost.

PS4.2.35.4 References

The Contractor shall submit names and locations of projects in South Africa where the offered product has been in successful use for a period of at least 5 years under similar conditions and at similar rates. The Contractor shall:

i) make arrangements with the project owners for access for such visits, if the Employer's Agent or his duly authorized representative wish to inspect such reference project sites.

ii)provide an acceptable alternative at the same accepted financial rate of the original proposed product, should the Employer's Agent or his duly authorized representative find the product unacceptable.

PS4.2.35.5 Approved products

Only products that have been tested and which have been approved by the SABS shall qualify.

PS4.2.35.6 Application rates

As specified by the manufacturer.

PS4.2.35.7 Control testing

The Contractor shall be required to conduct control testing as and when requested by the Employer's Agent or his duly authorized representative, proving the quality of the product used.

PS4.2.36 Specific work-related instructions

PS4.2.36.1 Contractor's responsibility

The Contractor shall be held responsible for damage to street or road surfaces, kerbing, stormwater drainage channels (gutters), existing utilities, etc. that result from his negligence during any survey. The Contractor shall repair, at his cost, any damage resulting there from, which shall be subject to approval by the owner of such asset and the Employer's Agent or his duly authorized representative.

PS4.2.36.2 No disturbance

The Contractor shall be required to perform Works at all conduits with limited and approved disturbance to the existing service provision. Should the Contractor decide to use a stringing method to survey the conduit, the stringing lines shall not be left in the conduit for more than 5 days or without consent of the Employer's Agent or his duly authorized representative.

PS4.2.36.3 Immediate danger

All obstructions, cracks, irregularities must be fully surveyed and documented. The Contractor must inform the Employer's Agent immediately of any obstruction encountered, locations of hazardous atmosphere, or conduits that are in immediate danger of structural failure. Where possible:

a) the survey shall be done from the opposite side, whilst appropriate health and safety measures are adhered to, so that the extent of the danger can be assessed.

b) the position shall be clearly and accurately marked, to allow operations and maintenance to easily locate the position.

PS 4.3 PLANT AND MATERIALS

The Contractor is required to provide all plant and materials necessary to carry out the works as specified and required. No additional allowances other than those already specified in the Schedule of Rates shall be allowed for with respect to plant and materials.

PS 4.4 ENGAGEMENT OF LABOUR

PS 4.4.1 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 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 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.

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 Agent for approval before construction commences.

PS 4.4.2 Transportation of labourers

The labour employed on this Contract shall be local labour from the nearest local community. Transportation should be provided for the labourers from Site Office to where they are working and back to the Site Office.

PS 4.4.3 Minimum wage for local labour

Contractor to comply with the latest Government Gazzette: Labour Relations Act, 1995 as set out by the Bargaining Council for Civil Engineering Industry.

PS 4.4.4 Training

The Contractor will be expected to provide formal training for the labourers. In this regard the labourers will be attending training for five days and the labourers should receive their full salary while on training. The Contractor is expected to have allowed for this in his rates elsewhere.

PS 4.4.5 Labour Returns

The Contractor will be required to submit his payment certificate together with monthly labour returns including copies of certified IDs, individual contracts, proof of payment, timesheets and training returns. **Contractor will be subjected to a R15 0000.00 nonrefundable penalty per occasion due to failure to submit within the stipulated timeframe.**

PS 4.5 EXISTING SERVICES

PS 4.5.1 Known services

Existing known services, both underground and overhead, are indicated on the drawings, but the positions of existing services on the drawings are not guaranteed nor does the Employer or the Employer's Agent accept any liability in this regard.

PS 4.5.2 Treatment of existing services

The Contractor must liaise with all relevant local authorities to satisfy himself that all relevant services have been located. At the commencement of the contract, the Contractor must hand excavate a distance 0, 5 metre on each side of the located service to expose it. The exposed service shall be identified and recorded on a drawing.

A copy of the drawing with all known services shall be submitted to the Employer's Agent before construction can commence in any road reserve. Once the exposed service is identified and recorded the excavation must immediately be backfilled. Re-excavation by hand at construction stage will not be measured in addition to normal trench excavation.

The Contractor shall retain full responsibility for establishing the exact positions of the various services in advance of any construction work. No allowance for delays or disruption shall be entertained unless the Contractor complies fully with the provisions of this clause regarding the establishment of the exact positions of the various services in advance of any construction work.

PS 4.5.3 Use of detection equipment for the location of underground services

The Contractor:

is responsible to provide his own equipment in order to determine the location of existing services, and

shall locate and expose existing services by hand.

PS 4.5.4 Damage to existing services

The Contractor:

must make provision for the possible existence of numerous services within and in close proximity to the work areas;

shall take necessary steps to protect any existing services whatsoever against damage which may arise as a result his operations on site. Adequacy in terms of protection of existing services shall be at the discretion of the Employer's Agent.The Contractor is to make good the protection of and any breakages to existing services;

must inform the relevant service provider immediately (within 2 hours of the incident) such that procedures for the re-instatement of the service can be effected, should he damage or break an existing service (whether known or unknown);

shall bear the cost of the repair of damages to any service, the possible existence of which could reasonably have been ascertained by him in good time.

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.

NOTA BENE: Drawings indicating other existing services in the vicinity of the Works are not guaranteed as being accurate, as all other services may not have been recorded or properly recorded. It shall remain the responsibility of the Contractor to perform preoperational work, to locate existing services in advance of the commencement of the Works.

PS 4.6 SITE ESTABLISHMENT, FACILITIES AVAILABLE AND REQUIRED

PS4.6.1 General

In order to facilitate compliance with the General Conditions of Contract and Conditions of Contract 2015 the Contractor shall be required to set-up an individual construction camp. The size and functionality of the site camp shall be in relation to the individual Contracts. It is, however, expected that the Contractor would have made themselves aware on whether one or multiple site camps are required for the execution of the complete Works.

The Contractor shall price accordingly and state so in their proposal. For the camp/s, the following shall apply:

a) The Contractor shall make arrangements with the relevant authority for a suitable site to establish a construction camp, storage, works offices, workshop/s, kitchen, and shelters for security personnel.

b) The Contractor shall note that only security personnel shall be permitted to remain in the campsite overnight.

c) Ablution facilities shall be provided for men and women separately. One toilet per twenty workers shall be provided. Such facilities shall at all times be maintained in a clean and hygienic condition. Toilets shall be screened from public view and their use shall be enforced.

d) Covered accommodation shall be provided for perishable or corrodible materials, fittings and the like and shall be adequate and suitable for their purpose. In the case of cement stores, they shall be well ventilated, weatherproof and waterproof with appropriate floors to keep the materials dry and freely aerated.

e) All such accommodation shall be subject to the approval of the Employer's Agent who shall have free access thereto at all times.

f) Temporary buildings and fencing are to be safe, neat and presentable and the surrounding areas must at all times be kept in a neat, clean and orderly condition for the duration of the Works.

g) It shall be the Contractor's responsibility to ensure that they are in compliance with all relevant laws and regulations as well as tribal requirements.

PS4.6.2 Site facilities required for Employer's Agent

a) Source of water supply: It will be the responsibility of the Contractor to make his own arrangements for the supply of water. Potable water is available in the area and the Contractor is to make the necessary arrangements for the provision of a metered point of supply with the Employer. The sum entered by the Contractor in the Bill of Quantities for provision of water shall be deemed to include full compensation for the procurement, transport, storage (where necessary), supply and application of water and for all the work necessary and incidental thereto for the various items of work where water is required for the purposes of the contract. The Employer does not guarantee the availability, sufficiency or continuity of any supply and no claims in this regard will be considered.

The Contractor is to be aware of the fact that this Contract is to be carried close to a built up environment and that, as such, excessive dust creation will be considered unacceptable by the local residents. The Contractor is to make provision for regular watering of the works in order to alleviate dust creation. During dry weather, or during periods when dust is created by the construction process, the Contractor will be required to water the works a minimum of twice a day, or as specified by the Employer's Agent. This is a requirement over and above the normal requirement for watering of the works.

b) Source of power supply: It will be the responsibility of the Contractor to make his own arrangements for the supply of electricity. The sum entered by the Contractor in the Bill of Quantities for the provision of power shall be deemed to include full compensation for the procurement and supply of powers to the works. The Employer does not guarantee the availability, sufficiency or continuity of any supply and no claims in this regard will be considered.

c) Contractor's camp: A suitable site for the Contractors camp will be identified prior to Commencement by the Contractor. The Contractor is to make the necessary arrangements for any approvals and payment of services to the Municipality where applicable. The camp site shall be kept clean and tidy, and at the completion of the contract shall be restored to its original condition at the Contractor's own cost, and to the satisfaction of the Employer's Agent. In order to facilitate compliance with the Conditions of Contract and the Specification, the Contractor may establish storage accommodation, works offices, workshops, mess-rooms, kitchens, shelters for watchmen, latrines, ablutions and the like in such positions and under such conditions as may be agreed by the Employer's Agent and indicated in the Addendum to the EMP.

Temporary buildings and fencing are to be neat and presentable and the surrounding areas must at all times be kept in a neat, clean and orderly condition.

The Contractor shall not make any excavation without written permission of the Employer's Agent.

Covered accommodation for perishable or corrodible materials, fittings and the like shall be adequate and suitable for their purpose, and, particularly in the case of cement stores, shall be well ventilated, weatherproof and waterproof with floors raised off the ground, so as to keep

the materials perfectly dry and freely aerated. All such accommodation shall be subject to the approval of the Employer's Agent who shall have free access there at all times.

In addition to the above, the Contractor shall provide one toilet per 20 workmen. Portable toilet facilities shall be made available to workers of both male and female genders, the number provided to be in proportion to the ratio of the sexes. The toilets shall be located in the vicinity of the work site, shall be screened from public view and the use thereof shall be enforced. The Contractor shall, where applicable, make the necessary arrangements for the regular removal of night soil.

The Contractor may not house members of his permanent staff except for a security guard at the site and is to make the necessary arrangements for the transport of his staff members to and from the site on a daily basis. As the Contractor's Camp may be located in close proximity to a residential area, attention to noise levels, particularly after hours, will be essential.

d) Site facilities required for Employer's Agent and others: The requirements of the Employer's Agent's Site Establishment are detailed in Project Specification PSA and PSAB.

The Contractor shall provide the following office facilities at his main site camp for the Employer's Agent and others:

- One office for the Employer's Agent's Representative.
- Temporary office accommodation to suit his own requirements.
- Covered parking facilities for two (2) cars for the Employer's Agent's Representative.

A cell phone will be required for the sole use of the Employer's Agent's Representative. The Contractor shall be responsible for the payment of calls related to the Contract made by the Employer's Agent's Representative, on this mobile phone, during the course of the Contract. A Telkom ADSL line with modem facilities shall be provided on site and be available for the sole use of the Employer's Agent's Representative at all times.

PS 4.7 SITE USAGE

PS4.7.1 Work on private or state property

The Contractor is to confine his activities strictly to the working area defined as being within 10 m on either side of the pipelines, spoil sites and the direct access roads to these. He shall not encroach upon any roadway except with the prior approval of the Employer, in writing. 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.

Shallow sewer connections are to be found at the rear of the mid-block latrines. Particular care shall be exercised when excavating behind these structures. Underground electric cables are to be found on all erven at depths of between 75 and 1000 mm. Typically, these cables are at a distance of up to 1200 mm parallel to the erf boundaries and perpendicular to the common boundaries where they connect to the houses. Cables may also be encountered along the boundary behind the latrines. Particular care should be exercised when excavating in the vicinity of these cables.

The Contractor shall, as soon as is practically possible, inform the Employer's Agent of any damages to services and shall not repair any such damage unless instructed to do so. The Contractor shall be responsible for making good, at his own cost and to the satisfaction of the Employer's Agent, all damage caused by him to buildings and other improvements to properties.

Should the Contractor consider that damage to buildings and structures is unavoidable in the execution of any portion of the Works, he shall obtain the approval of the Employer's Agent before proceeding with the work. Where damage is noticed before commencement of work on that erf, this should be reported to the Employer's Agent in order to prevent a possible liability claim from the owner.

PS4.7.2 Site safety and precautions against nuisance

The Works are to be conducted in an urban area where high volumes of pedestrian and vehicular traffic may prevail. The watching, barricading, lighting and traffic control on site shall be carried out in strict compliance with these specifications. The Contractor shall ensure that all safety measures are strictly adhered to. The Contractor shall ensure that excavations on sidewalks within the road reserves or within the erven, do not at any time present a safety hazard to pedestrians. All excavations that remain open overnight are to be adequately protected.

The Contractor shall provide all safety materials and equipment necessary for barricading and safeguarding the excavations. The safety of staff and labour involved with the Works and the security of installations, plant and equipment is of major concern and need special attention during the execution of the Works.

Plant used on the Works shall be as efficiently silenced as possible and noisy operations will be permitted only between the hours of 07:00 and 17:00. Any work outside normal hours will be permitted only on the written authority of the Employer's Agent. Wherever excavations or loading of material is liable to form dust, an effective method of spraying water over the excavated area and loaded material shall be instilled. Any rock or debris falling from trucks on the roads shall be removed immediately. Precautions shall be taken to prevent fouling of public roads or private surfaces. The Employer's Agent may order the Contractor to broom off and clean roads or surfaces where debris may constitute a danger to the public or a nuisance to the owners.

PS4.7.3 Work on live water mains

Every effort will be made by the Johannesburg Water to furnish the Contractor with all available information regarding existing reticulation systems. Such information is given in good faith. Actual conditions in the field may, however, vary from the records upon which information is based. The Contractor must allow in his programme for delays when working on live mains and, as far as possible, such work should not be on the critical path of any programme and every effort must be made to have alternative work available.

PS4.7.4 Flushing and cleaning of water mains

On satisfactory completion of work, the mains shall be flushed with potable water supplied by the Employer. The Contractor shall ensure that the water used for flushing is disposed of in an approved manner without damage, nuisance or injury to person or property. The Contractor shall allow in his rates for all costs associated with the flushing of water mains and communications pipes, save the cost of the water used. All water required for the flushing of water mains shall be supplied free of charge by the Johannesburg Water. If, in the opinion of the Employer's Agent, foreign material has entered or remained in pipelines, the Contractor shall arrange for the water mains to be cleaned. The cost of cleaning including the cost of water used, shall be for the Contractor's account.

PS4.7.5 Work outside normal working hours

In accordance with General Conditions of Contract 2015 Clause 5.8.1, certain work may only be done outside normal working hours. Such work shall be undertaken solely at the discretion of the Employer's Agent who shall, from time to time, issue advance orders in writing to the Contractor detailing the work to be undertaken. Work undertaken, as ordered, outside normal

working hours shall be measured and paid for at the rates applicable to each and every item carried out as scheduled.

Normal working hours shall be defined as between 07:00 and 17:30 Mondays to Fridays and also 07:00 to 13:00 on Saturdays.

Where the Works are conducted within the road reserve of major arterial roads, the contractor's operations will be restricted to out-of-peak traffic periods (typically 09:00 to 15:30) or as determined by the Traffic Department. The Contractor shall co-ordinate his activities in such a manner that only minor operations that are non-disruptive to traffic are carried out during peak traffic periods. Should the Contractor choose to work outside normal working hours without having been ordered to do so by the Employer's Agent, permission will not be unreasonably withheld but all additional costs arising out of such work shall be entirely to the Contractor's account.

PS 4.8 PERMITS AND WAYLEAVES

The Contractor will be required to obtain permits and wayleaves from all the applicable service providers within the jurisdiction of the CoJ, thus including the following services: roads and stormwater (JRA), bulk water supply (Rand Water), electricity (Eskom and City Power), gas (Egoli Gas), telecommunications (Telkom), and the like.
The Employer will assist the Contractor to obtain clearance from the various departments with services that are likely to be affected by the Contract. It is, however, the Contractor's responsibility to obtain final permit and wayleave approval according to applicable procedures and specifications. In the case of JRA, this will be as per the CoJ COP. Further, a processing fee per wayleave will be payable to cover the cost of processing and approval of the JRA wayleave applications.

All associated costs to obtain permits and way-leaves as required for the execution of the works, where such affect other services, shall be deemed to have been included in the scheduled rates for SANS 1200A or SANS 1200AA or SANS 1200AB where pricing provision for such items have been allowed for in the pricing schedules, alternatively it shall be deemed to be included in the various scheduled activity rates or prices provided by the Contractor.

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 water mains of the existing network would have to be modified slightly to facilitate the connection of the new water main installation.

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, 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 as well as any costs involved in refuting or processing such claims.

PS 4.11 WATER, SANITATION AND ELECTRICITY FOR CONSTRUCTION PURPOSES

PS4.11.1 Water

The Contractor shall make his own arrangements with the Employer to obtain a potable water metered standpipe connection for which at least 14 days' notice shall be given. The size of the connection provided will be as specified in the Water and Sanitation By-laws.

The Contractor may only draw water from fire hydrants through means of a legal, Employer owned, potable water metered standpipe. Failure to use such Employer owned potable water metered standpipes, or using illegal, non-Employer owned equipment for purposes of drawing water from fire hydrants, will result in the Contractor having to pay an account to the Employer, for an amount determined by the Employer

The potable water metered standpipe(s) must be made available to the Employer's water inspectors for purposes of reading and inspection, and failure to do so, will result in the immediate withdrawal of such potable water metered standpipe(s). The onus is on the Contractor to return such potable water metered standpipe(s) if they are found to be defective (not registering consumption). Failure to do so will result in an account being levied, payable to and determined by the Employer. Claims for delays caused where standpipe(s) are withdrawn and/or replaced will not be considered.

The current water tariffs applicable to the Contract are available from the Employer.

PS4.11.2 Sewer

The Contractor shall provide, maintain, move to positions as required and finally remove proper sanitary accommodation at each work front. Sanitary accommodation shall be properly screened and its use strictly enforced. The Contractor shall comply with the Employer's Sanitation General By-Laws Section 19(1) and 19(3).

The situation of sanitary accommodation prescribed in terms of the Sanitary General By-Laws shall be approved by the Employer's Agent as being convenient for the person for whose use it is intended. The sanitary accommodation provided must be adequately ventilated, properly disinfected and kept in a thoroughly clean condition at all times.

The Contractor shall bear all costs associated with the provision of sanitary accommodation. Compensation for these costs will be made under the relevant item in the Schedule of Rates.

PS4.11.3 Power

The Contractor shall make arrangements with the relevant authority for the supply and distribution of power for purposes of this Contract, the cost of which shall be deemed to be included in the rates inserted in the Schedule of Rates.

Power used for carrying out of the works in accordance with these Specifications will not be subject to measurement or payment.

PS 4.12 SURVEY CONTROL AND SETTING OUT OF THE WORKS

The Contractor is to confirm the levels and coordinates of all benchmarks prior to commencing with construction.

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

The Contractor shall record the setting out of the works in an approved format and order all required pipe fittings accordingly.

PS 5 MANAGEMENT OF THE WORKS

PS 5.1 PLANNING AND PROGRAMMING

PS5.1.1 Work plan

Seven days prior to commencing with any part of the Works, the Contractor shall submit to the Employer's Agent, for review and approval, a work plan detailing the procedure and schedule to be used to execute such works, detailing and substantiating any deviation from the originally proposed approach. Further, the work plan shall include a:

a) time frame;
b) description of all equipment and tools to be used;
c) list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable);
d) list of sub-contractors, schedule of work activity;
e) safety plan (clearly highlighting any potentially hazardous substances to be used);
f) traffic control plan (if applicable);
g) an environmental protection plan; and
h) Contingency plans for possible problems.

The approval given by the Employer's Agent shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as prescribed under this Contract

Work plan shall be comprehensive, realistic and based on actual working conditions. Further it shall form the various sub-sections of the overall Contract programme and plan

NOTA BENE: No works shall be allowed to commence without an approved work plan.

PS5.1.2 Planning

The Contractor shall ensure that he:

a) is well informed with regard to the Employer's overall maintenance programme and avail resources as required to efficiently complete this Contract; and
b) delivers goods and services timeously to meet the Employer's prevalent performance standards and where applicable to not unnecessarily delay any other contractors, service providers and suppliers.

PS5.2.3 Programming

In order to ensure a clear understanding, at the inception of the Contract, of the programming and documentation format requirements, the Contractor shall appoint a project programmer/ planner for liaison during the Contract. The Contractor shall for the Contract Period provide and regularly update (maximum monthly) a Contract Programme.

The programme shall at minimum contain:
a) Time Scale (minimum):
   i) Days, where the period does not exceed three months. Weeks, where the project period exceeds three months.
   ii) Months, where the period does not exceed one year.
   iii) Years, where the project period exceeds one year.
b) 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.
c) Start and Finish Dates: All tasks shall have specific start and finish dates.
d) 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.
e) Progress Tracking: The Contractor shall be required to periodically indicate progress per task graphically and on a percentage basis.
f) Non-working Time: All South African public holidays, weekends and the local traditional annual builder's break shall be incorporated in the programme..

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 show clearly the anticipated quantities of work to be performed each month, together with the manner in which the listed plant is to be used, as well as the anticipated earnings for the various sections of work.

NOTA BENE: A Contract programme shall be submitted to the Employer's Agent no later than 28 days after site handover date.

The Contractor shall provide the Employer's Agent with a method statement indicating the manner and sequence in which he intends to construct the works, for each work area, with the program. In the method statement the Contractor must address at least the following items:

a) sequence of the works for the relevant works area;
b) target dates for the tasks identified in sequence of the works for the relevant works area;
c) materials requirements;
d) construction Plant to be used;
e) services affecting construction; and

f) any factors that could affect construction progress after commencement.

