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ANNEXURE A TECHNICAL SPECIFICATIONS

VARIATIONS AND ADDITIONS TO THE STANDARD SPECIFICATIONS

The following variations and additions to the SANS 1200 Standardized Specifications referred to in Portion 1 will be valid for this contract. The prefix "PS A" indicates an amendment to SANS 1200 A, "PS C" to SANS 1200 C, etc. The numbers following these prefixes are the relevant clause numbers in SANS 1200.

SANS 1200 PSA: GENERAL

PS A 2 INTERPRETATIONS

PS A 2.3 DEFINITIONS

Add the following to the end of Sub-Clause:

"Notwithstanding anything to the contrary in these specifications, any approval, agreement, authorisation, instruction, etc. by the Engineer shall be made in writing."

PS A 3 MATERIALS

PS A 3.1 QUALITY

Add the following:

"All materials are to be the best of their respective kinds, new, undamaged, sound, and free from defects and shall comply with the relevant clauses of the Specification.

All references to Standard Specifications are to the latest amendment to such specifications.

Provided that a "Certificate of Compliance" issued within the last 6 months is submitted, materials bearing the SANS or BS mark will not be subjected to tests to determine whether they comply with the relevant specifications. The Engineer may at his discretion require any material not bearing such a mark to be tested in accordance with the relevant specifications; should he do so the Contractor shall arrange for such tests to be carried out at the Contractor's cost by the South African Bureau of Standards or other approved body.

Any material found not to be in accordance with the specification will be rejected and replaced by the Contractor at his own cost, regardless of whether or not the material bears the SANS or BS mark or has previously been tested.

PS A 3.3 DELAY DUE TO SUPPLY OF MATERIALS

Add the following new sub-clause:

DELAY DUE TO SUPPLY OF MATERIALS. The Contractor shall ensure that the work is not delayed, due to the lack of materials on the site of the works, by placing orders with suppliers timeously for the materials required under this Contract.

The Contractor shall, by producing copies of written orders or written enquiries to suppliers, prove to the satisfaction of the Engineer that any delay occasioned by non-availability of materials is the result of the inability of suppliers to supply and not due to his failure to place

his order timeously or to make exhaustive enquiries for supplies, before any extensions of the contract time will be allowed due to such delays."

PS A 4 PLANT

PS A 4.1 SILENCING OF PLANT

Replace

"Machinery and Occupational Safety Act, 1983 (Act No 6 of 1983)" with "Occupational Health and Safety Act 1993 (Act No 85 of 1993)".

PS A 4.2 CONTRACTOR'S OFFICES, STORES AND SERVICES

A suitable area will be made available for the Contractors camps that includes 2 x Main site office and Engineers offices and 5 x Contractor's yard, eating and ablution facilities for each Zone. The cost for establishing the satellite camps must be included in the rates for the main camp and no additional payment will be made. Monthly rental for camp site will be levied by TNPA Property. The area will be pointed out at the site inspection. Tenderers shall allow for all costs associated with their camp including fencing, hard-standing, etc.

The Contractor shall submit to the Engineer, within 7 days of the award of the Contract, an arrangement drawing of his proposed camp and depot sites, and he shall not proceed with the establishment thereof until he has received permission in writing to do so. The establishment may not encroach beyond the designated area without permission first having been obtained in writing from the Engineer.

Temporary buildings and sheds shall be of a standard acceptable to the Engineer for this category of building. Old, dilapidated structures will not be permitted on the Site and any structure erected in conflict with these requirements shall be removed within 24 hours of receipt of written notification from the Engineer to do so.

First aid services shall comply with the applicable provisions of the Occupational Health and Safety Act, 1993.

Toilet and ablution facilities complete with running water, and other facilities for construction workers, shall be at least in accordance with Section 28 of the Construction Regulations, 2003 of the Occupational Health and Safety Act, 1993.

The use of septic tanks and soak-a-ways are not permissible. Chemical toilets shall be provided, and the Contractor shall be responsible for arranging for the toilets to be emptied and cleaned at regular intervals.

All toilet and ablution facilities shall be maintained in a clean, serviceable condition, to the satisfaction of the Engineer.

Add the following paragraph before the first paragraph:

The Contractor's construction camp shall be situated as indicated at the site inspection and shall contain all offices, stores, workshops, toilet facilities, etc. The camp shall always be kept in a neat and tidy condition.

Add the following to the second paragraph:

One toilet per 10 workmen shall be provided and must be screened from public view and their use shall be enforced. The Contractor shall maintain them in a clean & hygienic state at all times.

The Contractor shall make arrangements if necessary for the removal of night soil.

Add the following to A4:

It is a requirement of the contract that the Contractor's site agent(s) shall be provided with cellular telephones to allow for effective communications between the Contractors' supervising personnel and the Engineer and his staff. All costs associated with the provision of the cellular telephones for the Contractor's personnel shall be included in the rates tendered under Pay Clauses 8.3.2 and 8.4.2.

PS A 4.2.1 ELECTRICAL POWER SUPPLY AND WATER SUPPLY

The Contractor shall make his own arrangements for his power and water supply as necessary and shall bear all costs in connection therewith. TNPA will make power and water available, but the Contractor must ensure that the usage is metered so that it can be monitored for compensation to TNPA.