The method statement must be approved by the Employer's Agent before commencement of construction. In order to minimize the impact on traffic, pedestrians and business the Contractor will be required to segment the works in such a manner that no portion of the works is more than one day ahead of the following position. These segments of the works shall be clearly defined in the Contractor's method statement for each work area.

If, during the progress of the work, the quantities of work performed per month fall below those shown on the program or if the sequence of operations is altered, or if the program is deviated from in any other way, the Contractor shall, within one week after being notified by the Employer's Agent, submit a revised program.

If the program is to be revised by reason of the Contractor falling behind his program, he shall produce a revised program showing the modifications to the original program necessary to ensure completion of the Works or any part thereof within the time for completion. Any proposal to increase the rate of work must be accompanied by positive steps to increase production by providing more labour and plant on the Site, or by using the available labour and plant in a more efficient manner.

Failure on the part of the Contractor to submit or to work according to the program or revised program shall be sufficient reason for the Employer to take steps as provided for in the GCC.

The approval by the Employer's Agent of any program shall have no contractual significance other than that the Employer's Agent would be satisfied if the work is carried out in accordance to such program and that the Contractor undertakes to carry out the work in accordance with the program. It shall not limit the right of the Employer's Agent to instruct the Contractor to vary the program should circumstances make this necessary.

PS 5.2 SEQUENCES OF THE WORKS

Notwithstanding any changes that the Employer's Agent deems necessary the sequences should include the following:

- Mobilisation, project planning and control and communications to stakeholders
- Site clearance for the affected areas
- Traffic control and temporary signage during construction
- Exposing existing services and driveways
- Excavation, trench preparation and compaction
- Supply, bedding and laying of pipes
- Provision and installation of valves and chambers
- Backfilling (blanket layers and top layers including compaction)
- Trenchless installations
- Construction of valve chambers
- Reinstatement of paved and other areas where affected
- Testing of the installation
- Clearing of the site including removal of spoil
- Site hand over

PS 5.3 SOFTWARE APPLICATIONS FOR PROGRAMMING

The construction programme shall be completed in Microsoft ® Project Standard 2007 or compatible software. The construction programme and updated versions thereof shall be made electronically available to the Employer's Agent.

PS 5.4 METHODS AND PROCEDURES

The Contractor shall submit to the Employer's Agent, within a period stated in the Contract Data, a detailed construction programme, detailing the date of commencement and completion of the work activities, dates, duration and extent of traffic accommodation interruption water supply to affected consumers. The detailed programme shall be based on the preliminary programme submitted with the tender and shall make an allowance for the following:

- Normal working hours shall be defined as between 07:00 and 17:30 Mondays to Fridays and also 07:00 to 13:00 on Saturdays.
- No work outside working hours will be allowed. Should the Contractor wish to work outside normal working hours written permission shall be obtained from the Employer's Agent and all additional costs arising out of such work shall be entirely to the Contractor's account.
- Only one side of the street may be affected by the construction at any one time.
- The Employer's Agent may require that the construction of certain road crossings be done outside normal working hours.

The Employer's Agent shall provide the Contractor with drawings and details of the Works that need to be done.

Once a detailed programme has been approved, the Contractor shall not deviate from the planned operations.

Pipeline and associated hydrants, valves and fittings

- The existing pipes will be left in place and remain operational until such time that it is switched over to the new pipeline.
- The connection of the new pipe will be done by the Contractor under strict monitoring by the Employer's Agent.
- Extreme care should be taken not to break or damage the existing pipelines. If this should happen and the existing pipe gets damaged during the course of installing the new line, then the relevant Depot Manager must to be notified. The trench will have to be drained by the Contractor after the Depot has turned the water supply off. All assistance must be given by the Contractor to the Depot in repairing the damaged pipe.
- The new pipelines will be laid as indicated on the drawings supplied.

All existing erf connections are to be disconnected from the existing reticulation and then reconnected to the new pipeline with minimum disruption to residents.

Fire hydrants and valves

- New fire hydrants, valves and fittings are to be supplied and installed on all the new pipelines.
- After the old mains have been disconnected from the reticulation system all existing valves and hydrants are to be handed to the Employer

General

- The Contractor will arrange for the warning of the public of any shutdown of supply necessary in his/her opinion for the proper execution of the Works.
- All disconnections and reconnections, connections to the existing mains, closing and opening of valves and the disruption of water supply must be liaised with the relevant Depot Manager at least 7 working days prior to the action.

- The disruption of supply and the duration of disruption of the supply to the consumers are to be kept to a minimum. Consumers are to be informed of any disruptions as described later in this specification.
- Any claims from the property owners and/or the community will be considered and evaluated by the Employer. Should The Employer's find a valid claim but found that the Contractor has neglected his/hers responsibilities and/or duties, which lead to the claim, the Contractor will be responsible for settling the claim.

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.

PS 5.6 ACCOMMODATION OF TRAFFIC ON PUBLIC ROADS OCCUPIED BY THE CONTRACTOR

PS5.6.1 Accommodation of traffic

The Contractor shall ensure the safe accommodation of traffic at all areas where the work may impact traffic and shall provide all delineators, watching, lighting, signs and barricades required by the road authorities, and in accordance with the South African Road Traffic Signs Manual.

PS5.6.2 Access to properties

Adequate access shall at all times be maintained to public and private properties unless otherwise arranged and approved. Details of the proposed means of access shall be submitted before any such access is restricted. Claims arising from impeded access shall be the responsibility of the Contractor.

At least 7 days before commencing any work affecting access to a property, the Employer's Agent and the occupier/owner of each such property shall be notified of the Contractor's intention to commence work, the date of commencement, expected duration and arrangements which will be made regarding maintenance of access.

PS5.6.3 Transport Department requirements

The Contractor shall provide a structurally sound and safe bridge with side rails across dangerous excavations crossing sidewalks to allow pedestrians safe access to such sidewalk. Associated costs for the provision of pedestrian access to sidewalks shall be deemed to have been included under the various excavations or combined activity rates and/or prices in the pricing schedules.

PS 5.7 OTHER CONTRACTORS ON SITE

There may be other Contractors working within the same area. As such, the Contractor is required to make adequate allowances for such possibilities. No claims with respect to works being carried out by other Contractors shall be entertained by the Employer.

PS 5.8 TESTING, COMPLETION, COMMISSIONING AND CORRECTION OF DEFECTS

The onus is on the Contractor to produce goods and services which shall conform in quality and in accuracy of detail to the requirements hereinafter specified. The Contractor must clearly understand that it is not the 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 experienced Construction Manager/Site Agents, foremen and surveyors together with all transport, instruments and equipment for supervising, checking and controlling the work.

The act of passing any completed work or accepting materials or goods 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 or goods 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.

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 be authorised to 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 shall 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.

PS 5.9 RECORDING OF WEATHER AND ABNORMAL RAINFALL

If during the time for completion of the works or any extension thereof abnormal rainfall or wet conditions shall occur then an extension of time in accordance with Clause 5.12.2 of the General Conditions of Contract 2015 hereof shall be granted by the Employer calculated in accordance with the formula given below for each calendar month or part thereof.

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

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.
Rw	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 Appendix 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:

INFORMATION SOURCE: South African Weather Service
Pretoria, Tel.: 082 233 8484

Y= 10 mm/24 hour day
X= 20 mm

Table 5.1: Statistical rainfall

STATISTICAL INFORMATION: JOHANNESBURG BOTANICAL GARDENS: 1985-2006		
Month	**RAINFALL**	
	Nn = Actual number of days during the calendar months in which a rainfall of more than Y-mm has been received	**Rn Average monthly rainfall**
January	4.1	116.4
February	3.6	121.3
March	2.6	96.0
April	1.1	30.4
May	0.5	15.2
June	0.1	5.9
July	0.0	1.5
August	0.2	8.7
September	0.3	13.2
October	2.0	66.0
November	3.0	84.5
December	3.8	105.4
TOTAL	**21.3**	**664.6**

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 5.10 FORMAT OF COMMUNICATIONS

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

PS 5.11 KEY PERSONNEL

The key role players involved or associated with the contract are listed below with references made to the General Conditions of Contract for Construction Works 2015 3rd Edition.

- 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 Construction Manager (GCC, Clause 4.12.2)
- Responsible person in terms of the OHAS Act (GCC, Clause 3.1.4)

On appointment in terms of the new Construction Regulations 2014, the Contractor will be required to appoint a Construction Manager and Safety Officer who are registered with SACPCMP.

PS 5.12 MANAGEMENT MEETINGS

Fortnightly site meetings shall be arranged and facilitated by the Employer's Agent or his representatives. Senior Contractor management staff attendance shall be compulsory.
The Contractor shall be required to provide reporting with regard to project progress, resources (human, plant and equipment), community issues, environmental and health and safety aspects.

PS 5.13 FORMS FOR 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.

PS 5.14 DAILY RECORDS

The Contractor shall keep daily site records as required by the Employer or his representative and as specified herein. Daily records shall include, labour, plant, materials, rainfall, environmental issues, health and safety issues, daily diary and the like. Such records shall 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.

PS 5.15 BONDS AND GUARANTEES

In addition to GCC 2015 Clause 8.6, the Contractor shall provide the Form of Guarantee for the due and punctual fulfilment and completion of all the Contractor's obligations under the Contract. No extension of time of the Contract Period of Performance or neither any variation of the Contract, nor the determination of the Contract by the Employer in terms of Clause 8.6 hereof, shall in any way impair or diminish or terminate any liability to the Employer under and by virtue of such Guarantee.

Should the Contractor, when notified of the acceptance of his offer, fail to provide an approved Guarantee 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 5.16 PAYMENT CERTIFICATES

Measurements will be done continuously between the Employer's Agents Representatives and the Contractor on dates and times agreed on. Dates must be arranged by these parties. 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 the 20th of 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.
- Payment certificates must be completed monthly and submitted to the Employer's Agent before or on the 20th of each month. The payment certificate shall be accompanied by the monthly EPWP stats, copies of individual contracts, certified copies of individual IDs, Timesheets and proof of payment.
- The Contractor shall note that payment shall only be made for Works activities successfully (delivering the end result) executed, complying with the quality requirements and provided to the Employer's Agent or his duly authorized representative.
- The Contractor will be required to submit his payment certificate together with monthly labour returns including copies of certified IDs, individual contracts, proof of payment and timesheets. **Contractor will be subjected to a R15 0000.00 nonrefundable penalty per occasion due to failure to submit within the stipulated timeframe.**

PS 6 FEATURES REQUIRING SPECIAL ATTENTION

PS6.1 Security

The Contractor shall be responsible to provide security on site(s):

a) as he deems necessary. The Employer shall not be held responsible for any loss or damage(s) suffered by the Contractor, his plant, equipment, materials, subcontractors or employees as a result of a security incident of any nature.

b) which have been identified, by the Employer's Agent and/or Employer, as potential high risk areas requiring security during site visits for the duration of the contract. The Contractor shall arrange that the security meet with the Employer's Agent and/or Employer representative at a convenient and safe location and thereafter escort to the necessary areas.

PS6.2 Operation of valves

Only employees of the Employer are permitted to operate primary and secondary water mains valves.

PS6.3 Work outside normal working hours

The Contractor is permitted to work outside of normal working hours only upon obtaining written permission from the Employer's Agent. It is anticipated that all switch-over work (tying new infrastructure into existing) will be completed during hours that will not affect the supply of water to affected communities.

PS6.4 Sanitary facilities

The Contractor is required to supply adequate sanitary facilities for employees, visitors, the Employer's Agent and Employer.

PS6.5 Community liaison and community relations

For the purpose of this project a Community Liaison Officers will be required; who shall be required to inform the community with regards to Contractor's activities in particular where such activities may affect the service provision to the affected community (See PS6.6).

PS6.6 Notices and warning to consumers

The Contractor shall ensure he maintains service (water and/or sanitation) provision at all times whilst executing the works where:

a) The maximum amount of time of no service shall be 8 hours for any property. Any service disruption longer than 8 hours shall be temporary bypassed by methodologies approved by the Employer's Agent or his duly authorized representative.

b) A Public Notification Program shall be implemented, requiring at minimum that the Contractor shall deliver written notices to each domestic and non-domestic customer affected by the works, 48 hours before commencement of the works, including providing:

i) a summary of work to be completed;

ii) the time and duration of service interruption; and

iii) a local telephone number to contact the Contractor for inquiries or complaints. All complaints received shall be addressed and resolved within the standard Employer response times and a summary of such complaints and associated actions shall be presented to the Employer's Agent or his duly authorized representatives on a monthly basis.

PS6.7 Continuity of service supply to customers

The activities of the Contractor shall not unreasonably interfere with the service supply to customer and be executed outside the agreed and notice time frames.

Where the Contractor cannot reasonably re-establish services within times agreed and notice time frames he shall proceed to contact the affected customer and make alternative arrangements that shall be acceptable to the customer and the Employer's Agent.

The associated costs of any customer claim arising from a lack of service provision due to the Contractor's negligence or his disregard for the Employer's SOP or his disregard for the conditions of this Contract, whilst executing activities as per this Contract, shall be solely for his the account. The Employer shall have the right to make equivalent monetary deductions from monies owed to the Contractor or from his Guarantee under this Contract and any other active contract(s) with the Employer.

PS6.8 Conditions and procedures for service agencies

The Contractor shall comply with the conditions and procedures of the various affected service agencies, as mandated in their associated wayleaves.

PS6.9 Reinstatement of asphalt by JRA

The JRA shall be given first preference to provide and execute all the reinstatement of asphalt at places where excavation is within the roadway. The Contractor shall make other adequate arrangements where the JRA:

a) indicated that it will not, for whatever reason, be able to perform such asphalt resurfacing; and

b) is the cause of delays, where in particular the Contractor shall note that the Employer shall not be liable of any additional extension of time related cost obligations to the Contractor, as he shall be deemed have agreed adequate conditions with the JRA and allowed delays on the part of the Employer.

PS6.10 Generic labour intensive specifications

EPWP guidelines shall not be applicable to this Contract, although it is expected that the Contractor execute the majority portion of the works utilising local labour. The Contractor will be required to submit monthly labour returns, including individual contracts, certified ID copies, Timesheets and proof of payment.

PS6.11 Causes for rejection

Causes for rejection shall include, but not be limited to, not complying to the Employer's requirements and/or specifications and the intended purpose for this Contract, thus:

a) poor data (including: photographs, recording, prints and reports) and data management;

b) inaccurate surveys, with regard to linear meterage of manhole length;

c) poor quality of survey information;

d) silt, grease, and debris remaining in conduits after cleaning; and

e) poor quality construction and remedial works:

i) Cracks in any concrete works or pre-cast units shall be cause for rejection.

ii) honeycombed or patched areas in any concrete works or pre-cast units in excess of 0.02m2 shall be cause for rejection.

PS6.12 Protection against water and storms

The Contractor shall be responsible for the full adequate protection of the works against damage due to storms, rain, floods, stormwater, subsoil water and seepage from whatever source. The Contractor shall take over the site where the works has to be executed at the beginning of the Contract Period and the full risk and cost of dealing with all water shall be borne by the Contractor.

The Contractor shall also provide all necessary pipe work, pumps and other appliances necessary for adequate dewatering of all excavations and shall maintain these in good condition and provide adequate standby equipment to ensure that no disruption of work will ensue as a result of possible breakdown of equipment.

PS6.13 Information supplied by the Employer's Agent

Certain information included in this document or supplied separately is presented in good faith and no guarantees can be given regarding the accuracy or representativeness thereof. This pertains more specifically to all soil tests, material results and similar information that are necessarily subject to limitations in the test methods and sampling. Natural variations in materials and formations also influence the applicability of certain conclusions.

The Employer can therefore not accept any responsibility for the accuracy of any information or for any damage resulting from the fact that the information later proved wrong or not representative. If the Contractor chooses to rely on the information he does so at his own risk.

PS6.14 Indemnity Certificate

The Contractor must, on completion of the Works, obtain certificates from all authorities concerned stating that they are satisfied with the condition of all borrow pits, detours, access roads and spoil material on their properties. The certificates must be handed over to the Employer's Agent before the maintenance period starts. The certificates will not exempt the Contractor from any obligations concerning the backfill of trenches, finishing off of borrow pits, access roads, detours etc. This work must still be carried out to the satisfaction of both the Employer and the Employer's Agent.

PS6.15 Return of materials

All old valves, valve covers, meter boxes and all pipework that can be reused shall be returned by the Contractor to the Water Depot or as directed by the Employer's Agent. The Contractor shall obtain the signature of the Superintendent acknowledging receipt of materials returned. The Contractor shall determine the condition of the materials.

PS6.16 Political and Community unrest

The Contractor shall notify the Employer or its duly Authorized Representative/s of any unrest situation and shall indicate all active Contract sites affected.

PS6.17 Water for Testing

All water for pipe pressure testing shall be paid by the Contractor through a legal Johannesburg Water connection.

PS 7 HEALTH AND SAFETY SPECIFICATION FOR CONSTRUCTION WORK

The Occupational Health and Safety Specification of the Employer's is bound in Volume 2 of these contract documents. Volume 2 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 Regulation 5 (1) (b) of the Construction Regulations 2014, 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 Construction Regulation 5 (1) (k), is required to prepare an occupational health and safety plan.

This plan has to be prepared in terms of Construction Regulation 7 (1) as well as the Employer's occupational health and safety specification. In terms of Construction Regulation 7 (1) (L), the Employer and the Principal 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 2, as a minimum.

PS 7.1 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 along the route of the new pipe for existing services. Any damages and or repairs to the existing services 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 7.2 Precaution against Pollution and Contamination

The Contractor shall take all necessary steps and precautions to prevent pollution of the surrounding area by his employees in any way. Any debris falling from construction vehicles and plant shall be removed immediately.

Every care is to be taken to avoid possible contamination of the mains during construction. Pipes are not to be stacked in the streets or gutters. On completion of a section, all loose material and foreign bodies are to be removed. The open ends of the new pipeline are to be protected by watertight caps, to the satisfaction of the Employer's Agent, to prevent the entrance of groundwater and foreign bodies until such time as these sections are connected to the live mains.

Sterilising chemicals shall be supplied by the Contractor for sterilizing all new water mains. All new lines are to be thoroughly flushed. All sterilisation shall be done at 10mg/ℓ free chlorine for 12 hours. The Contractor shall give due notice to The Employer of his intention.

PS 7.3 Operations under Live Conditions

Prior to the execution of any operation under live conditions, the Contractor shall liaise with the respective Depot Manager, at least 7 working days in advance, in this regard. At least one representative of the Depot shall be present during the execution of such operation. These operations will include disconnection and reconnection to the existing Sewer/ Storm water main and Water storage tank at the works.

PS 8 ENVIRONMENTAL MANAGEMENT

Tendering Contractors are to adhere to the mitigation measures listed in the EMP (refer to Volume 2: Occupational Health and Safety Specification and Environmental Management Plan for Capital Investment Projects). Environmental mitigation measures are actions needed to align a project implementation phase with environmental control principles, where potential impacts to the natural and social environment are prevented, minimised or remediated. Environmental safeguarding is governed by various sets of legislation, with the most noteworthy for this project constituting the National Environmental Management Act (No. 107 of 1998) and the National Water Act (No. 36 of 1998).

PS 9 VALVES

i. Wedge type gate valves: Shall be used for and valves from sizes 200 mm and above and the valves must be as per SANS 664. (All valves greater than and equal to 300 mm should be geared).

ii. Resilient seal gate valves: for valves sizes up to and including 150 mm;

iii. Air release valves: single chamber, double orifice with integral anti-shock device.

iv. Hytrol valves: can be piped as PRV's, pressure sustaining valves, level control valves, flow control valves etc. Other designs must be pre-approved;

v. Butterfly valves: may be used in restricted areas upon approval by Divisional Manager: Development Control/Design Manager CAPEX. Strictly not allowed in the reticulation.

vi. Reflux valves: non-return valves must be approved by Divisional Manager Development Control/Design Manager CAPEX.

Types used:

Weighted type: used essentially in pump stations and on reservoirs and in town installations;

Double-door dampered type: used on pumping mains;

vii. Above ground hydrants: All new installations to be above ground. Underground hydrants only to be used if approved by Divisional Manager: Development Control/ Design Manager: CAPEX.

All valves are required to have 70% local content.

PS 10 Domestic Water Meter

Preferred Type of Meter to be Used by Johannesburg Water

Sizes (Nom Dia)	**Customer Type / End Use**	**Approved Meter Type**	**Class**	**Strainer Required**
15	Domestic	Multi-jet or volumetric (Plastic Bodied) Above ground Existing Areas	C	No
15	Domestic	Concentric Multi-jet or volumetric (Plastic Bodied) Above ground New Areas	C	No

PS10.1 Domestic meter boxes

All domestic water meters must be fitted into a proprietary meter box the above ground configuration

PS10.2 Above Ground Meter Boxes

Above ground meter boxes are to be installed in new areas and existing areas.

Meters and related plastic components in above ground installations must be protected from direct sunlight and from freezing where freezing is considered a danger.

PORTION B: 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 A 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.

PSA GENERAL

PSA 2 INTERPRETATIONS

PSA 2.3 DEFINITIONS

a) General

ADD THE FOLLOWING DEFINITIONS:

"General conditions: The General Conditions of Contract specified for use with this Contract and the special conditions of Contract as applicable.

Specified: As specified in the standardized specifications, the Drawings or the Project Specifications. Specifications shall have the corresponding meaning."

c) Measurement and payment

REPLACE THE DEFINITIONS FOR "fixed charge", "time-related charge" *AND* "value-related charge" *WITH THE FOLLOWING*:

"Fixed charge: A charge that is not subject to adjustment on account of variation in the value of the Contract amount or the Contract Time of Completion.

Time-related charge: A charge, the amount of which varies in accordance with the Time for Completion of the work, adjusted in accordance with the provisions of the Contract.

Value-related charge: A charge, the amount of which varies pro rata with the final value of the measured work executed and valued in accordance with the provisions of the Contract."

PSA 3 MATERIALS

PSA 3.1 QUALITY

ADD THE FOLLOWING:

"All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified in accordance with SANS Specifications shall bear the SANS mark, whether so specified or not."

ADD THE FOLLOWING SUB-CLAUSE:

PSA 3.3 ORDERING OF MATERIALS

The quantities set out in the Schedule of Quantities have been carefully determined from calculations based on data available at the time and should therefore be considered to be approximate quantities only. Before ordering materials of any kind the Contractor shall check with the Employer's Agent whether or not the scope of the work for which the materials are

required is likely to change substantially. No liability or responsibility whatsoever shall be attached to the Employer for materials ordered by the Contractor except when ordered in accordance with written confirmation issued by the Employer's Agent."

PSA 4 PLANT

PSA 4.1 SILENCING OF PLANT

REPLACE THE CONTENTS OF SUBCLAUSE 4.1 WITH THE FOLLOWING:

"The Contractor's attention is drawn to the applicable regulations pertaining to noise and hearing conservation, framed under the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) as amended.

The Contractor shall at all times and at his own cost, be responsible for implementing all necessary steps to ensure full compliance with such regulations, including but not restricted to the provision and use of suitable and effective silencing devices for pneumatic tools and other plant which would otherwise cause a noise level in excess of that specified in the said regulations.

Where appropriate, the Contractor shall further, by means of temporary barriers, effectively isolate the source of such noise in order to comply with the said regulations."

PSA 5 CONSTRUCTION

PSA 5.1 SURVEY

PSA 5.1.2 Preservation and replacement of survey beacons and pegs subject to the Land Survey Act

*DELETE THE WORDS "*in the vicinity of boundaries*" IN THE SECOND SENTENCE OF SUBCLAUSE 5.1.2 AND REPLACE THE WORDS "*under the direction of*" IN THE SAME SENTENCE WITH* "in consultation and liaison with."

ADD THE FOLLOWING AFTER THE SECOND SENTENCE OF SUBCLAUSE 5.1.2:

"The Contractor and the Employer's Agent shall record on the said list, their concurrence or disagreement (as the case may be) regarding the completeness and accuracy of the details recorded therein."

REPLACE THE THIRD SENTENCE OF SUBCLAUSE 5.1.2 WITH THE FOLLOWING:

"At the completion of the Contract, the Contractor shall expose all pegs that were listed at the commencement of the construction as being in order and the Contractor shall arrange with a registered Land Surveyor for the checking of the positions of all such pegs and the replacement of those that the Land Surveyor's check reveals have become disturbed or damaged. The Contractor shall, as a precedent to the issue of the Certificate of Completion, provide to the Employer's Agent, a certificate from the registered Land Surveyor, certifying that all the pegs listed at the commencement of construction in accordance with the provisions of this clause, have been checked and that those found to have been disturbed, damaged or destroyed have been replaced in their correct positions, all in accordance with the provisions of the said Act.

The costs of all checking, replacement and certification as aforesaid shall be entirely for the Contractor's account. This, with the provisions always that the Contractor shall not be held liable for the cost of replacement of pegs which:

(a) cannot reasonably be re-established in their original positions by reason of the finished dimensions of the permanent works, and

(b) the contractor can prove beyond reasonable doubt to the satisfaction of the Employer's Agent, were disturbed, damaged or destroyed by others beyond his control."

PSA 5.3 PROTECTION OF EXISTING STRUCTURES

REPLACE "Machinery and Occupational Safety Act, 1983 (Act No 6 of 1983)*" WITH "*Occupational Health and Safety Act, 1993 (Act No 85 of 1993), as amended,*" AND INSERT THE FOLLOWING AFTER* "(Act No. 27 of 1956)": "as amended."

PSA 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

REPLACE THE HEADING AND THE CONTENTS OF SUBCLAUSE 5.4 WITH THE FOLLOWING:

PSA 5.4 LOCATION AND PROTECTION OF EXISTING SERVICES

PSA 5.4.1 <u>Location of existing services</u>

Before commencing with any work in an area, the Contractor shall ascertain the presence and actual position of all services which can reasonably be expected by an experienced and competent Contractor to be present on, under, over or within the Site.

Without in any way limiting his liability in terms of the Conditions of Contract in relation to damage to property and interference with services, the Contractor shall, in collaboration with the Employer's Agent, obtain the most up-to-date plans as are available, showing the positions of services existing in the area where he intends to work. Neither the Employer nor the Employer's Agent offers any warranty as to the accuracy or completeness of such plans and because services can often not be reliably located from plans, the Contractor shall ascertain the actual location of services depicted on such plans by means of careful inspection of the Site.

Thereafter, the Contractor shall, by the use of appropriate methodologies, carefully expose the services at such positions as are agreed to by the Employer's Agent, for the purposes of verifying the exact location and position of the services. Where the exposure of existing services involves excavation to expose underground services, the further requirements of sub Clauses 4.4 of GCC 2015 and 5.1.2.2 of SANS 1200 D (as amended) shall apply.

The aforesaid procedure shall also be followed in respect of services not shown on the plans but which may reasonably be anticipated by an experienced Contractor to be present or potentially present on the site.

All services, the positions of which have been determined as aforesaid at the critical points, shall henceforth be designated as 'known services' and their positions shall be indicated by the Contractor on a separate set of drawings, a copy of which shall be furnished to the Employer's Agent without delay.

As soon as any service which has not been identified and located as described above is encountered on, under, over or within the site, it shall henceforth be deemed to be a known service and the aforesaid provisions pertaining to locating, verifying and recording its position on the balance of the site shall apply. The Contractor shall notify the Employer's Agent immediately when any such service is encountered or discovered on the Site.

Whilst he is in possession of the Site, the Contractor shall be liable for all loss of or damage as may occur to

(a) known services, anywhere along the entire lengths of their routes, as may reasonably be deduced from the actual locations at which their positions were verified as aforesaid, due cognizance being taken of such deviations in line and level which may reasonably be anticipated, and

(b) any other service which ought reasonably to have been a known service in accordance with the provisions of this clause.

The Contractor shall also be liable for consequential damage in regard to (a) and (b), whether caused directly by the Contractor's operations or by the lack of proper protection.

No separate payment will be made to the Contractor in respect of any costs incurred in preparing and submitting to the Employer's Agent the Drawings as aforesaid. These costs shall be deemed included in the Contractor's other tendered rates and prices included in the Contract.

Payment to the Contractor in respect of exposing services at the positions agreed by the Employer's Agent and as described above will be made under the payment items (if any) as may be provided for in the respective sections of the specifications pertaining to the type of work involved.

PSA 5.4.2 <u>Protection during construction</u>

The Contractor shall take all reasonable precautions and arrange its operations in such a manner as to prevent damage occurring to all known services during the period which the Contractor has occupation and/or possession of the Site.

Services left exposed shall be suitably protected from damage and in such a manner as will eliminate any danger arising there from to the public and/or workmen, all in accordance with the requirements of the prevailing legislation and related regulations.

Unless otherwise instructed by the Employer's Agent, no services shall be left exposed after its exact position has been determined and all excavations carried out for the purpose of exposing underground services shall be promptly backfilled and compacted. In roadways, the requirements of Subclause 5.9 of SANS 1200 DB should be observed. In other areas compaction is to be to 90% modified AASHTO density.

PSA 5.4.3 <u>Alterations and repairs to existing services</u>

Unless the contrary is clearly specified in the Contract or ordered by the Employer's Agent, the Contractor shall not carry out alterations to existing services. When any such alterations become necessary, the Contractor shall promptly inform the Employer's Agent, who will either make arrangements for such work to be executed by the owner of the service, or instruct the Contractor to make such arrangements himself.

Should damage occur to any existing services, the Contractor shall immediately inform the Employer's Agent, or when this is not possible, the relevant authority, and obtain instructions as to who should carry out repairs. In urgent cases, the Contractor shall take appropriate steps to minimize damage to and interruption of the service. No repairs of telecommunication cables or electric power lines and cables shall be attempted by the Contractor.

The following list of contact telephone numbers is provided for:

Service	Authority	Contact Details	Contact Number
Communication	Telkom	J Tshabalala	(011) 301-9052
Electricity	Eskom	K Bedessie	(011) 711-2290

Municipal Electricity	City Power	D Oliver	(011) 490-7195
Gas	Sasol	B van der Heuvel	(011) 617-8261
Bulk Water	Rand Water	I Davids	(011) 682-0911
Provincial Road	Gautrans	J Olivier	(012) 310-2200
Municipal Road	Johannesburg Roads Agency	J Montero	(011) 298-5000

PSA 6 TOLERANCES

ADD THE FOLLOWING SUBCLAUSE TO CLUASE 6:

PSA 6.4 USE OF TOLERANCES

No guarantee is given that the full specified tolerances will be available independently of each other, and the Contractor is cautioned that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work.

Except where the contrary is specified, or when clearly not applicable, all quantities for measurement and payment shall be determined from the 'authorised' dimensions. These are specified dimensions or those shown on the drawings or, if changed, as finally prescribed by the Employer's Agent, without any allowance for the specified tolerances. Except if otherwise specified all measurements for determining quantities for payment will be based on the 'authorised' dimensions.

If work is constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the calculation of quantities will be based on the 'authorised' dimensions, regardless of the actual dimensions to which the work has been constructed.

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Employer's Agent may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be calculated based on the actual dimensions as constructed."

PSA 7 TESTING

PSA 7.2 APPROVED LABORATORIES

REPLACE THE CONTENTS OF SUBCLAUSE 7.2 WITH THE FOLLOWING:

"Unless otherwise specified in the relevant specification or elsewhere in the Project Specification, the following shall be deemed to be approved laboratories in which design work, or testing required in terms of a specification for the purposes of acceptance by the Employer's Agent of the quality of materials used and/or workmanship achieved, may be carried out:

(a) Any testing laboratory certified by the South African National Accreditation Systems (SANAS) in respect of the nature and type of testing to be undertaken for the purposes of the Contract;

(b) Any testing laboratory owned, managed or operated by the Employer or the Employer's Agent;

(c) Any testing laboratory established and operated on the Site by or on behalf of the Employer or the Employer's Agent;

(d) Any other laboratory that the Employer's Agent approves in his absolute discretion."

PSA 8 MEASUREMENT AND PAYMENT

PSA 8.1 MEASUREMENT

PSA 8.1.2 Preliminary and General Item or Section

PSA 8.1.2.1 Contents

REPLACE THE LAST SENTENCE OF SUBCLAUSE 8.1.2.1(b) WITH THE FOLLOWING:

"Separate items will be scheduled to cover the fixed, value-related and time-related components of the Contractor's preliminary and general costs."

PSA 8.2 PAYMENT

PSA 8.2.1 Fixed-charge and Value-related Items

REPLACE THE CONTENTS OF SUBCLAUSE 8.2.1 WITH THE FOLLOWING:

PSA 8.2.1.1 Fixed-charge Items

Payment of fixed charges in respect of item 8.3.1 will be made as follows:

(a) EIGHTY PER CENT (80%) of the sum tendered will be paid when the facilities have been provided and approved;

(b) The remaining TWENTY PER CENT (20%) will be paid when the works have been completed, the facilities have been removed and the site of the Contractor's establishment has been cleared and cleaned to the satisfaction of the Employer's Agent.

No adjustment will be made to the sum tendered in respect of item 8.3.1 should the value of the works finally executed or the time for completion vary in any way from that specified in the tender."

PSA 8.2.1.2 Value-related Items

Payment for the sum tendered under item 8.3.2 will be made in three separate installments as follows:

(a) The first installment, which is 40% of the sum, will be paid when the Contractor has fulfilled all his obligations to date under this specification, the General Conditions of Contract and the Special Conditions of Contract, and when the value of work certified for payment, excluding materials on site and payments for preliminary and general items, is equal to not less than 5% of the total value of the work listed in the Schedule of Quantities.

(b) The second installment, which is 40% of the sum, will be made when the amount certified for payment, including retention moneys but excluding this second installment, exceeds 50% of the tender sum.

(c) The final payment, which is 20% of the sum, will be made when the works have been certified as completed and the Contractor has fulfilled all his obligations to date under

this Specification, the General Conditions of Contract and the Special Conditions of Contract.

Should the value of the measured work finally completed be more or less than the tender sum, the sum tendered under item 8.3.2 will be adjusted up or down in accordance with the provisions of Clause 6.11 of the Conditions of Contract 2015, and this adjustment will be applied to the third installment."

PSA 8.2.2 Time-related Items

REPLACE THE CONTENTS OF SUBCLAUSE 8.2.2 WITH THE FOLLOWING:

"Subject to the provisions of sub clauses 8.2.3 and 8.2.4, payment under item 8.4.1 (time-related item) will be made monthly in equal amounts, calculated by dividing the sum tendered for the item by the tendered contract period in months, provided always that the total of the monthly amounts so paid for the item is not out of proportion to the value of the progress of the Works as a whole."

PSA 8.3 SCHEDULED FIXED-CHARGE AND VALUE-RELATED CHARGE

ADD THE FOLLOWING NEW SUBCLAUSES TO CLAUSE 8.3

PSA 8.3.5 Additional Contractual Obligations

PSA 8.3.5.1 Notice and warning to consumers ……Unit : Sum

The sum shall cover the full compensation and cost of supply and delivery of the notices and warnings to customers at least 3 days before a shutdown is to take place in each section of work.

PSA 8.3.5.2 OHS Act Obligations ……...Unit: Sum

The sum shall cover the full compensation and fixed costs for the compliance with the Occupational Health and Safety Act, Construction Regulations 2014 and all the requirements stipulated in the Employer's Health and Safety Specifications."

PSA 8.3.5.3 EMP Obligations ……..Unit: Sum

The sum shall cover the full compensation and all fixed costs for compliance with the requirements of The Employer's Environmental Management Plan.

PSA 8.4 SCHEDULED TIME-RELATED ITEMS

ADD THE FOLLOWING NEW SUBCLAUSES TO CLAUSE 8.4.

PSA 8.4.6 Additional Obligations

PSA 8.4.6.1 1) OHS Act Obligation……...Unit: Sum

The sum shall cover the full compensation and all time related costs for the duration of the contract, for the compliance with the Occupational Health and Safety Act, Construction Regulations 2014 and all the requirements stipulated in the Employer's Health and Safety Specifications. The cost shall include the salary for a full time OHS Officer for the project.

2) Environmental Officer Salary……..Unit: Month

The Contract shall appoint a suitably qualified Environmental Officer, for any Project that triggers Environmental Authorization and approved by Johannesburg Water SOC Ltd.

Appointment	Qualifications and Experience
Full time site Environmental Liaison Officer/Environmental Officer	• National Dip in Environmental Management/ + 3 years' experience in construction project; or • BA/BSc Environmental Management + 3 years' experience in construction project;

3) Environmental Control Officer……Unit: Sated Provisional Sum

The Engineer shall allow for a Provisional Sum for the Environmental Control Officer who shall be employed by the Project for any Environmental Authorized project.

Appointment	Qualifications and Experience
Environmental Control Officer(ECO)	• National Diploma or BA/BSc Environmental Management + 3 years' experience as an Independent ECO;

PSA 8.4.6.2 Security services costs……..……..…...Unit: Month

The sum shall cover the full compensation and all costs for a sufficient 24 hour guarded services for the duration of the contract.

PSA 8.4.6.3 Community Liaison Officer ……..Unit: Stated Sum

PSA 8.4.6.4 Risk Assessments every month……..Unit: Month

The stated sum shall cover full compensation and all costs payable on a monthly basis, to provide a full time qualified and suitable experienced Community Liaison Office for the duration of the contract. The stated sum shall also cover for the CLO cellphone airtime.

PSA 8.5 SUMS STATED PROVISIONALLY BY EMPLOYER'S AGENT

AMEND SUBCLAUSE 8.5.b)1 AND ADD THE FOLLOWING ITEMS:

i) Alteration to existing services by authorities……Unit: Stated Sum
ii) Control tests by independent laboratory ……..….. Unit: Stated Sum
iii) Provision of photographic records ……Unit: Stated Sum
iv) CLO and CSO…….. Unit: Stated Sum
v) Temporary protection of services…….. Unit: Stated Sum
vi) Pipeline Cathodic Protection……. Unit: Stated Sum
vii) Reinstatement of asphalt by JRA…….. Unit: Stated Sum
viii) Etc……..

The Contractor is responsible for both the cost of normal testing as described in the Project Specifications and for the cost of any additional test that indicates that the Specifications have not been complied with."

These sums will be paid to the Contractor in equal monthly amounts."

PSA 8.7 DAYWORKS

ADD THE FOLLOWING NEW CLAUSES:

PSA 8.7.1 Scope

This section covers the method of measurement and payment for work carried out on a day work basis.

PSA 8.7.1.1 General Requirements

Work will be classified as day work only if the Employer's Agent considers no other rate in the Bill of Quantities appropriate for payment purposes.

An instruction regarding all work to be carried out under day work in terms of Clause 6.5 of the General Conditions of Contract 2015 will be issued at the discretion of the Employer's Agent. Some or all of the items priced under day work in the Bill of Quantities may possibly not be required for this Contract.

Before ordering any material, the Contractor shall submit quotations to the Employer's Agent for his approval, and shall submit such receipts or vouchers to the Employer's Agent as may be necessary for proving the amount claimed.

PSA 8.7.1.2 Measurement and Payment - Day works

The day work rates submitted for vehicles and construction equipment, in the Bill of Quantities shall be a hire charge for the use of the vehicle and driver or constructional plant/equipment and operator (excluding VAT) and shall apply only to vehicles and construction equipment approved in writing by the Employer's Agent. The rate shall include for maintenance, fuels and oils and other operating costs, establishment, insurance and other contingency costs relating to the running of the vehicle, plant or equipment.

Where there is ambiguity between the power developed at the flywheel and mass of a machine, the power shall govern the measurement category.

The Contractor and the Employer's Agent will agree on the method of recording the working hours prior to the commencement of the work. Any long period of idling at any one time which in the opinion of the Employer's Agent or his representative is beyond that required for normal operating conditions will not be paid for as working time. Non-working hours for any reason shall not be measured for payment.

The ten percent allowed for overheads etc. as per Clause 6.5.1.2.3 of the General Conditions of Contract 2015 shall include full compensation for all administrative costs, supervision, overheads, liabilities and obligations related to the running of the vehicles, constructional plant and equipment. The tendered percentage shall also include for profit and shall be subject to the Contract Price Adjustment factor laid down in the Contract Data.

PSA 8.8 TEMPORARY WORKS

PSA 8.8.4 Existing Services

AMEND THE SUB CLAUSE AS FOLLOWS:

PSA8.8.4 a) Supply or hire of specialist equipment …….Unit: ProvSum/Sum

The sum shall cover the cost for the supply, operation and/or hire of specialist equipment for detection of underground services as ordered by the Employer's Agent.

b) Excavate by hand in soft material to expose existing services……..Unit: m^3

The rate shall cover the cost for removal of premix or other surfacing where necessary, excavating in all materials, shoring, backfilling, compaction and reinstatement of surfaces except for asphalt.

PSA 8.9 STANDING TIME……..……Unit: hour

Rate to include all costs the Contractor incurs on an hourly basis for all resources. Standing time will be paid to the Contractor in a case where there are delays attributable from the Employer in providing information or instruction and where the Contractor have no work to be undertaken during that period. For all equipment standing time will be dayworks rate less 10%.

PSAB EMPLOYER'S AGENT'S OFFICE

PSAB 3 MATERIALS

PSAB 3.1 NAMEBOARDS

DELETE THE ENTIRE CLAUSE AND REPLACE WITH:

"The name board shall be of either tempered hardboard at least 12mm thick or steel sheeting so braced on the reverse side as to prevent warping or buckling and shall be mounted on two or more firmly planted poles as necessary. The quality of the paint shall conform to SANS Standard Specification CKS 193. The colour of the paint shall conform to SANS 1091-1975 colour F11, strong blue. The Employer's SOC Ltd logo shall be in colour. The height of the larger name board shall be 2400mm and the width 4800mm, whilst the height of the smaller name board shall be 800mm and the width 1600mm".

PSAB 3.2 OFFICE BUILDING(S)

Delete this sub-clause entirely and re-title the sub-clause "FACILITIES FOR THE EMPLOYER'S AGENT"

Add the following sub-clause.

PSAB 3.2.1 Office Building(s)

The Contractor shall provide, furnish and equip one or more offices (as scheduled) for the use of the Employer's Agent.

The Contractor shall provide, furnish and equip one or more offices (as scheduled) for the use of the Employer's Agent.

Each office shall be weatherproof The Contractor shall provide and furnish one office for the use of the Employer's Agent. Each office shall consist of one room with a floor area of at least 15 m^2 and a ceiling height of at least 2.5 m.
, shall be air conditioned, shall have a wooden boarded floor that is at least 150 mm above the ground, and shall be provided with a ceiling and a lining to the walls, or equivalent insulation, with an acceptable type of door with a secure lock, and two opening windows of glazed area at least 3 m^2. Each office shall be well ventilated and shall be so insulated as to provide comfortable working conditions.

Office building shall be painted with an approved paint after erection and the paintwork shall be maintained during the contract period.

Each door shall be provided with a lock and two keys.

The sitting of all offices shall be to the Employer's Agent's satisfaction and shall be decided upon in consultation with him/her and confirmed in writing before erection.

All accommodation shall include the provision of access roads where required, fresh clean portable water and sewerage, which will be considered as part and parcel of the accommodation provided and will not be paid for separately.

The site Office shall be fenced using diamond wire mesh right round with access gate.

All accommodation shall meet with the approval of the Employer's Agent.

The offices shall comply with the following requirements.

Dimensions	Boardroom	Employer's Agent's Office
Minimum floor area	28 m^2	15 m^2
Minimum window area	4.0 m^2	3.0 m^2
Minimum window area opening	2.4 m^2	1.5 m^2
Minimum clear height	2.5 m	2.5 m
Shaded parking for vehicles		2

Furniture and Equipment

Employer's Agent's shall be equipped with the following:

(i) Office desk with a surface area of at least 1.5m^2 with at least 3 drawers one of which can be locked.

(ii) Two office chairs.

(iii) a lockable upright steel cabinet with three shelves or a steel filing cabinet with four drawers

(iv) Refrigerator

(v) Printer

(vi) Sufficient racks and hangers for hanging contract drawings. The hangers shall be of the "Barhold" type, with one hanger to five drawings.

(vii) 1 x Double 80-watt fluorescent light fittings complete with ballast and tubes.

The Boardroom shall be equipped with the following:

(i) Conference table large enough to accommodate twelve people and have an area of at least 15m^2.

(ii) Fifteen office chairs

(iii) 2 x Double 80-watt fluorescent light fittings complete with ballast and tubes.

The Contractor shall also supply a toilet for the exclusive use of the Employer's Agent.

The Contractor must provide basic survey instruments: dumpy level, tripod stand and staff.

On completion of the Works, ownership of the buildings, furnishings and equipment shall revert to the Contractor who shall remove them from the Site.

PSAB 3.3 CARPORT

ADD THE FOLLOWING NEW CLAUSE:

The Contractor shall construct the number of carports specified in Portion A of the Project Specifications, for the sole use of the Employer's Agent and his staff. Each carport shall be constructed so that the vehicle parked under it is always protected against the direct rays of the sun. The carport area shall be at least 20 m² and the floor shall be covered with a layer of crushed stone to alleviate dusty and muddy conditions. The carport(s) shall be positioned so as to provide easy and convenient access to the Employer's Agent's office."

PSAB 4 PLANT

PSAB 4.1 TELEPHONE

REPLACE SUBCLAUSE 4.1 OF SANS 1200 AB WITH THE FOLLOWING:

"The Contractor shall arrange for the provision of a suitable approved by the Employer's Agent cellular phone and airtime and data bundles per month for the Employer's Agent's Representative. The Contractor at the tendered rates under the relevant scheduled item shall recover the associated charges and telephone calls and data bundles associates with the contract.

PSAB 4.2 SURVEY EQUIPMENT

ADD THE FOLLOWING NEW CLAUSE:

The Contractor shall provide on site and make available for the exclusive use of the Employer's Agent and his staff, the survey equipment listed in Portion A of the Project Specifications.

All survey equipment provided by the Contractor shall be in good condition, properly calibrated and fit for the purpose.

In addition to survey equipment provided by the Contractor for the exclusive use of the Employer's Agent and his staff, the Contractor shall make available for use by the Employer's Agent, the further survey equipment listed in Portion 1 of the Project Specifications, at all times when such is reasonably required by the Employer's Agent and his staff for the purposes of the Contract."

PSAB 4.3 COMPUTER FACILITIES

ADD THE FOLLOWING NEW CLAUSE:

The Contractor shall, for the duration of the Contract, provide the computer equipment complete with printer, modem and telephone connection including 3G connection together with the software specified hereunder, for the exclusive use of the Employer's Agent and his staff:

a) 1 laptop

b) 1 printer

The laptop shall comply with the following minimum specifications:
The laptop shall comply with the following minimum specifications:
Lenovo thinkpd T540P Intel Core 17-4700MQ, 8GB, 1TB, DVD+-RW DL, 15.6FHD (1920X1080), NVIDIA 1GB, 3
WAR: 3 Year on-site Warranty upgrade
Mem: Lenovo 8GB DDR3L 1600 (PC3-1280D) 50 DIMM Memory
Dock: Thinkpad Pro Dock-65W-South Africa

Printers shall, unless otherwise approved by the Employer's Agent, be SamsungSCX-4600 Colour Laser Printer Series or equivalent compatible.

All computer hardware shall be provided complete with the requisite connecting cables and all interfacing devices and software necessary for its efficient operation as an integral system.

The following software shall be properly installed on the computer, and the original license agreements and disks shall be provided to the Employer's Agent for safekeeping:

- Microsoft Windows 7 / XP
- MS-Office 2010 / XP
- MS Projects 2010

All computer equipment provided shall be kept fully serviceable at all times by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 12 hours after notification by the Employer's Agent's staff.

The Contractor shall further provide at his own cost, all paper and black ink cartridges and other consumables reasonably required by the Employer's Agent."

PSAB 5 CONSTRUCTION

ADD THE FOLLOWING NEW SUBCLAUSES TO CLAUSE 5 OF SANS 1200 AB:

PSAB 5.6 SURVEY EQUIPMENT

All survey equipment provided by the Contractor shall be kept fully serviceable at all times by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 12 hours after notification by the Employer's Agent's staff.

Where required by the Employer's Agent, the Contractor shall, at his own cost, promptly arrange for the recalibration of survey equipment provided."

PSC SITE CLEARANCE

PSC 3 MATERIALS

PSC 3.1 DISPOSAL OF MATERIALS

ADD THE FOLLOWING:

"The Contractor shall obtain his own dumping sites for the disposal of material and all transport costs shall be included in the rates tendered for site clearance."

PSC 5 CONSTRUCTION

PSC 5.1 AREAS TO BE CLEARED AND GRUBBED

ADD THE FOLLOWING:

"Small diameter pipeline routes shall be cleared to a distance of 1,0m on both sides of the pipeline centre line and large diameter pipeline routes shall be cleared to a distance of 2,0m on both sides of the pipeline centre line. Route pegs or markers shall not be destroyed or damaged during clearing operations."

PSC 5.2 CUTTING OF TREES

PSC 5.2.3 Preservation of trees

PSC 5.2.3.2 Individual trees

REPLACE THE LAST SENTENCE WITH THE FOLLOWING:

"An amount of R 2000.00 will be deducted from moneys due to the Contractor as a penalty for every tree that is damaged or removed unnecessarily."

PSC 8 MEASUREMENT AND PAYMENT

PSC 8.2 PAYMENT

PSC 8.2.1 Clear and grub

REPLACE THE FIRST LINE WITH THE FOLLOWING:

"The area designated by the Employer's Agent to be cleared and grubbed will be measured in square metre to the nearest square metre or," otherwise specified.

PSC 8.2.5 Take down existing fences

REPLACE ITEM 8.2.5 WITH THE FOLLOWING:

PSC 8.2.5 Take down existing fences:

(a) Description of fence ……..…….... Unit: m or km

(b) Etc for other items

The unit of measurement shall be the metre or kilometer of fence taken down and removed from the site.

The rate shall cover the cost of taking down the complete fence (fence height up to 2m) as scheduled and removing all fence material from the site, filling of holes, leveling ground surfaces and cleaning the site as well as providing temporary fence during construction."

PSC 8.2.8 Demolish and remove structures/buildings and dismantle steelwork, etc.

REPLACE "Unit: sum" *WITH* "Unit: sum or number of m²".

REPLACE THE LAST SENTENCE WITH:

"The rate shall cover the cost of all such separate items as scheduled in the Schedule of Quantities."

ADD THE FOLLOWING ITEMS:

PSC 8.2.11a Temporary fencing or hoarding:

(a) Indicate temporary usage, description and type …… Unit: m

(b) Etc for other usage and types.

The unit of measurement shall be the linear metre of fence or hoarding supplied and erected, and in the case of temporary fencing for maintaining and removing on completion of the works or part of the works.

The tendered rate shall include full compensation for the cost of supplying and erecting the complete fence as specified or scheduled and in the case of temporary fencing for taking down the fences, removing from the site, filling of holes, leveling ground surfaces and cleaning the site.

Seventy per cent (70%) of the tendered rate shall be payable on completion and approval of the temporary fences, and the remaining thirty per cent (30%) on completion of the removal of the fences.

PSC 8.2.11b Removal of man-made surfaces

The rate shall cover all plant, labour, material, saw cutting (asphalt and concrete), breaking up, lifting, loading, transportation, off-loading surfacing and storing (where applicable).
Unit: m²
Roadways, Asphalt and other layers
i) Asphalt (≤ 50mm thick) and including base, sub-base and subgrades layers up to 800mm deep.
ii) Asphalt (> 50 ≤ 100mm thick) and including base, sub-base and subgrades layers up to 800mm deep.
a)Footways and driveways
Asphalt ≤ 50mm thickness
Asphalt > 50 ≤ 100mm thickness
Interlocking concrete segmental paving blocks (all colours)
Concrete slabs (450 x 450mm)
Brick paving
Unreinforced concrete ≤75mm thick
Reinforced concrete ≤75mm thick
Grassing
Kerbing (all types of kerbing) …….. (Unit: m)

PSC 8.2.12 Backfilling and reinstatement of man-made surfaces

The rate shall cover the cost of all associated plant, labour, material, loading, transportation from storage, off-loading and placing (levelling and compacting where applicable) the following materials in roadways, footways and driveways in accordance with the COP:

PSC 8.2.12.1 Backfilling and reinstatement of roads

Unit:m²

a) Scenario A

i) 150mm base – G2 Graded crushed stone to 102% Mod AASHTO density
ii) 150mm subbase – G5 Graded crushed stone to 97% Mod AASHTO density
iii) 150mm Fill – G7 material compacted to 95% Mod AASHTO density
iv) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO

b) Scenario B

i) 150mm base – G2 material compacted to 97% Mod AASHTO density
ii) 150mm subbase – C4 Stabilised gravel material to 95% Mod AASHTO density*
iii) 150mm selected subgrade - Insitu material compacted to 93% Mod AASHTO

***Rate shall include stabilization agent.**

c) Scenario C (Foot paths)

i) 150mm base – Recovered material compacted to 93% Mod AASHTO
ii) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO

d) Surfacing

i) 30mm Bitumen hot –mix: Fine
ii) 70mm Bitumen hot –mix: BTB

PSC 8.2.12.2 Backfilling and reinstatement footways

a) Using removed materials:
i) Interlocking concrete segmental paving blocks (all colours) ……Unit: m²
ii) Concrete slabs (450 x 450mm)…….Unit:m²
iii) Brick paving……..Unit:m²
iv) Grassing……Unit:m²
v) Kerbing……... (Unit:m)

b) Using new supplied materials:
i) 30mm Bitumen hot –mix: Fine
ii) Interlocking concrete segmental paving blocks, including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and blocks
   1) Grey blocks
   2) Coloured blocks
iii) Concrete slabs (450 x 450mm) including a 20mm river sand bedding layer, jointing mortar.
iv) Brick paving including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and bricks.
v) Unreinforced concrete ≤ 75mm thick (15MPa)
vi) Reinforced (395 mesh) concrete ≤ 75mm thick (15MPa)
vii) Grassing
viii) Concrete channeling, including formwork, leveling and compacting 300 x 125mm cast in situ concrete of 15MPa.
ix) Kerbing, including a 50mm bedding (cement and river sand), jointing mortar and 15MPa concrete haunching at all joints……..(Unit: m)
   1) Figure 1
   2) Figure 7
   3) Figure 8
   4) Figure 12

PSC 8.2.13 Reinstatement of existing masonry walls and steel palisade fences

The rate shall cover the cost of reinstating existing masonry walls, plastered or unplastered, and steel palisade fences (including any gates) including plant, labour, material, on-loading, transporting, off-loading and cleaning for the following:……..Unit: m²

a) Face brick

i) 110mm wall
ii) 220mm wall
iii) 330mm wall

b) Plastered
i) 110mm wall
ii) 220mm wall
iii) 330mm wall

c) Steel palisade fences (height = 2.1m)

ADD THE FOLLOWING ITEMS:

PSC 8.2.14 <u>Protection of trees</u>

The rate shall cover the cost related to the protection of trees……..Unit: No

PSD EARTHWORKS

PSD 2 INTERPRETATIONS

PSD 2.1 SUPPORTING SPECIFICATIONS

REPLACE SUBCLAUSE 2.1.2 WITH THE FOLLOWING:

"PSD 2.1.2: Any of the other SANS 1200 Specifications may form part of the Contract Documents."

PSD 2.3 DEFINITIONS

REPLACE THE WORD AND THE DEFINITION FOR "Borrow" *WITH THE FOLLOWING:*

"Borrow material: Material, other than material obtained from excavations required for the Works, obtained from sources such as borrow pits or the authorised widening of excavations. "Borrow" shall have a corresponding meaning."

REPLACE THE DEFINITION FOR "Specified density" *WITH THE FOLLOWING:*

"Specified density: The specified dry density expressed as a percentage of modified AASHTO dry density."

REPLACE THE DEFINITION FOR "Stockpile" *WITH THE FOLLOWING:*

"Stockpile (verb): The process of selecting and, when necessary, loading, transporting and off-loading material in a designated area for later use for a specific purpose."

ADD THE FOLLOWING DEFINITIONS:

"Commercial source: A source of material provided by the Contractor, not the Employer, and including any borrow pit, provided by the Contractor.

Fill: An embankment or terrace constructed of material obtained from excavations or borrow pits. In roads it includes the earthworks up to the underside of the selected subgrade level.

Fill (material): Material used for the construction of an embankment or terrace.

Roadbed: The natural in situ material on which the fill, or in the absence of fill, the pavement layers, are constructed."

PSD 3 MATERIALS

PSD 3.1 CLASSIFICATION FOR EXCAVATION PURPOSES

PSD 3.1.1 Method of classifying

ADD THE FOLLOWING:

"The classification of material other than 'soft excavation' shall be agreed upon before excavation may commence.

The Contractor shall immediately inform the Employer's Agent if and when the nature of the material being excavated changes to such an extent that a new classification is warranted for further excavation. Failure on the part of the Contractor to advise the Employer's Agent in

good time shall entitle the Employer's Agent to reclassify, at his discretion, such excavated material."

ADD THE FOLLOWING NEW SUB CLAUSES:

PSD 3.1.3 CLASSIFICATION FOR HAND EXCAVATION

Classification of material for various types of hand excavation will be based on the results of a dynamic cone penetrometer. The category of material shall be determined by testing the material at regular intervals and at various depths along the centre line of the trench. A minimum of 5 tests shall be done at each location and the average number of blows of the tests shall be used to determine the category of material.

The interval between test locations shall be determined by the variation of material type but shall not exceed 50m. The depth of testing shall be determined by the variation of material type and can increase or decrease in hardness with increasing depth of excavation. Table PSD 3.1.3 indicates the categories:

TABLE PSD 3.1.3: Classification for Hand Excavation

Category of Material	**Consistency**		**DCP Blows to Penetrate 100mm**	
	Granular	**Cohesive**	**Granular**	**Cohesive**
Soft Soft excavation shall be excavation in material that can be efficiently removed from the trench using a pick and shovel but not requiring prior breaking using mechanical equipment such as pavement breakers	Up to medium dense	Firm to stiff	0-6	1-5
Intermediate Intermediate excavation shall be excavation in material that require loosening with a hand spike (gwala) before being removed from the trench	Dense	Stiff to very stiff	7-15	6-8
Hard Hard excavation shall be excavation in material that requires prior breaking using mechanical equipment, such as pavement breakers with clay spades, before being removed from the trench.	Very dense		16-50	9-15
Rock Rock excavation shall be excavation in material other than described above which by nature of the material requires prior breaking using	-	-	>50	>15

mechanical equipment, such as pavement breakers with moil points, before being removed from the trench				

PSD 3.2.3 Material suitable for backfill or fill against structures

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Material used for backfill behind structures shall generally be the material excavated, subject to the following conditions:

(a) The material shall not contain an excessive number of stones retained on a 50 mm sieve.

(b) The material shall not contain large clay lumps that do not break up under the action of the compaction equipment.

(c) The liquid limit of the material shall not exceed 40, neither shall the Pi exceed 18."

PSD 3.3 SELECTION

ADD THE FOLLOWING SUBCLAUSE:

PSD 3.3.3 Selection in borrow pits and excavations

Approval of a borrow area for a certain purpose does not necessarily mean that all the material in that area is suitable for the specified purpose. What it does mean is that the borrow area contains some suitable material. The onus shall rest on the Contractor to ensure that only material that is indeed suitable is removed and used for the specified purpose.

When the Contractor has to select excavated material for a specific purpose, the above provisions relating to borrow areas shall apply *mutatis mutandis* to excavations.

The Contractor shall not waste or contaminate material that has been selected for a specific purpose."

PSD 5 CONSTRUCTION

PSD 5.1 PRECAUTIONS

PSD 5.1.1 Safety

PSD 5.1.1.1 Barricading and lighting

REPLACE "Machinery and Occupational Safety Act, 1983 (Act 6 of 1983)" *WITH* "Occupational Health and Safety Act, 1993 (Act 85 of 1993)."

REPLACE SUB-PARAGRAPH (a) AND (b) WITH THE FOLLOWING AND ADD SUB-PARAGRAPH c):

a) 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

b) provided with notice boards marked "CLOSED – GESLUIT" at each end of closed or partially closed roads; and

c) provided with flashing orange lights, placed at 15m intervals along the barricading at night.

ADD THE FOLLOWING TO THIS SUBCLAUSE:

Should the Contractor fail to provide adequate lighting, signing and barricading, access to properties, or leave the site in a dangerous condition, the Employer's Agent shall be entitled to suspend all work under the Contractor until in the Employer's Agent's opinion the Contractor's obligation in these respects have been fulfilled and/or arrange for any emergency work to be carried out by some other agency and to deduct the cost of this work from any monies due to the Contractor.

PSD 5.1.1.2 Safeguarding of excavations

REPLACE "Machinery and Occupational Safety Act" *IN SUB-PARAGRAPH* (a) *WITH* "Occupational Health and Safety Act, 1993 (Act 85 of 1993)."

ADD THE FOLLOWING TO SUB PARAGRAPH (d):

Loose ground, materials, tools and appliances shall be kept clear of the edge of the excavations and a pathway at least 0,30 m shall be left clear along the edge of the excavation.

PSD 5.1.1.3 Explosives

REPLACE THE CONTENTS OF THIS SUBCLAUSE AS FOLLOWS:

Where blasting is resorted to, it shall be carried out strictly according to Explosives Act and Regulations 1956 (Act No. 26 of 1956, as amended). However, in no case will blasting be allowed if a reasonable possibility exists of injury to any foundation, wall, pipe, cable or any structure, complete or partly complete. Where the Employer's Agent considers blasting to be dangerous, the same shall not be permitted and his decision shall be final and binding.

Wherever blasting is permitted and resorted to in the vicinity or within the limits of existing townships, roads, etc., it shall only be executed under the cover of sufficient earth backfill, heavy wire mesh screens or rubber matting of adequate weight and area to prevent the blasted material from being ejected from the trench. If any damage should occur, the Contractor shall carry out remedial work arising from such damage and will be held to have allowed therefore in his price.

The Contractor shall undertake such blasting so that the Peak Particle Velocity (PPV) as measured at the closest point to the existing outfall sewer and or building structure shall not exceed 25mm/s. Each blast shall be monitored and the findings recorded by an appropriately qualified explosives expert using a suitably calibrated apparatus. The Contractor shall also timeously inform the relevant inspectorate and obtain the required blasting permit from the South African Police Services, Division of Explosives before proceeding with any blasting on site. If in the opinion of the Employer's Agent, the Contractor makes careless use of explosives, he may forbid the Contractor the use of explosives.

It is a condition that should blasting result in the disturbing of material outside the trench, the Employer's Agent will require the Contractor to remove the disturbed material and backfill it to a compaction standard of the natural in-situ material. All this work for correcting areas of disturbed material will be done at the Contractor's cost.

The schedule rate for hard rock excavation shall cover all costs incurred in connection with supply, transportation, storage and handling of explosives, the related blasting costs and any remedial work should this be required.

PSD 5.1.1.4 Hard rock excavation without using explosives

ADD THE FOLLOWING TO THIS CLAUSE:

It is a condition that should blasting result in the disturbing of structures outside the trench; the Employer's Agent will require the Contractor to remove the rock material by means of pneumatic or hydraulic breakers, e.g. jack-hammers or wood-peckers.

The schedule rate for hard rock excavation without using explosives shall cover all costs incurred in connection with supply of specialist equipment, the transportation to and from the site as well as the removal and disposal of the hard material should this be required.

PSD 5.1.2 Existing services

PSD 5.1.2.2 Detection, location and exposure

REPLACE THE CONTENTS OF SUBCLAUSE 5.1.2.2 WITH THE FOLLOWING:

"The exposure by the Contractor of underground services, as required in terms of subclause 5.4 of SANS 1200 A (as amended) shall be carried out by careful hand excavation at such positions and to such dimensions as are agreed to by the Employer's Agent.

Unless otherwise instructed or agreed by the Employer's Agent, no service shall be left exposed after its exact position has been determined and all excavations carried out for the purposes of exposing underground services shall be promptly backfilled and compacted to the following densities:

(a) In roadways: 93% Mod AASHTO density; and

(b) In all other areas: 90% Mod AASHTO density.

Where hand excavations to expose underground services have to be carried out in roadways, the Contractor shall reinstate the road layerworks in accordance with the provisions of subclause 5.9 of SANS 1200 DB.

Payment in respect of exposing the services by means of hand excavation as described above, will be made in accordance with subclause PSA 8.8.4

Payment in respect of reinstating layerworks in roadways will be made in accordance with subclause 8.3.6.1 of SANS 1200 DB."

PSD 5.1.2.3 Protection of cables

REPLACE SUBCLAUSE 5.1.2.3 WITH THE FOLLOWING:

PSD 5.1.2.3 Protection during construction

Further to the requirements of subclause 5.4.2 of SANS 1200 A (as amended), major excavating equipment and other plant shall not be operated dangerously close to known services. Where necessary, excavation in close proximity to known services shall be carefully carried out with suitable hand tools, excluding picks wherever their use could damage the services. No additional payment will apply to such more difficult work.

Should any service not being a known service be discovered or encountered during the course of the Contract, the Contractor shall, in addition to complying with the requirements of subclause 5.4.2 of SANS 1200 A (as amended), immediately notify the Employer's Agent thereof and implement such measures as will prevent damage of such service or, if it was

damaged in the course of discovery, will prevent and minimize the occurrence of any further damage occurring."

PSD 5.1.2.4 Negligence

DELETE SUB-CLAUSE 5.1.2.4

PSD 5.1.3 Stormwater and Groundwater

ADD THE FOLLOWING TO THE SUB-CLAUSE:

"The Contractor shall, where applicable and at the earliest practicable opportunity, install the permanent drainage specified or shown on the drawings and shall at his own cost provide the temporary drainage required to protect the Works."

PSD 5.1.4 Nuisance

PSD 5.1.4.3 Excavated material not to endanger or interfere

AMEND THE CLAUSE AS FOLLOWS:

"A safe, clear path shall be kept open at all times for pedestrians. Equipment, materials and waste shall be stored, stockpiled or removed in such a manner that pedestrians are not endangered and that the nuisance level is kept to a minimum. If construction activities occupy the whole footway and verge area so that pedestrians are forced to walk in the traffic lane, adequate protection from traffic shall be provided.

Where instructed by the Employer's Agent or where the Works impose a danger to traffic or pedestrians, the Contractor shall at his own cost remove off Site excavated material to temporary stockpiles (approved by the Employer's Agent) and the return to Site, excavated material for use as backfill or bedding."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSD 5.1.4.4 Open Trenches

Unless otherwise permitted and where relevant, not more than the 100 m of trench in one place shall be opened ahead of the completed and backfilled pipeline."

PSD 5.1.5 Reinstatement and Maintenance of Roads

ADD THE FOLLOWING TO THE SUB-CLAUSE:

"Where crossings have been made, the roads shall be reinstated in accordance with the details specified in subclause 5.9 of SANS 1200 DB."

PSD 5.1.6 Road Traffic Control

DELETE THE SECOND SENTENCE OF SUBCLAUSE 5.1.6

PSD 5.2 METHODS AND PROCEDURES

PSD 5.2.2 Excavation

PSD 5.2.2.1 Excavation for general earthworks and for structures

ADD THE FOLLOWING TO PARAGRAPH (b):

"When the nature of the material precludes the above procedure, additional excavations shall be carried out to provide working space for the erection of formwork. The rate tendered for item 8.3.5 will be deemed to include the cost of a working width of 600 mm, but the Contractor may excavate a greater working width at no additional cost to the Employer."

REPLACE THE CONTENT OF PARAGRAPH (e) WITH THE FOLLOWING:

"Where excavations have been carried below the authorised levels, the Contractor shall backfill such excavations to the correct level with approved gravel compacted to 90% of modified AASHTO density or to the density of the surrounding material.

Where excavations have been carried out in hard material, the Employer's Agent may direct the over-excavation to be backfilled with weak concrete if there is a danger of settlement or differential settlement of the foundations.

Where the sides of excavations against which concrete is to be cast have been over-excavated or have collapsed partially, the Contractor shall retrim the excavations if necessary and, unless other remedial measures are agreed to by the Employer's Agent, shall cast the concrete for the structure, including the additional concrete that may be required as a result of the over-excavation or partial collapse. The cost of the additional concrete or remedial measures shall be for the Contractor's account."

PSD 5.2.2.3 <u>Disposal</u>

REPLACE THE SECOND SENTENCE WITH THE FOLLOWING:

"The Contractor shall provide all necessary spoil sites for the spoiling of all surplus and unsuitable materials and shall make the necessary arrangements with the owner of the site where the material is disposed of, and pay all charges and levies as may be applicable for the use of such spoil sites.

Every spoil site provided by the Contractor shall be approved by the local authority in whose area it is located, and the spoiling shall comply with the applicable statutory and municipal regulations as well as the requirements of the owner of the spoil site.

Payment to the Contractor in respect of locating and making arrangements for suitable spoil sites and spoiling material at such sites will be made in accordance with the provisions of subclause PSD 8.3.14."

ADD THE FOLLOWING SUBCLAUSE IN SUBCLAUSE 5.2.2:

PSD 5.2.2.4 <u>Selection and stockpiling</u>

Approval or designation of the material in a particular borrow pit or excavation for a particular purpose does not imply that all the material in the borrow pit or excavation is suitable for the particular purpose to which the said approval or designation relates, nor that all material in the borrow pit or source should be used for the particular purpose. The Contractor shall select suitable material from that borrow pit or source, discard unsuitable material and reserve material for other purposes as necessary.

The Contractor shall organize and carry out his operations in such a manner as will prevent the contamination of suitable embankment and backfill material with unsuitable materials. Any excavated material which becomes, in the Employer's Agent's opinion, unsuitable for use in embankments or backfill as a result of contamination, shall be disposed of in a manner

acceptable to the Employer's Agent and shall be replaced by the Contractor with materials acceptable to the Employer's Agent, all at the Contractor's cost."

PSD 5.2.5 Transport for earthworks

REPLACE THE CONTENT OF SUBCLAUSE WITH THE FOLLOWING:

"The transport of all excavated materials, irrespective of the distance and source, shall be deemed to be free-haul, the cost of which is included in the Contractor's tendered rates and prices for the excavation of the materials. No separate compensation shall apply for the transportation of excavated materials."

PSD 7 TESTING

PSD 7.2 TAKING AND TESTING OF SAMPLES

REPLACE THE CONTENT OF THIS SUBCLAUSE WITH THE FOLLOWING:

"The Contractor shall arrange with the approved independent laboratory by the Contractor to carry out sufficient tests on a regular basis as agreed between him and the Employer's Agent to determine whether the degree of compaction, and, where applicable, the quality of materials used, comply with the specifications and shall submit the results of these tests to the Employer's Agent in a form approved by him.

The compaction requirements for fills shall be deemed complied with when at least 75% of the dry-density tests on any lot show values equal to or above the specified density and when no single value is more than five percentage points below the specified value."

PSD 8 MEASUREMENT AND PAYMENT

PSD 8.3 SCHEDULED ITEMS

PSD 8.3.1 Site preparation

REPLACE SUBCLAUSES 8.3.1.1 AND 8.3.1.2 WITH THE FOLLOWING:

"Where site preparation such as clearing, grubbing, the removal of large trees or the removal and stockpiling of topsoil is required, the provisions and scheduled items of SANS 1200 C shall apply."

PSDB EARTHWORKS (PIPE TRENCHES)

PSDB 3 MATERIALS

PSDB 3.5 BACKFILL MATERIALS

ADD THE FOLLOWING PARAGRAPHS TO SUBCLAUSE:

"(c) Cement-stabilised backfilling

Backfilling shall, where directed by the Employer's Agent, be stabilized with 5% cement. The aggregate shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed with 5% cement and shall be compacted in layers of 100 mm thick to 90% of modified AASHTO density.

(d) Soil-crete backfilling

The aggregate for soil-crete shall be mixed with 5% cement and shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed in a concrete mixer with the cement and enough water to acquire a consistency that allows the mixture to be placed with vibrators to fill all voids between the pipe and the sides of the trench. Shuttering shall be used where necessary."

PSDB 3.7 SELECTION

REPLACE THE WORDS "If he so wishes" *IN THE FIRST LINE OF THE SECOND PARAGRAPH WITH THE WORDS* "at his own cost."

PSDB 5 CONSTRUCTION

PSDB 5.1 PRECAUTIONS

PSDB 5.1.2 Stormwater, Seepage and Dewatering of Excavation

PSDB 5.1.2.3 Sloping ground

ADD THE FOLLOWING SENTENCE AT THE END OF THE PARAGRAPH:

"All trench excavations on sloping embankments shall be backfilled in accordance with 5.6.2 over the full extent of the actual trench excavation and to the original embankment ground level."

PSDB 5.1.3 Accommodation of traffic and access to properties

REPLACE THE SEMICOLON AND THE WORD "and" *AT THE END OF THE SUBCLAUSE 5.1.3 (a) WITH A FULL STOP AND REPLACE ITEM (b) WITH THE FOLLOWING:*

"(b) Where necessary to achieve compliance by the Contractor with his obligations to provide and maintain pedestrian and vehicular access to properties affected by the works, the contractor shall construct and maintain to the satisfaction of the Employer's Agent, such temporary access roads around, and/or steel or timber bridges over excavations in roads, pavements, entrances or accesses to properties.

The Contractor shall make available on site at all times a sufficient number of steel plates at least 2.0m x 2.0m x 8mm thick to be laid across open trenches to provide access to private properties. The cost of providing, placing and removing the steel plates shall be included in the rates for trench excavation.

On completion of the work, the Contractor shall dismantle and remove all such temporary constructions and reinstate these areas to their former condition.

Except only where the Employer's Agent has included in the Schedule of Quantities, particular payment items specifically therefore, the Contractor will not be paid directly for the construction and maintenance of temporary access roads and/or the provision and maintenance of bridges as aforementioned, and the costs thereof shall be deemed included in the Contractor's tendered rates for excavation."

ADD THE FOLLOWING NEW SUBCLAUSE TO SUBCLAUSE 5.1:

PSDB 5.1.5 Removal of existing pipelines

Where existing pipes have to be removed, they shall be carefully opened up by machine excavation to 300 mm above the pipes after which the whole pipe shall be fully exposed by means of hand excavation. The excavation width shall comply with subclause 8.2.3.

The pipes shall be removed from the trench in a manner approved by the Employer's Agent, and brought to the surface for inspection by the Employer's Agent.

Pipes that are declared suitable for reuse and pipes declared unfit for reuse shall be dealt with in an applicable manner described in the specifications, or on the Drawings or on the Employer's Agent's instructions, as relevant."

PSDB 5.2 MINIMUM BASE WIDTHS

ADD THE FOLLOWING SUB PARAGRAPH TO:

c) Should the excavated trench width exceed the specified side allowance on each side of the pipe of 300mm by a value greater than 300mm, remedial measures shall be as directed and shall be provided at the Contractor's cost unless it can be shown that such excess width is due to factors beyond the Contractor's control.

Trench widths should be as near vertical as possible in order to minimize the quantity of selected fill material to be provided."

PSDB 5.4 EXCAVATION

ADD THE FOLLOWING SUB CLAUSES:

PSDB 5.4.1 Principles

"a) The cost of trimming excavations by hand or machine shall not be paid for separately but shall be included in the rates tendered for excavation.

b) All excavated material shall be kept within defined limits and shall, wherever possible, be deposited alongside the trench. The material shall be deposited so as to leave a clear strip of at least one metre between the edge of the trench and the excavated material and shall not cause undue inconvenience to traffic and property owners. The material shall be placed and kept well clear of all manhole covers, culvert in- and outlets, fire hydrants, benchmarks, stand pegs, fences, etc.

c) To prevent vertical trench walls from collapsing, excavated material shall, wherever possible, not be stacked on the side of any underlying strata sloping down towards the trench and in this regard attention is specifically drawn to the shales sloping south to north in the Pretoria area.

d) Excavations more than 1,5 m deep shall be adequately shored or braced to support the overhanging material and other loads which may occur. If the Contractor is of the opinion that shoring or bracing for an excavation of depth of more than 1,5 m is not necessary, he shall notify the Employer's Agent accordingly in writing, including a report from a Professional Engineer or a Professional Technologist competent in excavations. The report shall include the relevant laboratory tests.

e) The Contractor shall provide all the open and close timbering, strutting and shoring required for the safety of the excavations and structures adjacent to the trenches, and shall be solely and wholly responsible for ensuring the adequacy of these measures for this purpose.

Without in any way affecting or detracting from the Contractor's responsibility, the Employer's Agent shall have the right to instruct the Contractor to provide additional or improved timbering, shoring or strutting where he considers this to be necessary. The Contractor shall have no claim for additional payment on this account.

The shoring method adopted shall be compatible with the soil type and the excavating, backfilling and pipe-laying methods adopted and shall not place any undue restrictions on the laying of the pipes.

Timbering and shoring shall be left in position until the Employer's Agent has authorised their removal.

f) Shoring and bracing may not be necessary where the Contractor elects to slope the sides of the excavation to at least the maximum angle of repose measured relative to the horizontal plane, as determined by laboratory tests. Sloping of the sides could be combined with steps. The Contractor will submit the proposed excavation profile to the Employer's Agent for approval.

g) The cost for shoring, bracing and sloping of the sides will be included in the rates tendered for excavation. The cost for the services of a Professional Engineer or a Professional Technologist, including the relevant laboratory costs, shall be included in the tendered rates.

h) The Safety Officer, or another competent person appointed by the Contractor in writing, shall inspect every excavation, including bracing and shoring:

(i) daily, prior to each shift;

(ii) after every blasting operation;

(iii) after an unexpected fall of ground;

(iv) after substantial damage to supports; and

(v) after rain,

in order to pronounce the safety of the excavation to ensure the safety of persons, and those results are to be recorded in a register kept on site and made available to an inspector, the Employer, Employer's Agent, Contractor or employee upon request;

i) Each excavation which is accessible to the public or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered, shall be

(i) adequately protected by a barrier or fence of at least one metre in height and as close to the excavation as is practicable; and

(ii) provided with warning illuminants or any other clearly visible boundary indicators at night or when visibility is poor."

PSDB 5.4.2 Hand Excavatability

PSDB 5.4.3 Excavation of Asphalt Surfaces

The existing asphalt road surfacing shall be saw-cut prior to excavation commencing for the full width of the trench as specified on the construction drawings so as to ensure a neat finish to the reinstated surfacing.

PSDB 5.6 BACKFILLING

PSDB 5.6.3 Disposal of Soft Excavation Material

DELETE THE EXISTING CLAUSE AND REPLACE WITH:

"The Contractor shall locate and negotiate for tipping sites for the disposal of surplus material and bear all costs in connection therewith. Arrangements for the consent of the owner of a property to deposit spoil and or temporary spoil thereon shall be confirmed in writing. Such arrangements shall be approved before being implemented. All spoil sites shall be neatly finished off and compacted to 90% of MOD.AASHTO density."

PSDB 5.6.6 Completion of Backfilling

ADD THE FOLLOWING:

Backfilling should not lag more than 50m behind the laying operation.

PSDB 5.7 COMPACTION

ADD THE FOLLOWING:

"Where pipelines cross existing gravel roads, backfilling shall be carried out as specified in Subclause 5.7.2 and payment therefore will be made under sub item 8.3.3.3."

PSDB 5.9 REINSTATEMENT OF SURFACES

ADD THE FOLLOWING TO THIS SUB CLAUSE:

PSDB 5.9.2 Private Property and Commonage

The ground and paved surface of servitudes, parks, driveways, roadways and sidewalks shall be reinstated to at least the standard and conditions as existed previously.

Grass sods shall be cut out from the grassed areas to be excavated and shall be set aside, preserved and kept damp until used for reinstatement. All other material to be used for reinstatement shall be suitably stored for such purpose.

The rate for reinstatement of block paved surfacing shall include all costs for the supplying and laying of the surfacing. The rate shall also cover for taking brick paving out carefully, stockpiling and replacement with new if bricks are broken or damaged. The rate must furthermore provide for all plant, labour and material costs associated with the work.

The rate for reinstatement of asphalt or concrete paved surfacing shall include all costs for the saw cutting, supplying and laying of the surfacing. The rate shall also cover for removal and spoiling of the material. The rate must furthermore provide for all plant, labour and material costs associated with the work.

The width of any trench through an area paved with bricks or precast concrete units shall be the minimum practicable width that, in the opinion of the Employer's Agent, can be removed without cutting bricks or precast units.

PSDB 5.9.4 Bitumen roads: Sub-base and Base

DELETE THIS SUB CLAUSE AND REPLACE WITH THE FOLLOWING:

Johannesburg Roads Agency will reinstate all asphalt surfaces. Refer to PS 6.7.

ADD THE FOLLOWING NEW SUB CLAUSES:

PSDB 5.9.7 Construction of Layers for Footways

The reinstatement of the paving blocks shall be the responsibility of the Contractor. The reinstatement and backfilling of pavement layers shall be done in accordance with PS 6.7

ADD THE FOLLOWING NEW SUB CLAUSES:

PSDB 5.9.8 Existing Kerbs and Channels

"Where excavations have to cross existing kerbs and channels, then:

a) In the case of a precast kerb and channel the kerb, segmented paving blocks and channel shall be carefully removed and stored so as to avoid any damage to or theft of the kerb and channel, and replaced after the excavation has been backfilled. Any damage to or theft of the kerb and channel shall be made good by the Contractor at his expense.

b) In the case of cast insitu or extruded insitu kerb and channel the kerb and channel shall be cut with a diamond tipped saw and carefully removed so as to avoid any damage to the remaining kerbs and channels. After the excavation has been backfilled the portion of kerb and channel removed shall be replaced with a cast insitu kerb and channel of the same profile as the existing kerb and channel."

ADD THE FOLLOWING NEW SUB-CLAUSE:

PSDB 5.11 LOCATION OF EXISTING SERVICES

Positions and details of known existing services as received from the various Departments are indicated on the Construction Drawings. Exact positions cannot be guaranteed by The Employer who will not be held responsible for any damages to any services. The Contractor shall excavate by hand to locate any such services and ensure that care is taken not to damage these services.

ADD THE FOLLOWING NEW SUB-CLAUSE:

PSDB 5.12 DEALING AND PROTECTING EXISTING SERVICES

All existing services, underground as well as above ground level, shall be protected by the Contractor in an appropriate manner, for the duration of the construction or as deemed necessary by the Employer's Agent, such that no damage to or interruption of the services shall occur.

ADD THE FOLLOWING NEW SUB-CLAUSE:

PSDB 5.13 GAS MAIN, ELECTRICITY AND TELECOMMUNICATION POLES

Gas mains, electricity and telecommunication poles along the pipe route are to be stabilized and protected prior to excavation and for the duration of construction.

ADD THE FOLLOWING NEW CLAUSE:

PSDB 5.14 TREES IN CONSTRUCTION PATH

Whenever possible any trees that lie within the construction path, shall not be removed and care shall be exercised to avoid damaging them. If the Contractor considers the removal of any tree unavoidable he/she shall obtain in writing the approval of the Employer's Agent and the Environmental Consultant prior to removal of any trees. Rates to cover removal and replacement where practical are provided in the schedule of quantities. A penalty of R2, 000.00 will be applied for any unauthorized or unnecessary damage to any tree which in the opinion of the Employer's Agent could have been avoided.

ADD THE FOLLOWING NEW SUBCLAUSE 5:

PSDB 7 TESTING

ADD THE FOLLOWING NEW SUBCLAUSE:

PSDB 7.2 <u>Inspection at Intermediate Stages of Construction</u>

The Contractor shall call the Employer's Agent, giving him reasonable notice, to inspect the works at the following intermediate stages of construction:

a) After completion of the trench excavation and preparation of the trench bottom and before any pipe is laid.

b) After the selected backfill material has been placed around the pipe and before the remainder of the trench is backfilled.

c) Before placing of premix on roads or any final surfacing on constructed footways. Work shall not progress through the specified stages without the approval of the Employer's Agent or his representative on site.

Failure to comply with the provision of this clause shall result in the suspension of the backfilling work until the testing has been approved by the Employer's Agent."

PSDB 8 MEASUREMENT AND PAYMENT

PSDB 8.1 BASIC PRINCIPLES

ADD THE FOLLOWING PRARGRAPH:

"The basic principle of measurement and payment for earthworks for a pipe trench is that the rates tendered for excavation shall also cover the cost of trimming, handling and shoring or bracing as specified in clause PSDB 5.4".

PSDB 8.3 SCHEDULED ITEMS

PSDB 8.3.2 Excavation

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

ADD THE FOLLOWING SUB-ITEM:
The rate shall also cover the cost of excavating for trenches using labour intensive construction methods. The rate shall exclude the cost of removal of grass sods but shall include for the disposal of surplus/unsuitable material. The rate shall, in addition, cover the costs for compliance with the requirements of PSDB 5.4.1.

b) Extra over item (a) above for:

ADD THE FOLLOWING AT THE END OF THE EXISTING SUB-ITEM 2:

"No payments will be made under sub items (1) and (2) in respect of any materials measured and paid for under sub item 3 below."

AND ADD THE FOLLOWING NEW SUBITEMS IN 8.3.2(b):

"(3) Hand excavation and backfill where ordered by the Employer's Agent ……Unit: m^3

The unit of measurement shall be the cubic metre of material, measured in place according to the authorized dimensions, which was excavated by the hand on the specific prior written instructions of the Employer's Agent; provided always that the Employer's Agent's said instruction shall have stated that measurement and payment for such hand excavation will be in accordance with this item.

The tendered rate shall include full compensation for the additional cost, effort and time resulting from excavating in the respective materials using hand methods only.

The Employer's Agent shall not be obliged to authorize payment under this item in respect of any hand excavation carried out (whether ordered in writing or otherwise), which hand excavation was in any case necessary to achieve compliance by the Contractor with his obligations under the Contract to

(i) utilize construction appropriate to the nature of the specific parts of the works; and/or

(ii) protect existing structures and/or services; and/or

(iii) comply with all prevailing legislation and regulations.

(4) Cutting of premix and concrete surfaces…..……..…Unit: m^2

The cutting of premix and concrete surfaces shall be measured per square metre of cut as scheduled. Cutting of premix and concrete surfaces shall be done with a diamond

tipped saw or by some other approved method. The depth of the cut shall be such that the adjoining premix and concrete surfaces are not disturbed when excavation takes place. The cutting of surfaces shall be done 100mm on either side of the trench.

(5) Backfill stabilized with 5% cement where directed by the Employer's Agent…..Unit: m^3

The unit of measurement shall be the cubic metre of backfill material, measured in place after compaction according to the authorised dimensions, which was stabilised on the Employer's Agent's instructions in accordance with subclause PSDB 3.5(c).

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing, backfilling and compacting the stabilised material to 90% of modified AASHTO density.

(6) Soil-crete backfill where directed by the Employer's Agent ……Unit: m^3

The unit of measurement shall be the cubic metre of soil-crete placed on the Employer's Agent's instructions in accordance with subclause PSDB 3.5(d), measured in place according to the authorised dimensions.

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete as well as for the cost of shuttering if required."

PSDB 8.3.3 Excavation ancillaries

PSDB 8.3.3.3 Compaction in road reserves

REPLACE THE HEADING OF THIS SUBITEM WITH THE FOLLOWING:

"PSDB 8.3.3.3.3 Compaction in road crossings"

*REPLACE THE SENTENCE, "*The volume will be measured as specified in 8.2.2, 8.2.3 and 8.3.3.1"*, WITH THE FOLLOWING:*

"To determine the volume in the case of gravel roads, the depth will be measured from the underside of the gravel wearing course to the top of the fill blanket, and in the case of bitumen roads, from the underside of the subbase to the top of the fill blanket.

The rest of the trench shall be backfilled as specified in clauses 5.9.3, 5.9.4 and 5.9.5, as applicable, and payment will be made under item 8.3.6.1."

PSDB 8.3.3.4 Overhaul

REPLACE THE CONTENTS OF THIS ITEM WITH THE FOLLOWING:

"Measurement and payment shall be in accordance with subclause PSD 5.2.5."

PSDB 8.3.4 Particular items

PSDB 8.3.4(a) Shore trench opposite structure or service

REPLACE THE HEADING OF THIS SUBITEM WITH THE FOLLOWING:

PSDB 8.3.4(a) Shore trench opposite structure or service for depths:"

ADD THE FOLLOWING AFTER THE LAST SENTENCE:

"Separate items will be measured for depths of trenches in increments of 1 m. The rate for each stated category shall cover the cost of shoring from ground level up to the full depth of the stated category. Payment for this item will only be made if written instructions were issued by the Employer's Agent over and above the Standard Specifications for safety of excavations as specified in SANS 1200 DB, subclause 5.1."

PSDB 8.3.4(b) Temporary works: Control water inflow from …….. to ……..

REPLACE THIS SUBITEM WITH THE FOLLOWING:

PSDB 8.3.4(b) Accommodation of existing flows for temporary or permanent connections or construction of new structures or pipe trenches:

1) (Description of item stated) …… Unit: Sum

2) Etc for other structures

The tendered sums shall include full compensation for any inconvenience suffered, for normal and exceptional risks, for unforeseen eventualities and for maintaining the accommodated flow as long as necessary and shall include for the design and construction of all necessary temporary measures such as additional clearing, grubbing, earthworks, culverts, structures, pipework, pumping, cleaning up and any other associated work that may be required as specified in Clause PS1.5. Where a temporary structure for the

accommodation of an existing flow has been designed by the Employer's Agent and is to be constructed by the Contractor, payment for such structure shall, unless otherwise stated in the scheduled item, be made under the applicable sub items in this payment item."

PSDB 8.3.5 Existing services that Intersect or Adjoin a Pipe Trench

PSDB 8.3.5 a) Services that intersect a trench

ADD TO THE FIRST SENTENCE OF THIS SUB CLAUSE AS FOLLOWS:

After "Except where water pipes are to be recovered" add "*and water leads for erf connections need to be renewed*"

ADD THD NEW SUBCLAUSE PSDB 8.3.5 c) TO CLAUSE 8.3.5 AS FOLLOWS:

PSDB 8.3.5 c) Services that require special care

1) Description of service……Unit: No

2) Etc for other items……Unit: No

The Unit of measurement shall be the number of each service described. Electricity, telecommunication poles and water mains along the pipe route are to be stabilised and protected prior to excavation and for the duration of construction. The rate shall cover the temporary stabilization and protection of electricity and telecommunication poles.

ADD THD NEW SUBCLAUSE PSDB 8.3.6.2 TO CLAUSE 8.3.6 AS FOLLOWS:

PSDB 8.3.6.2 Reinstatement of surfacing for footways

a) Brick paving …….. Unit: m²

b) Concrete paving …….. Unit: m²

c) Concrete slabs …… Unit:. m²

The Unit of measurement shall be square metre of a reinstated. The rate for reinstatement of footway surfacing shall include all costs for careful removal, replacement of damaged sections and laying of the surfacing using labour intensive construction methods. The rates shall include for the lifting, stockpiling and replacement of broken or damaged bricks, blocks or slabs and shall provide for all plant, labour and material costs associated with the work.

The width of any trench through an area paved with bricks or precast concrete units shall be the minimum practicable width which, in the opinion of the Employer's Agent, can be removed without cutting bricks or precast units.

ADD THE NEW SUBCLAUSE PSDB 8.3.6.3 TO CLAUSE 8.3.6 AS FOLLOWS:

PSDB 8.3.6.3 Reinstatement of kerbs and channels……Unit: m²

The unit of measurement shall be square metre of area reinstated. The rate shall cover the cost of all labour, plant and material required and shall also include for the disposal of all unsuitable materials.

ADD THD NEW SUBCLAUSE PSDB 8.3.6.3 TO CLAUSE 8.3.6 AS FOLLOWS:

PSDB 8.3.6.4 Reinstatement of grassed surfaces ……Unit: m²

The unit of measurement shall be square metre of area reinstated. The rate shall cover the cost of careful removal of grass sods to a minimum depth to a minimum depth of 100mm, stockpiling, maintenance for later re-use and reinstatement thereof."

DELETE THIS SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

PSDB 8.3.6.5 <u>Reinstatement of fence</u>

a) Description of fence……Unit: m

b) Etc for other items

The unit of measurement shall be the metre of fence reinstated complete. The rate shall cover the full compensation, labour, material and ancillary works for the reinstatement.

PSDK GABIONS AND PITCHING

PSDK 3 MATERIALS

PSDK 3.2 Pitching

PSDK 3.2.1 Stone

REPLACE THE CONTENTS OF TABLE 2 WITH THE FOLLOWING:

"TABLE 2 SIZE AND MASS OF INDIVIDUAL STONES FOR PITCHING

1	2	3	4
Size/mass of pitching	Thickness of pitching Mm, min	Least dimension Mm, min	Mass kg, min
Extra heavy	600	300	180
Heavy	400	190	50
Medium	300	150	27
Light	200	110	11

PSDK 5 CONSTRUCTION

PSDK 5.3.3 Grouted pitching

REPLACE THE WORDS "(Table 4)" *IN THE SECOND LINE OF THE FIRST PARAGRAPH WITH* "(Table 2)"

PSG CONCRETE STRUCTURAL

PSG 3 MATERIALS

PSG 3.2 CEMENT

PSG 3.2.2 Alternative types of cement

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Only sulphate resistant cement shall be used on this project.

If the Contractor wishes to use any other type of cement, he shall obtain the Employer's Agent,s prior written approval (see 8.1 .3 .2 and 8.1.3.3.) The tendered rates, however, shall be based on the use of sulphate resistant cement only".

PSG 3.2.3 Storage of cement

ADD THE FOLLOWING:

"Cement shall not be store for longer than 12 weeks without the Employer's Agent's permission".

PSG 3.4 AGGREGATES

ADD THE FOLLOWING SUBCLUASE:

PSG 3.4.4 Aggregate of dolomatic origin

All aggregates for structural concrete, manholes, pipe encasement, pipe bedding cradles, mass filling, etc. shall be of dolomatic origin. The quantity of insoluble matter in respect of concrete made with aggregates of dolomatic origin, determined according to the method described in SANS 677, Appendix C, shall not be more than 15%.

PSG 4 PLANT

PSG 4.1 GENERAL

ADD THE FOLLOWING SUBCLAUSE

PSG 4.1.1 Minimum Plant

The contractor shall have the following minimum Plant available and in sound working order:

(a) Two concrete mixers, each of sufficient capacity to complete a section off the wall between horizontal construction joints within 4 hours and without interruption;

(b) Two concrete vibrators, at least one of which shall be powered by an internal combustion engine;

(c) One air compressor;

(d) Storage tanks at the water carts or trucks are adequate capacity to ensure that sufficient water will be available before commencement of every major concrete-placing operation.

If the Plant used for placing concrete for the structure of electrically or mechanically powered, the Contractors shall also provide some other approved, non- electrically powered standby

means for placing concrete at an adequate rate in the event of a power or mechanical failure of the main Plant.

When the Contractor elects to place a crane inside the walls of the structure during the construction period, shall communicate with the Employer's Agent in good time to ensure that the design and layout of the panels that form the roof slabs and floor allow for such positioning of the crane. When sections of the roof and floor have to be redesigned to accommodate the crane, the redesigned cost shall be borne by the Contractor.

PSG 4.5 FORMWORK

PSG 4.5.1 Design

ADD THE FOLLOWING:

All form work with scaffolding required for any part the works shall be designed by the Contractor, and before commencing with the erection of any formwork or scaffolding, the Contractor shall submit the methods he proposes to use to the Employer's Agent for approval. The Employer's Agent has the authority to order alterations to the design or the sizes of any part of the formwork or scaffolding. The Contractor shall check the safety and suitability of all such alterations. The fact of the Employer's Agent has approved or altered any part of the formwork of scaffolding shall not be construed as relieving the Contractor of his responsibility with regard to the strength and stability of the formwork or scaffolding.

PSG 4.5.3 Ties

ADD THE FOLLOWING:

"No plugs, bolts, ties or clamps of any description used to hold formwork will be allowed into the project or through the concrete unless expressly approved by the Employer's Agent.

Only approved tie-rods consisting of solid rods (that remain embedded in the concrete) and with removable ends shall be used to hold the formwork of the walls. The removable tie-rod ends shall facilitate removal without damage to the concrete, and no permanently embedded parts of such tie-rods shall have less than 50mm of cover to the finished concrete surface.

The cavities left in the concrete when the tie-rod end cones are removed shall soundly caulked with a cement mortar to which an approved shrinkage-reducing agent has been added, and shall be neatly to finished to a smooth surface uniform with that of the surrounding concrete.

The cost of supplying special tie-rods as well as the filling of the cavities left by the tie-rod cones shall be included in the rates tendered for formwork under the appropriate pay items.

On no account shall formwork be secured to reinforcing bars".

PSG 5 CONSTRUCTION

PSG 5.1 REINFORCEMENT

PSG 5.1.2 Fixing

ADD THE FOLLOWING:

"The Employer's Agent will inspect the reinforcing after it has been fixed in place, the formwork has been cleaned, cover blocks have been positioned, and before concreting commences.

Welding of reinforcing steel will not be permitted".

PSG 5.1.3 Cover

ADD THE FOLLOWING:

"The distance between pipes in the reinforcing steel shall nowhere be less than:

(a) 40 mm or

(b) 5 mm plus the maximum size of the coarse aggregate, whichever is the largest

PSG 5.2 FORMWORK

PSG 5.2.5 Removal of formwork

ADD THE FOLLOWING SUBCLAUSE:

PSG 5.2.5.6 The Contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and/or for that propping of beams and slabs".

PSG 5.3 HOLES, CHASES AND FIXING BLOCKS

ADD THE FOLLOWING:

"Cover blocks for reinforcing and fixtures may be placed into the concrete provided that neither the strength nor any other desirable characteristics (such as the appearance) of the concrete section is affected or impaired in the opinion of the Employer's Agent.

The holes or cavities left by the ferrule heads in the concrete of water-retaining structures shall be filled with an approved non-shrink grout applied strictly in accordance with the manufacturer's specifications."

PSG 5.4 PIPES AND CONDUITS

ADD THE FLLOWING:

"All pipes passing through to concrete floors, walls or slabs shall be cast into a concrete member simultaneously with the casting of the member. Openings for pipes shall only be left in concrete members when so directed by the Employer's Agent or when shown on the drawings. Pipes shall be installed in such openings according to the details shown on the drawings.

If water tightness is a requirement where pipes are cast into walls, floors and slabs, the Contractor shall ensure water tightness where smooth-surfaced pipes are used by using an approved method such as tape wrapping the pipes prior to casting in. The cost of such method will be deemed to be included in the rates tendered for item PSG 8.10".

PSG 5.5 CONCRETE

PSG 5.5.1 Quality

PSG 5.5.1.5 Durability

The exposure conditions of the concrete are classified as "severe".

PSG 5.5.1.7 Strength concrete

ADD THE FOLLOWING:

"The concrete mixes for sulphate resistant cement shall be designed by an approved laboratory for approval by the Employer's Agent before commencement of any concrete work".

PSG 5.5.3 Mixing

PSG 5.5.3.2 Ready-mixed concrete

ADD THE FOLLOWING:

"Ready-mixed concrete may be used on the Site. The contractor shall take samples for testing from every load delivered to the Site".

PSG 5.5 5 Placing

ADD THE FOLLOWING SUBCLAUSE:

PSG 5.5.5.10 "Concreting of the wall between horizontal construction joints shall be carried out in both directions from a point on the wall in order to close the gap with fresh concrete".

PSG 5.5.7 Construction joints

ADD THE FOLLOWING:

"Horizontal construction joints are permitted in structure walls in positions indicated on the drawings or approved by the Employer's Agent. Vertical construction joints in the wall are subject to the written approval of the Employer's Agent and the cost of all such vertical or horizontal construction joints will be deemed to be included in the rates for cast-in-situ concrete. This also applies to the preparation of concrete to form construction joints in the flume walls as specified on the drawings.

The construction joints in water-retaining structure shall be made strictly in accordance with the details shown on the drawings. The joints between screeds and concrete floors shall be regards as construction joints and the surface of the floor shall be prepared as described for construction joints.

Should the Contractor's method of construction necessitate the placing of construction or other joint in a position not shown on the drawings, such method of construction and position of the joint shall be approved by the Employer's Agent in writing. The cost of such joint shall be included in the tendered rates and shall include scrabbling of the concrete where steel reinforcement is continuous.

The walls shall be cast in lifts of height that permits each lift to be poured without interruption in one continuous operation during working hours.

It is the Contractor's responsibility to ensure that construction joints are watertight. The Contractor's proposed method for ensuring the watertightness of such joints shall be submitted to the Employer's Agent for his approval.

For construction joints at kickers all additional costs for concrete, preparation, etc will be deemed to be included in the rates tendered for concrete in walls or sides and kicker joints or construction joints will not be measured separately".

PSG 5.5.8 Curing and protection

ADD THE FOLLOWING:

"Curing by retaining the formwork in place or by covering with a waterproof membrane are the curing methods strongly recommended. Concrete will not be paid for unless properly cured and proof of curing is continuously visible on the Site".

PSG 5.5.11 Watertight concrete

ADD THE FOLLOWING:

"The minimum cement content in water-retaining structures shall be 325 kg/m³, and the maximum cement content shall be 450 kg/m³ in reinforced concrete."

The maximum water cement ratio for water-retaining structures shall be more 0, 50".

ADD THE FOLLOWING SUBCLAUSE:

PSG 5.5.16 Soilcrete

Where soilcrete is specified for filling under floor slabs the soilcrete shall comply with the requirements of subclause PSDB 3.5 (d) of section 1200 DP as amended and shall be placed as specified in this subclause.

PSG 6 TOLERANCES

PSG 6.2 PERMISSIBLE DEVIATIONS

PSG 6.2.3 Specified permissible deviations

ADD THE FOLLOWING:

"Degree of accuracy II is applicable

Every specified permissible deviation is binding in itself. The cumulative effect of permissible deviations will not be considered. The maximum permissible vertical deviation is subject to the other permissible deviations".

REPLACE SUBCLAUSE 6.2.3 (D)(5) WITH THE FOLLOWING:

	Permissible deviation		
	Degree of accuracy		
	III	II	I
	mm	mm	mm
"Vertically, per metre of height	5	3	2
Subject to a maximum	50	30	10

PSG 7 TESTS

PSG 7.1 FACILITIES & FREQUENCY OF SAMPLING

PSG 7.1.1. Facilities

ADD THE FOLLOWING:

"The Contractor shall provide sufficient storage capacity for the concrete cubes and shall arrange to have them tested by an approved laboratory.

The cost all testing, including the cost of sampling, storage and transporting samples should be included in the rates tendered for concrete work".

PSG 7.3 ACCEPTANCE CRITERIA FOR STRENGTH CONCRETE

ADD THE FOLLOWING:

"Test results obtained from the supplier of ready-mix concrete will not be accepted for evaluation in terms of subclause 7.3, but samples for testing shall be taken off such concrete at the point of placing ".

ADD THE FOLLOWING SUBCLAUSE:

PSG 7.3.6 Testing for watertightness

Water for testing shall be provided by the Contractor and shall be responsible for providing all necessary equipment that may be required for filling the structures.

The structure shall be filled with water at a uniform rate not exceeding 2.0 m in 24 hours until the top water level been reached. The water level will then be carefully noted and recorded by the Employer's Agent in relation to a fixed benchmark, and shall be contained by the addition of further water for a sterilising period to permit complete absorption of water by the concrete.

The sterilising period may be 7 days for a maximum design crack width of 0.1mm or 21 days for 0.2mm or larger. After the sterilising period, the level of the liquid surface shall be recorded at 24-hour intervals for a test period of 7 days. During the 7 day test period the total permissible drop in level, after allowing for evaporation shall not exceed 1/500 the one of the average water depth of the full tank, or 10 mm.

The evaporation shall be measured by the mean drop in level caused by the evaporation of the water in three flat containers floating in the water being recorded.

In the event of appreciable leakage being evident at any of the stages of the filling or testing or the event of the Employer's Agent considering the final degree of water tightness to be unsatisfactory, the contractor when ordered by the Employer's Agent shall discontinue such filling or testing and shall, at his own expense, take approved steps immediately to rectify the leakage, until a satisfactory test is obtained, which shall prove to the Employer's Agent that a sufficient degree of watertightness has been obtained.

The cost of emptying a water-retaining structure which cannot be drained shall be borne by the Contractor. The water shall be discharged in a manner approved by the Employer's Agent and shall be such that the employer can utilise the water is he so desires.

The water shall not be used as a medium for addictives to affect remedial work or to stop leaks.

The cost of retesting the structure for watertightness shall be borne by the Contractor".

PSG 8 MEASUREMENT AND PAYMENT

PSG 8.1 MEASUREMENT AND RATES

PSG 8.1.1 Formwork

DELEAT "or splays over 20 mm x 20 mm" FROM THE FIRST LINE OF PARAGRAPH 8.1.1.2

ADD THE FOLLOWING PARAGRAPH 8.1.1.2

"Splays up to and including 25 mm x 25 mm will not be measured separately and will be deemed to be included in the formwork costs".

ADD THE FOLLOWING PARAGRAPHS

"8.1.1.7 For construction joints at kickers (joint F), all additional costs for formwork to edges up to 300 mm high will be deemed to be included in the rates tendered for vertical formwork to sides of walls and will not be measured separately in narrow width.

8.1.1.8.1 No formwork will be measured to edges of blinding layers under structures and the cost thereof (if needed), will be deemed to be included in the rates tendered for concrete in blinding layers.

8.1.1.8.2 Back-shuttering or formwork to top revealed surfaces of sloping - or conical formwork will only be measured to surfaces over 40° and 85° to the horizontal.

8.1.1.8.3 Formwork to horizontal surfaces in pump stations, valve chambers, man holes or sumps can either be removed through the manhole cover opening or the Contractor may use permanent formwork at his own cost as no claims in this regard will be considered".

PSG 8.1.2 Reinforcement

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"The unit of measurement for steel bars shall be the ton of reinforcement in place, in accordance with the Drawings or as authorised by the Employer's Agent.

The unit of measurement for welded steel fabric shall be the kilogram of fabric reinforcement in place, and the quantity shall be calculated from the net area covered by mesh, excluding overlaps.

Clips, ties, separators, stools and other steel used for positioning reinforcement will not be measured, unless these are shown on the bending schedules.

The tendered rate shall include full compensation for the supply, delivery, cutting, bending, welding, placing and fixing of the steel reinforcement, including all tying wire, stools, supports and waste".

PSG 8.1.3 Concrete

Delete "or the plank size of the excavation where additional excavation is provided to facilitate erection of forms" from the second line of paragraph 8.1.3.1(c).

PSL MEDIUM-PRESSURE PIPELINES

PSL 2 INTERPRETATIONS

PSL 2.4 ABREVIATIONS

ADD THE FOLLOWING:

HDPE : High density polyethylene

mPVC : Modified Polyvinyl chloride

PSL 3 MATERIALS

PSL 3.1 GENERAL

ADD THE FOLLOWING TO CLAUSE:

The contract specifications for materials and construction activities will conform to SANS 1200, SANS 1914-5 and Johannesburg Water requirements. The project specifications will include specific items to ensure proper implementation, control reporting on labour based construction and methods as included in the specifications.

Materials for this contract should preferably be obtained from manufacturers who operate an effective quality management system such as that described in SANS 0157 or ISO 9000.

PSL 3.4 STEEL PIPES, FITTINGS, AND SPECIALS

PSL 3.4.3 Pipes of nominal bore over 150mm

OMIT PARAGRAPH (C) AND INSERT THE FOLLOWING:

"Steel pipes and fittings shall be manufactured in accordance with SANS 719 and SANS 1476 for a minimum Grade x 421 300WA dual certified (yield strength of 289MPa). The wall thickness of the pipes and fittings shall be 6 mm. All pipes and specials shall be supplied complete with couplings and jointing material.

Straight joints and bends to be fillet welded on site.

Pipes and fitting to be externally coated with fusion bonded medium density polyethylene (sintakote) or polyclad 777 and lined internally with solvent-free epoxy lining or similar approved. Thickness of lining shall not be less than 250 micron and test certificates of the lining thickness must be furnished to the Employer's Agent for his approval. E128 external corrosion protection at joints.

Cathodic protection design will be done by a specialist and will be procured separately and construction will be as directed by the specialist.

The pipe manufacturer shall submit to the Employer's Agent the steel maker's certificates covering all steel used. These certificates shall indicate the process of manufacture, the chemical analysis and the physical properties of the steel except that, at the option of the pipe manufacturer, the physical properties of the steel may be determined from specimens taken from finished pipe."

PSL 3.7 OTHER TYPES OF PIPES

PSL 3.7.1 uPVC Pipes

ADD THE FOLLOWING TO THE SUB CLAUSE

"uPVC Pipe's systems shall conform to SANS 966-1998Part1 or II as applicable and have integral pipe end sockets of the rubber ring joint type. All uPVC - pipes shall be in 6m lengths. Fittings and specials for uPVC pipes shall be manufactured in Grade 14 cast iron, rated to at least 1600kPa working pressure. Unless otherwise specified fittings and specials shall be bitumen dipped.

PSL 3.7.2 Polyethylene Pipes

REPLACE THE SUBCLASE WITH THE FOLLOWING

"HDPE pipes of diameter up to and including 63 mm shall conform with SANS 4427 Part 2 for Type IV pipes. HDPE pipes greater than 63 mm shall conform with SANS 4427 Part 3 for Type V pipes. Unless otherwise specified, pipes shall be Class 16 and plain ended for butt welding".

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.7.3 uPVC Pipes

Class 16 uPVC high impact pipes shall conform to SANS 1283 (alternatively ISO 4422) shall be used unless otherwise indicated. Jointing shall be effected by means of approved "press-on" shouldered ends and cast iron and steel victaulic clamps. Unless otherwise specified, pipes shall be Class 16.

Where the cutting of any pipe is necessary, shouldered ends shall be fixed to the pipe by means of an approved machine capable of clamping the pipe without causing any damage to the pipe and pressing on the shouldered end by means of a hydraulic operated jack applying a uniform axial force to locate the shouldered end truly in position. The use of impact force to either the pipe or shouldered end will not be permitted. No on-site fixing of shouldered ends shall be permitted. "

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.7.4 mPVC Pipes

High impact mPVC Class 16 and shall conform to SANS 1283 for diameter up to and including 315mm with a fully end load restraint coupling system approved by Johannesburg Water.

PSL 3.8 JOINTING MATERIAL

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.8.2 Flexible couplings

OMIT THE EXISTING CLAUSE AND INSERT THE FOLLOWING:

"All flexible couplings shall be "Viking Johnson" couplings without centre register, or approved similar.

Rubber rings shall be of the wedge-type and shall be manufactured from natural or synthetic rubber only. Reclaimed rubber shall not be used in the manufacture of the rubber rings."

PSL 3.8.3 Flanges and accessories

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

"The dimensions and drilling of standard flanges shall comply with the requirements of SANS 1123 and SANS 1476 for a working pressure of 2500 kPa. Flanges shall be machined flat, i.e. without a raised joint face. Puddle flanges shall have the same dimensions as standard flanges but shall be undrilled. Flanges to be drilled according to Table 16.

Faces of flanges which will be in contact with jointing gaskets shall receive a protective coating of such thickness and consistence as will not impair the air/gas/water tightness of the joint."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.8.8 Victaulic joints

Joints for uPVC and medium steel pipelines shall conform to SANS 815: Standard specifications for shouldered end pipes, fittings and couplings.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.8.9 HDPE Pipe joints

Joints for HDPE pipe shall be by means of welding, welded flanges or approved external compression type fittings (Plasson or similar approved)."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.8.10 HDPE Pipe Welding

Only SAPPMA or ISO approved welders shall be used for welding HDPE pipes.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.9 CORROSION PROTECTION

PSL 3.9.2 Steel pipe

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

"All coating and linings, shall be completed strictly to the publication "Corrosion Protection for Civil, Mechanical and Electrical Employer's Agent 2000 Edition.

Pipes and fitting shall be externally coated with fusion bonded medium density polyethylene (sintakote) or polyclad 777 and internally with liquid epoxy lining or similar approved.

The thickness of the lining material shall not be less than 250 micron and test certificates of the lining thickness must be furnished to the Employer's Agent for his approval."

PSL 3.9.2.3 Repairs to epoxy coatings

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

PSL 3.9.2.3.1 General

(a) Where the damage is extensive the remedial procedures shall be agreed in writing with the Employer's Agent.

(b) All repairs shall comply with the requirements of the repair-product manufacturer's data sheet. The Employer's Agent may at his discretion request that repaired coating areas undergo adhesion tests.

(c) The Contractor shall repair any damage occurring during transport, on site during handling, assembly, storage, and erection.

(d) The repaired area shall be tested in accordance with Sub-Clauses 8.4 and 8.12 of SANS 1217 for compliance with the relevant requirements for thickness and electrical insulation defects respectively.

(e) Any item showing electrical insulation defects exceeding an average of five per square metre (a cluster of pinholes within a radius of 25 mm being regarded as a single defective area), or flaking or other signs of loss of adhesion, shall not be repaired. The item shall be blast cleaned and re-coated in accordance with the relevant requirements of the Clause PSL 3.9.2.3.3.

PSL 3.9.2.3.2 Repair Methods for Minor Defects

The repair of areas showing electrical insulation defects or low film thickness shall, if approved by the Employer's Agent, be carried out as follows:

(a) Degrease in accordance with Clause PSL 3.9.2.3.4.

(b) Thoroughly abrade the damaged area, including an adjacent surrounding area of at least 25 mm wide, with a medium grade 220 abrasive paper;

(c) Vacuum-clean the surface to remove dust and debris in accordance with SANS 5769.

(d) Wipe the abraded paint surface with methyl ethyl ketone and allow to dry, and

(e) Apply as many coats of the following repair material as necessary to achieve the specified thickness and finish.

(i) Solvent free epoxy; or
(ii) Fusion-bonded epoxy powder repair kit.

NOTE: Apply a final topcoat over the repaired area to achieve a pleasing, uniform finish of the item.

PSL 3.9.2.3.3 Repair Methods for Major Defects

The total un-coated areas for renovation by the applicator shall not exceed 0.5% of the total surface area of a component. Each un-coated area for renovation shall not exceed 2 500 mm². If damaged areas are larger, the items containing such areas shall be re-coated.

The repair of areas showing damage down to the steel surface shall, if approved by the Employer's Agent, be carried out as follows:

(a) Degrease in accordance with Clause PSL 3.9.2.3.4

(b) Blast-clean all damaged areas to Sa 3 (ISO 8501-1).

(c) Feather the surrounding paint for a distance of 25 mm beyond the damaged areas with a medium grade 220 abrasive paper.

(d) Vacuum-clean the surface to remove dust and debris in accordance with SANS 5769.

(e) Wipe only the abraded paint surface with methyl ethyl ketone and allow drying.

(f) Apply as many coats of the following repair material as necessary to achieve the specified thickness and finish.
(i) Solvent free epoxy or
(ii) Fusion-bonded epoxy powder repair kit.

NOTE: Apply a final topcoat over the repaired area to achieve a pleasing, uniform finish of the item.

PSL 3.9.2.3.4 Degreasing

(a) All surfaces to be coated shall be tested for oil and grease contamination by the water break free test.

(b) Oil and grease contamination shall be removed by:
- Steam-cleaning;
- An emulsifiable or aqueous detergent applied in accordance with SANS 1344; and
- An alkaline cleaning solution.

(b) Allow to react, and then rinse off with clean, potable water to remove all residues prior to surface preparation, all in accordance with Clauses 3.3 and 3.4 of SANS 10064.

(c) The surfaces shall be tested after degreasing and show no oil, grease and chemical contamination after degreasing.

(d) Care shall be taken to avoid entrapment of cleaning agents in recesses or other retention areas.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.9.2.4 REPAIR OF DAMAGED SINTAKOTE

PSL 3.9.2.4.1 General

Damaged Sintakote shall be repaired in accordance with the procedures detailed in the Tyco Handling and Installation Manual for steel pipeline systems for the repair of Sintakote or in accordance with clause 3.2 or clause3.3

PSL 3.9.2.4.2 REPAIR OF SMALL PINHOLE TYPE DEFECTS

PSL 3.9.2.4.2.1 Surface Preparation

- Clean and dry the area to be repaired including the removal of dirt, dust and other contaminants. Slightly roughen the area around the repair for a minimum distance of 50 millimetres using a coarse file or abrasive paper.
- Wipe the surface with a clean dry rag.

PSL 3.9.2.4.2.2 Priming

- Stir the primer to ensure complete mixing prior to application. Apply a thin even coat of Densopol Primer D around the area of repair using a paint brush or roller

- Allow the primer to tack dry(approximately 10 to 20 minutes)

PSL 3.9.2.4.2.3 Tape Wrapping

- Apply Deponsole 60 tape to the repair area ensuring a minimum of 50 mm overlap onto sound coating around the defect area.
- Apply Denso MP/HD P.V.C self adhesive over wrap tape around the full pipe circumference to completely cover the repaired patch.

PSL 3.9.2.4.3 REPAIR OF LARGE AREA OF DAMAGE WHERE STEEL IS EXPOSED

PSL 3.9.2.4.3.1 Surface preparation

Cut out the area of Sinkakote and clean the steel surface in accordance with AS1627.2.Clean and dry the area to be repaired .Slightly roughen the area around the repaired using a course file or abrasive paper. Wipe the surface clean with a dry clean rag.

PSL 3.9.2.4.3.2 Priming

- Stir the primer to ensure complete mixing prior to application. Apply a thin, even coat of Densopol Primer D onto the steel surface and around the periphery of the Sintakote.
- Allow the primer to track dry(Approximately 10 to 20 minutes)

PSL 3.9.2.4.3.3 Filling/Priming

- Cut out a piece of Bitumen Mastic Strip to fit into the bare steel area prior to applying the primer.
- Insert the cut out piece of Bitumen Mastic Strip into the repair area.
- Re-apply a thin even coat of Densopol Primer D over the patch and adjacent area of Sintakote.
- Allow the primer to track dry(Approximately 10 to 20 minutes)

PSL 3.9.2.4.3.4 Tape Wrapping

- Apply Densopol 60 tape to the repair area ensuring a 50mm overlap over the fitted patch.
- Apply Denso MP/HD P.V.C self adhesive over wrap tape around the full pipe circumference to completely cover the repaired patch.

PSL 3.9.2.4.4 SURFACE PREPARATION

All joints shall be fully welded and sealed and all sharp edges and corners ground off to a radius of not less than 1.5 mm. All weld spatter and irregularities shall be removed. Any unsound or damaged edges of sintakote shall be cut back into the sound coating and the edges chamfered.

The surface shall be cleaned by means of power tools to achieve a minimum surface preparation in accordance with AS1627.2 TO CLASS St. 2. All dust, dirt, moisture and grease shall be removed. Slightly roughen the sintakote 100 millimeters both sides of the joint, using a coarse file or abrasive paper. Wipe the surface clean with a dry rag.

PSL 3.9.2.4.5 PRIMING

- Stir the primer to ensure complete mixing prior to application, Apply a thin even coat of Densopol Primer D to the steel and roughened sintakote surfaces using a paintbrush or roller.
- Allow the primer to touch dry (approximately 10 to 20 minutes)

PSL 3.9.2.4.6 MASTIC FILLING

To improve the contours for wrapping the tape, fillet welds, sharp edges of sintakote, test plugs or welding lid holes shall be filled and profiled with Bitumen Mastic Strip. The mastic filling shall be molded such that the Densopol 60 tape can be applied with no sharp edges protruding or air entrapment.

PSL 3.9.2.4.7 TAPE WRAPPING

Commencing at least 100 milliliters back onto the primed sintakote one complete turn of 150 milliliter wide Densopol 60 tapes shall be applied. Release film shall be removed before application. While holding the tape under tension, the pipe shall be spirally wrapped using a 55 percent overlap and finished 100 mm onto the primed sintakote with one complete circumferential wrap around the pipe. The tape shall be cut off in the downward direction of wrapping. New roles of tape shall have the ends overlapped at least 75 mm.

During wrapping the tape shall be smoothed out by hand to exclude any air bubbles or wrinkles and to seal overlaps.

Care shall be taken to prevent any folds or misplacement of the tape, especially under the pipe, and to prevent the tape becoming contaminated during wrapping.

The butt-welds in segmental (lobster bends) are to have the tape applied partial layer by partial layer with a 55 percent overlap until a full spiral wrap can be made (refer sketch in appendix A) continue wrapping onto the primed sintakote for at least 100mm with one complete circumferential wrap around the pipe.

Straight steel pipes shall also be wrapped with Densopol 60 with a 55 percent overlap in accordance with the above clauses.

PSL 3.9.2.4.8 STEEL FITTINGS AND FLANGES

PSL 3.9.2.4.8.1 GENERAL

Procedures for the protection of steel fittings applies to both main pipeline fittings and branch pipe work. Fittings manufactured and coated by Tyco shall be factory coated with Sintakote. Difficult fittings such as valves may be protected using a more conformable petrolatum system in accordance with TS29 only with the approval of an SA Water representative.

PSL 3.9.2.4.8.2 SURFACE PREPARATION

Still surfaces shall be prepared in accordance with clause 4.1.

PSL 3.9.2.4.8.3 TAPE WRAPPING

Prepare and wrap all straight sections leading up to the fitting and flange in accordance with section 4.

PSL 3.9.2.4.8.4 PRIMING

- Stir the primer to ensure complete mixing prior to application. Apply a thin even coat of Densopol Primer D to the prepared steel surfaces and a minimum of 50mm onto the Densopol 60 wrapped areas using a paint brush.
- Allow the primer to touch dry (approximately 10 to 20 minutes).

PSL 3.9.2.4.8.5 MASTIC WRAPPING

Unavoidable sharp edges such as bolts, nuts and collars shall have mastic strip molded over the positions or edges. Strip with a 55 percent overlap onto itself and minimum 50mm overlap onto the Densopol 60 or Sintatoke coated pipe work. Press the Bitumen Mastic Strip firmly into place ensuring no air voids are beneath the Bitumen Mastic Strip.
Note: The Bitumen Mastic Strip provides corrosion protection to the steel work and is similar in composition to Densopol 60, but it does not have a woven carrier.

PSL 3.9.2.8.6 OVER WRAPPING

150 or 100mm wide Denso MP/HD tape (self adhesive PVC) shall be spirally wrapped over the Bitumen Mastic Strip with a 55percent overlap. While wrapping, the Denso MP/HD tape shall be pulled firmly and the lapse properly sealed.

PSL 3.9.2.8.7 TESTING

All repairs and wrapping shall be tested using a high voltage “spark” tester in accordance with AS3894.1 at an operating voltage of 15 KV.

PSL 3.9.3 Protection against electrolytic corrosion

OMIT THE EXISTING CLAUSE AND INSERT THE FOLLOWING:

"All joints and fittings shall be fully wrapped with approved protective tapes. Protective tape shall comply with either Specification A or Specification B as ordered by the Employer's Agent.

Specification A

This tape shall be made up of pre-bonded components to form a composite single wrap tape. The adhesive inner protective tape must provide complete protection to steel piping against electrolytic corrosion. It shall be impermeable to water, chemically inert and physically stable and must provide a perfect seal at the overlap on a spiral-winding pattern.

The adhesive outer protective tapes shall be tough and impact resistant, providing suitable protection of the inner protective tape against mechanical damage. It shall be stable and not crack or deteriorate when buried. The tapes shall be chemically resistant to all common acids and alkalis normally encountered in the soils at the construction site.

The tapes shall be suitable for both machine and hand application.

The Combination electrical characteristics of the inner and outer wrap together must exceed:

Dielectric strength = 25kV/mm
Insulation = 10 0hm metre
The following minimum criteria shall be satisfied:

	Inner Tape	Outer Wrap
Thickness (mm)	0,3	0,3
Tensile strength (kg/cm width)	3,3	5,0
Elongation at break (%)	200%	50%
Adhesion to primed steel (gm/cm width)	220	220

Specification B

This tape shall be made up of a non-woven synthetic fibre carrier impregnated and coated on both sides with a compound incorporating high melting point bitumen (Densotherm or similar approval). During application the tape shall be correctly heated and laps adequately sealed all in accordance with the instructions and recommendations of the supplier.

Before the application of any protective material, the surface of the pipe shall be thoroughly cleaned and all loose or damaged pipe coating removed. All ridges, depressions and steps in the surface shall be filled with an approved filler so as to present a smooth uniform surface. After the filler has hardened, the entire surface to be wrapped shall be primed with a primer or otherwise treated as recommended by the supplier of the tape.

The protective tape shall be applied as a spiral wrap with not less than 50% overlap. The width of the tape shall be appropriate for the section to be wrapped."

PSL 3.9.5 Joints, nuts, bolts and washers

DELETE AND REPLACE WITH THE FOLLOWING:

"All bolts and nuts shall comply with the requirements of the relevant sections of SANS 1700 and shall be of Grade 4.6 steel. Washers shall be provided at each nut and shall be of the same material (or coating where applicable to match the bolt and nut. Nuts and bolts subject to vibration shall be machined finished fitted with plain washers and treated with "Loctite" or equivalent.

Bolts other than jacking bolts shall project not less than 3mm and not more than 10mm from the heads of the nuts after tightening.

All bolts to be built into concrete work as well as bolts to be installed above ground level (outside buildings), directly above and under water shall all be of stainless steel grade 304. Bolts for flexible couplings and flanges for underground installation shall be hot dip galvanized. Bolts to be installed inside buildings shall be hot dip galvanized. Galvanizing shall be in accordance with the Standard Corrosion Protection Specification (Heavy coating).

Suitable plastic sleeves and/or washers shall be used for protection against corrosion by bi-metallic action".

PSL 3.9.6 Corrosive soil

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

"Steel pipes, pipe fittings and steel flanges in contact with soil shall over and above the protection as described above be protected as specified in Clause 3.9.3 with "DENSO" tape and/or mastic or approved similar. Application shall be strictly in accordance with the manufacturer's instructions. A polyethylene tape of 300 microns minimum shall be spirally wrapped over the petrolatum tape and fixed to the clean pipe ends with pressure sensitive tape."

PSL 5 <u>CONSTRUCTION</u>

PSL 5.1 LAYING

PSL 5.1.4 <u>Depth and Cover</u>

PSL 5.1.4.2 Cover

ADD THE FOLLOWING TO THIS SUBCLAUSE:

"The minimum cover to finished surface over water mains shall be at least 1000 mm in trafficked areas and at least 800 mm elsewhere. At valves the depth of the pipeline shall be increased if necessary to ensure a minimum cover of 100mm over the valve cap. The cover shall be maintained as close as possible to the minimum without local sags or humps and shall not be increased above the minimum by more than 200mm without the approval of the Employer's Agent."

PSL 5.2 JOINTING METHODS

PSL 5.2.3 Welding

DELETE THE EXISTING CLAUSE AND REPLACE WITH THE FOLLOWING:

a) General

"Field welding of pipes which have been lined will be permitted only for pipes of DN600 and larger where a man is able to enter the pipe to make good the lining after welding and testing in accordance with Clause 7.2 of SANS 1200L has been completed. Pipes of lesser

diameter may be field welded where concrete linings will be made after the pipeline has been laid and all welds have been tested and approved.

At the discretion of the Employer's Agent, roll welding will be permitted, provided pipe alignment is maintained by use of skids or of structural framework to accommodate two or more lengths of pipe with an adequate number of roller dollies to prevent sag in the pipe. The entire root bead, however, shall be made with the pipe in a stationary position.

All pipes welded in the trench shall be properly laid and aligned before welding commences. Bell holes shall be excavated at all field welds. The Contractor shall not lift the pipe to provide adequate access for the welders to enable them to stovepipe weld the joint.

The alignment of abutting ends shall be such that the offset will not exceed 1.7 mm. Line up clamps shall be used for joint "fit-ups". The use of "bridges and wedges" or any method that may induce unnecessary stresses is forbidden.

Both ends of coated and lined pipes shall be wrapped for a distance of at least 800 mm on either side of the weld by means of an asbestos mat or other approved material to ensure that weld spatter or other damage is not caused to the coating and lining during the welding process. The pipe trench shall be kept free of all dirt and water in the vicinity of the weld until after all corrosion protection measures have been completed and approved. "

b) Welding procedure and qualification of welders

Steel Pipes

Welding shall be done by only qualified welders who satisfy the requirements of API 1104, Clause 3.0. Before any welding of pipeline materials commences, the qualification of welders shall have been approved, all detailed welding procedure specifications with weld diagrams required for their completion shall have been submitted for approval in a neat form and the welding procedure qualification tests shall have been successfully concluded all in accordance with the relevant standard specifications. Each welder shall mark the pipe adjacent to the weld with the figure assigned to him.

Sufficient records shall be kept by the Contractor to ensure that all field welds can be subsequently identified with the welder concerned.

As far as practicable all out of trench welding shall preferably be done by an automatic submerged process and the Contractor shall provide all necessary plant to carry out this process. MSEAP welding may be used where in-trench welding is done.

Heat treatment for welding shall be in accordance with API 1104 if required by same and the Contractor shall provide an approved shield to protect the pipe joint from wind and weather during heat treatment and welding.

c) Line up

Pipes shall be lined up in such a manner as to prevent damage thereto. If the pipe to be used has a longitudinal seam, these seams shall be staggered by not less than twenty degrees and welded sections, or single lengths, shall be assembled in such a manner that this seam shall remain in the top quadrant of the pipe during coating operations and after lowering into the trench.

d) **Cleaning of pipe ends** Before welding, all foreign matter shall be removed from the beveled ends. If any of the ends of the pipe joints are damaged to the extent that satisfactory welding contact cannot be obtained, the damaged pipe ends shall be cut and beveled with an approved beveling machine. These field bevels of pipe ends shall be

made to the satisfaction of the Employer's Agent. Should laminations, split ends, or other defects in the pipe be discovered, the joints of pipes containing such defects shall be cropped, repaired, or removed from the line as designated by the Employer's Agent.

e) Inclement Weather

No welding shall be carried out during rain or high wind unless the welder and joint are adequately protected and sheltered, to ensure that the welding is not impaired.

f)Protection of coatings and linings

Before welding commences, a suitable apron at least 800 mm wide shall be wrapped around both sides of the area to be welded to ensure that weld spatter does not damage the coating and lining.

g) Butt-welding

Pipes and specials to be joined by field welding shall be supplied with ends beveled for welding. All welding of joints shall comply with API 1104 and only approved type welding rods shall be used. If backing rings are permitted, they shall be placed in position and wedged up or adjusted so that the pipe ends are completely circular and properly mated. The space between abutting pipe ends, when aligned for welding, shall be such as to ensure complete penetration without burn-through. For pipes having the same dimensions, the spacing shall be approximately 1.5 mm. The alignment of the abutting pipe ends shall be such as to minimize the offset between pipe surfaces. For pipes of the same nominal wall thickness, the offset shall not exceed 1.5 mm. Internal line-up clamps shall be used wherever practicable and may be removed after the root bead is 50% completed, provided that the completed part of the root bead is in segments of approximately equal lengths, spaced about the circumference of the pipe. If conditions make it difficult to prevent movement of the pipe, or if the weld will be unduly stressed, the root bead shall be completed before releasing clamp tension.

External line-up clamps shall be used where it is impracticable to use internal line-up clamps. Partial root beads made when using external clamps shall be uniformly spaced about the circumference of the pipe, and shall have an accumulative length of not less than 50% of the pipe circumference before the clamps are removed.

Tack welding shall be carried out to maintain the root gap and position of the pipe ends during the welding proper. The number of tack-welds shall be kept to a minimum but shall not be less than four around the circumference of the pipe.

After proper preparation and tack welding, the root bead shall be carried out followed by successive filler passes, and capper pass in accordance with the approved welding procedure.

The filler and finish beads shall be deposited by an acceptable method and each filler bead shall be approximately 3 mm in thickness. Completed welds shall have a reinforcing of not less than 0.8 mm and not more than 1.5 mm above the pipe surface around the entire perimeter of the weld, and the width of the finish or cover shall be not more than 3 mm greater than the original groove. The number of beads required shall be governed by the wall thickness of the pipe, so that the completed weld will have the reinforcement previously specified; provided, however, that each weld shall consist of at least three beads. No two beads shall be started at the same point. No mitre welds will be permitted, and all welds are to be at ninety degrees (± 5^{o}) to the axis of the pipe. All slag and scale shall be removed from each bead for visual inspection immediately after each bead is run.

In all field butt-welds where it is possible to work inside the pipe, the inside weld shall be

done first.

The chemical composition of weld metal and parent metal shall be similar and the inner weld metal or reinforcement shall not extend more than 1 mm above the inside metal surface of a pipe or special, and any excess shall be removed by grinding.

Defects caused by stray welding arc flashes shall be removed by grinding, provided that the pipe wall thickness is not reduced to less than the specified minimum thickness, otherwise the portion shall be cut out and repaired.

h) Fillet welding

Welding shall be as for butt-welding as applicable. All pipes of 600 mm ND and over shall be welded on both the outside and the inside.

i) Repair of welds

Rectification of defective welds shall be in accordance with API 1104 and to the satisfaction of the Employer's Agent. All costs related to the repair of defective welds shall be borne by the Contractor. Defective welds shall be repaired immediately they are found to be so. The Employer's Agent has the right to stop the Contractor proceeding with further pipe laying in the event of the Contractor delaying the rectification of defective welds. Furthermore, no consideration will be given to any claims arising from delays in construction resulting from such action.

All welded joints which have been repaired shall be 100% radiographed or otherwise tested to the Employer's Agent's satisfaction at the Contractor's own expense.

PSL 5.8 BRICKWORK IN CHAMBERS AND MANHOLES

ADD THE FOLLOWING TO THIS SUBCLAUSE:

"The joints of exposed faces shall be flush-trowelled, hard and smooth and shall be rubbed for the full width of the joint as the work proceeds to give a hard polished finish."

ADD THE FOLLOWING NEW SUBCLAUSE

PSL 5.11 WORK ON EXISTING MAINS

Where connections are to be made to existing mains, the Contractor shall excavate back along the existing main only as far as is necessary to complete the connection satisfactorily and shall ensure that the existing mains are disturbed as little as possible. Backfilling shall be carefully placed and properly compacted beneath existing and new work to ensure that the mains, specials, etc. are properly bedded.

Work on existing mains and components of the reticulation system shall be carefully planned in consultation with the Employer's Agent. The work shall be carried out expeditiously to ensure that the disruption of services and inconvenience to the local residents is kept to a minimum. All tie-ins shall be completed within a maximum of 10 hours.

The Contractor under strict supervision by the Employer's Agent or The Employer will do all these connections.

Hand excavation must be used to expose the existing mains and erf connections where required. While every effort has been made to ensure that the information relating to these connections is correct the Employer's Agent or The Employer takes no responsibility for the accuracy, or for the completeness of the information."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 5.12 CONNECTION TO THE EXISTING MAINS

The Contractor shall supply all necessary fittings / materials for under pressure connections suitable for all pipe sizes.

The Contractor shall confirm all measurement on site prior to ordering any pipe fittings."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 5.13 PIPELINE RENEWAL WORK

All material recovered as a result of the repairs or replacement of the components shall be returned to the Contractors store where they shall be cleaned, sorted and listed. A list of the recovered material shall be handed to the Employer's Agent on a monthly basis. All recovered material shall be delivered to the JW Water Depot on a regular basis or at the end of the Contract.

ADD THE FOLLOWING NEW CLAUSE:

PSL 5.14 STERILISING OF WATER MAINS

All new water mains shall be sterilised at 10mg/l free chlorine for 12 hours and will then be thoroughly flushed.

PSL 7 TESTING

PSL 7.2 INITIAL TESTS ON WELDED STEEL PIPES

PSL 7.2.2 Radiographic Examination

Fifteen percent of all welded joints, or when ordered by the Employer's Agent, shall be examined radiographically.

ADD THE FOLLOWING NEW CLAUSE:

PSL 7.2.3 Hydrostatic Test

(a) All pipes and fittings shall be subject to an approved hydrostatic test and to a test pressure determined as follows:

$$P = \frac{2000\ t\ f}{D}$$

Where

P = test pressure in kPa

F = 85 percent of the guaranteed minimum yield strength in MPa for steel plate

D = outside diameter of the pipe in mm

T = wall thickness in mm.

(b) Hydrostatic testing shall not be carried out until all aspects of fabrication have been completed.

(c) The pressure shall be applied steadily by approved means and maintained without variation sufficiently long for proof and inspection.

(d) Should water sweat or ooze from any part or any defects of any nature be discovered the pipe shall be emptied and the defects made good. The pipe shall then be tested again. Should a pipe, after repair, fail to pass the second hydraulic test the Employer's Agent may order its rejection.

(e) The fact that any pipe may have passed the hydraulic test at the works shall not exempt the Contractor from his liability under Clause 7 of the General Conditions of Contract 2015.

(f) If a pipe fails to pass any of the above tests in Clauses PSL 7.2.1, PSL 7.2.2 or PSL 7.2.3, it shall be rejected, but the Employer's Agent may permit repairs or alterations to be made to enable the pipe to pass the test.

(g) The Employer's Agent may require one or more pipes to be tested to destruction. If practicable the Employer's Agent may require the Contractor to repair the pipes and retest them. The cost of repairs will be paid by the Employer as an extra to the Contract."

ADD THE FOLLOWING NEW CLAUSE:

PSL 7.2.4 Testing of HDPE pipes

Sample of the welded joins shall be taken and the following test shall be carried out by an approved laboratory selected by the Employer:

1. Tensile strength on seam weld
2. Elongation at break
3. OIT (Oxidation Induction Time)
4. MFR (Melt Flow Rate)
5. Carbon black content
6. Carbon black dispersion

PSL 8 MEASUREMENT AND PAYMENT

PSL 8.2 SCHEDULED ITEMS

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 8.2.16 c) Demolish Structure

a) Description of connection, types and diameters involved……...Unit: No

b) Etc for the other items

The unit of measurement shall be sum for various types of connection into existing line mains

The rate shall cover the cost of excavation, plant and labour required, demolishing the existing chambers, safeguarding the existing valves and specials from damage and safely disposing of the rubble material.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 8.2.17 Connect to Existing Mains

a) Description of connection, types and diameters involved……...Unit: No

b) Etc for the other items

The rate shall cover the cost of isolating, cutting, excavation (up to 4 m deep), bedding, dewatering and exposing the existing main at the connection point, supply necessary fittings for under pressure connections for the section of the mains as required, temporary support, safety precaution backfilling and the removal of surplus and unsuitable material.

ADD THE FOLLOWING NEW SUBCLAUSES:

PSL 8.2.18 Recover valves, fittings, specials, etc

a) Description of item…….Unit: No.

b) Etc for other item

The unit of measurement shall be number of described item to be recovered

The rate for the recovery of the above shall cover the cost of the excavation, breaking out existing brick or precast concrete, and removal of the valves, fittings and specials removal of debris and spoil to Contractor's dump site and importing suitable backfill material, the plugging with concrete of the open ends of the abandoned water mains, the removal of the surface boxes, backfilling to required density, the handling and transporting of the recovered materials to the Ennerdale Depot, the listing of the salvaged materials and the backfilling and compaction of the chambers and reinstatement of surface covering.

PSL 8.2.19 Supply and install Valves…….....Unit: No

a) Gate Valves

All gate valves shall be flanged wedge type isolation valves to SABS 664, Class 16, anti-clockwise closing. All valves 400 mm and bigger are to be supplied with an approved **open gear box assembly** as follows:.

1. For the 600mm Valve:

Multi-Stage Spur gearing with 6:1 minimum ratio, having operating spindles on the input spindle and at a stage where the valve can be stroked without exceeding the maximum input torque of 275Nm if no differential pressure is applied to the valve.

1.1 For the 450mm Valve:

Single-Stage spur gearing with 4:1 ratio having one spindle to operate with a 1:1 ratio and a second spindle to operate with a 4:1 ratio. A maximum input torque of 240Nm is recommended.

2. The gears shall be robust and machine cut and their mounting shall be of substantial design.

3. Each pinion gear spindle shall be supported between two bearings or alternatively one bearing of sufficient depth to prevent misalignment of the opinion gear and spindle. The bearings shall be fitted with bronze bushes and shall be provided with grease nipple lubricating

points and shall be lubricated prior to delivery. All points to be lubricated shall be fitted with 1/8 inch BSP straight nipples for grease-gun lubrication. Adequate lubrication shall be provided for all gear and indicator bushes.

4. All valves shall open by anti-clockwise rotation of the main spindle and gearboxes shall be fitted with an intermediate idler where necessary.

5. In the case of Type A and Type B gearing a shear pin or other safety device shall be incorporated between the high and low gears to prevent damage to the valve if excessive force is applied. Two spare pins shall be attached to each valve.

6. Shear pins shall be easily replaced in the field. Hard-driven pins will not be accepted as shear pins.

b) Air Valves

Air valves must be double acting air valves of compact single chamber design with both small and large air release orifices inside the chamber. The valve must also act as a vacuum breaker, with intake capacities of 60 % of discharge rates given.

The unit measurement for valves shall be number of each described assembly

The rate shall include supply installation and testing including for all corrosion protection, bolts, gaskets, and any other contingency work.

d) Valve Boxes for Valve not exceeding 350mm

Sterling Concrete CC or similar approved precast concrete valve (hydrant) box stacked segments shall be used. A Type 5 standard Polymer cover shall be used with Johannesburg Water inscription on it.

PSL 8.2.20 **Cathodic Protection**…….....Unit: Sum

The rate shall include investigation, design, supply and commission system as per specified and/ or instructed by the Employer's Agent (Provisional Sum)

PSL 8.2.21 **Supply and install fittings assembly**…….....Unit: No

The unit of measurement shall be number of a described item to be installed. The applicable particular specification contained herein on various clauses will apply to the various pieces, for example **PSL 8.2.19** will be applicable to any valve and air valve in the assembly.

The rate shall include supply installation and testing including for all corrosion protection, bolts, gaskets, and any other contingency work to enable the proper operation of the fittings assembly.

PSL 8.2.22 **Laboratory testing of HDPE joins**…….....Unit: Prov Sum

The Employer's Agent shall set aside an amount as Provisional Sum for laboratory testing of HDPE welding joins. The amount shall cover the cutting, transportation and laboratory test of the sample joins.

PSL 8.2.23 **Removal of damaged pipes**……Unit: m

All pipes that have been removed from the excavations are spoiled within 48 hours of excavation failing which the Employer's Agent shall be entitled to suspend work under the Contract.

The rate shall include the complete (labour, plant and equipment) cost for the removal of such material.

PSL 8.2.24 Trenchless technology

PSL 8.2.24.1 Supply and Installation of pipe through pipe cracking Unit: m

The rate shall include the complete (labour, qualified operators, material, plant and equipment) cost for the successful pipe cracking of the pipe, installation and supply of pipes of various diameters, jointing of pipe, launching and reception pits. The rate shall also Include the provision and operation of all equipment and accessories, provision and application of all materials, safety equipment (including that required for the Employer's Agent or his duly authorized representative's sole use), traffic accommodation and testing and reporting.

PSL 8.2.24.2 Supply and Installation of pipe through Horizontal Direction Drilling (HDD) Unit: m

The rate shall include the complete (labour, qualified operators, material, plant and equipment) cost for the successful drillin of the pipe, installation and supply of pipes of various diameters, jointing of pipe, launching and reception pits. The rate shall also Include the provision and operation of all equipment and accessories, provision and application of all materials, safety equipment (including that required for the Employer's Agent or his duly authorized representative's sole use), traffic accommodation and testing and reporting.

PSLB BEDDING (PIPES)

PSLB 3 MATERIALS

PSLB 3.1 SELECTED GRANULAR MATERIAL

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Selected granular material shall have a PI not exceeding 10 and shall be free from sharp-ended particles or particles exceeding 19 mm in size."

"Selected fill material shall have a PI not exceeding 15 and shall be free from sharp-ended particles or particles exceeding 19 mm in size."

PSLB 3.3 BEDDING

ADD THE FOLLOWING:

"uPVC and HDPE pipes are deemed to be flexible pipes for the purposes of this subclause."

PSLB 3.4 SELECTION

PSLB 3.4.1 Suitable material available from trench excavation

REPLACE THE WORDS "(but is not required)" *IN THE FIFTH LINE WITH THE WORDS* "(at his own cost)".

PSLB 7 TESTING

PSLB 7.1 DENSITY

REPLACE THE SECOND SENTENCE IN THE FIRST PARAGRAPH WITH "The test will be carried out using the Troxler method."

ADD THE FOLLOWING SUB-CLAUSE

PSLB 7.1.1 Submission of bedding compaction test results

The Contractor will be required to submit to the Employer's Agent four (4) compaction test results of bedding for every 100metres. Bedding compaction to be 90% MOD AASTHO density. The compaction tests to be performed by the Troxler method.

PSLB 8 MEASUREMENT AND PAYMENT

PSLB 8.1 PRINCIPLES

ADD THE FOLLOWING TO THIS SUB-CLAUSE

PSLB 8.1.3 Volume of bedding materials

The volume of bedding material shall be measured net i.e. the volume of the pipe is to be deducted.

PSLB 8.1.5 Disposal of displaced material

DELETE THIS SUB-CLAUSE AND REFER TO CLAUSE PSDB 5.6.3:

PSLB 8.1.6 Free-haul

DELETE THE WORDS "of 0,5 km" *IN THE FIRST LINE OF THIS SUBCLAUSE.*

PSLB 8.2 SCHEDULED ITEMS

PSLB 8.2.1 Provision of bedding from trench excavations

DELETE THIS SUB-CLAUSE AND REPLACE WITH THE FOLLOWING:

Without the need for screening or other treatments:

a) Selected granular material.....……..Unit: m^3

b) Selected fill material.....……Unit: m^3

The rates shall cover the cost of acquiring, from any point along the trench excavation as be Selected by the Employer's Agent within 5,0 km, 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, and of disposing of displaced material within a free haul distance 5,0 km.

Including for screening and/or other treatment:

a) Selected granular material.....……Unit: m^3

b) Selected fill material.....……Unit: m^3

The rates shall cover the cost of screening by means of mesh sieves or otherwise treating excavated material, at any point along the trench excavation as may be selected by the Employer's Agent, in order to produce bedding that complies with the relevant specification, delivering it to points along the trench, within 5,0 km, 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 displace material within a free haul distance of 5,0 km.

PSLB 8.2.2 Supply only of bedding by importation

PSLB 8.2.2.3 From commercial sources (Provisional)

ADD THE FOLLOWING SUB-SUBITEM TO THIS CLAUSE:

"(c) Special bedding material

1) Description of material…….…… Unit: m^2 or m^3

2) Etc for other items

The unit of measurement shall be the square metre or cubic metre of material as specified.

The rate shall cover the cost as specified for (a) and (b)." The rate shall include the cost of acquiring from commercial sources, transporting regardless of distance, off loading and placing in the trench bottom clean where ordered by the Employer's Agent.

ADD THE FOLLOWING SUB-SUBCLAUSE:

PSLB 8.2.6 Compaction Test

Compaction testing using the troxler method……..……..Unit: No

PSLC CABLE DUCTS

PSLC 3 MATERIALS

PSLC 3.1 DUCTS

ADD THE FOLLOWING:

PSLC 3.1.1 Split uPVC pipes

Split pipes shall only be used to provide ducts for existing services that cannot be severed and threaded through the ducts. The pipes shall be cut accurately in the middle, and opposite halves shall be matched as sawn. Split pipes shall be placed around the service, firmly bound by steel straps, and encased in concrete."

PSLC 3.4 CABLE DUCT MARKERS

ADD THE FOLLOWING:

"A cable duct marker shall consist of a 300 mm x 300 mm x 100 mm deep, class 20 MPa/19 mm concrete block, connected by means of a non-ferrous metal strip to a temporary plug to seal the end of the duct. The plug shall prevent moisture or soil from entering the duct. The metal strip shall be firmly connected to both the plug and the concrete block. The concrete block shall be positioned not further than 0,5 m horizontally from the end of the cable duct. The face of the concrete block shall be clearly marked "E" to indicate electricity cables."

PSLC 8 MEASUREMENT AND PAYMENT

PSLC 8.2 SCHEDULED ITEMS

PSLC 8.2.5 Supply, lay, bed and prove duct

REPLACE THE PAYMENT PARAGRAPH WITH THE FOLLOWING:

"Separate items are scheduled for each diameter of duct.

The rates shall cover the cost of providing all the materials and the cost of laying the ducts, installing the draw wire, jointing, bedding and providing all as specified."