PS A 4.2.2 CONSTRUCTION PLANT

Add the following new Sub-Clause:

CONSTRUCTION PLANT: Construction plant shall be of a suitable type for carrying out the work for which it is required. Its capacity shall be sufficient to meet the requirements of the work within the contract time. It shall be kept at all times in full working order and repair. If the Engineer considers that the plant in use is in any way inappropriate, inefficient or inadequate in capacity, he shall have the right to call upon the Contractor to provide such additional plant or equipment as may be required to efficiently execute the Works.

PS A 5 CONSTRUCTION

PS A 5.1 SURVEY

PS A 5.1.1 SETTING OUT OF THE WORKS

Add the following at the end of the first paragraph:

No claims resulting from errors in setting out of the works or in levels resulting from errors in the Engineer's control points, benchmarks or other beacons will be entertained should the Contractor fail to check such and report any discrepancies to the Engineer in writing timeously before commencing with the setting out of the Works.

Add the following Clause PSA 5.1.3:

There are numerous existing services which could be affected by the works and/or have to be protected in terms of the Contract near and at the existing Port of Durban. Existing services will need to be located and levels confirmed prior to final procurement of pipe specials. The exact location and depth of the services may result in connection points changing.

As a result, the Contractor shall be responsible for the identification, location, exposure, and surveying of the known, reasonably inferred, and unknown existing services to be crossed or worked alongside. He shall liaise closely with representatives of the responsible authorities or service providers, the Engineer and with land users to identify the services and their possible locations in order to determine their type, positions, depths, dimensions and routes.

The existing services will be exposed. The width of each excavation shall be sufficient to locate and identify the type and routes of the existing services. Where feasible, the Contractor shall hire and use specialist equipment to locate electrical cables.

The Contractor shall complete such investigations in advance of the start of construction work in any section and submit a report to the Engineer to do any relevant re-designs. The onus is on the Contractor for timeous liaison with the authorities, service providers and tenants and for continuity of construction activities by ensuring that the location and arrangements for negotiation (e.g. protection, removal and diversion) of all services occur well in advance.

The Contractor shall be responsible for retaining the services of a qualified surveyor for the surveying of the positions and levels of the exposed services. The surveyor's responsibilities shall be as follows:

To familiarise himself with the site, the proposed works and with any relevant information regarding beacons, benchmarks, or any other trigonometric information available for the required setting out.

Following setting out of the works and the exposing of the services, to provide the type, positions and levels of the existing services to the Engineer in a reproducible format (e.g. AutoCAD) to the satisfaction of the Engineer.

The Contractor shall note that no construction work may commence until written approval on the finalised position and design levels are received from the Engineer. Such approval shall be given within 10 working days after receipt of the information noted above.

The Contractor shall be responsible for the programming and correctness of the surveyor's work, as well as all aspects of his appointment. The Contractor shall be responsible to include such time aspects necessary for this survey procedure into the construction program. No extension of time will be granted to the Contractor as a result of failure in performance of his appointed surveyor, nor will the Engineer or Employer be involved whatsoever in this appointment or programming.

Measurement and payment for location and exposure of existing services shall be done under Payment Items PSA 8.8.4 by specialist equipment and hand excavation respectively. Surveying the positions and details of the existing services shall be paid under Payment Item PSA 8.8.4. The costs of normal survey requirements under the Contract shall be deemed to be covered by the rates of scheduled payment items.

Where Ground Penetrating Radar is called for in the Bill of Quantities, the following shall be included:

- Locating all buried Utilities within the supplied route within a 10m boundary.
- Surveying these positions and other details.
- Reducing all field data and compiling files and reports for draughting.
- Compiling detailed drawings of GPR data
- Transferring the information onto an electronic base plan provided by the client.
- Final Survey results will be a CSV file, PDF, and a DWG in electronic format.

PS A 5.2 WATCHING, BARRICADING, LIGHTING AND TRAFFIC CROSSINGS

Add the following:

The requirements for watching, barricading, lighting and traffic crossings are set out in the earthworks specification SANS 1200 D, as amended herein.

PS A 5.4 PROTECTION OF THE OVERHEAD AND UNDERGROUND SERVICES

Add the following:

The Contractor shall as soon as possible after handing over of the site, commence with the detection of existing services, continuously without interruptions and finalize it at least 7 days before excavation starts at that particular section.

Provision must be made for trial hole trenches, every 10m, 1,2m long, 0,6m wide and 1,5m deep along any of the routes indicated on the drawings.

Particular attention is drawn to the requirement for timeous investigation and the submission of a report by the Contractor, as stipulated in the second paragraph of the clause.

Add the following:

Before any excavation is carried out within 10 m of the position of a known service the Contractor shall notify the Owner of the service, as well as the Engineer or his Representative, that the excavation is to be made and shall ascertain and comply with all conditions imposed by the Owner. The excavation shall not commence until written authorisation has been received from the Owner that excavations may proceed.

The Contractor shall be liable for any damage that may occur to any service as a result of his operations, and he shall immediately notify the Owner and the Engineer of such damage and make all arrangements and pay all costs in connection with the repair thereof.

Provision must be made for the protection and maintenance of existing services for the duration of the contract. No payment will be made in respect of this and all costs must be included in the tendered rates. All such services, the positions of which have been located at the critical points, shall be designated as "known" services and their positions shall be indicated on a separate set of drawings, a copy of which shall be furnished to the Engineer.

While he is in occupation of the site, the Contractor shall be liable for all damage caused by him to known services as well as for consequential damage arising there from, whether caused directly by his operations or by lack of proper protection.

PS A 5.5 WATER SUPPLY

Water consumption on various sites will be done by using (TNPA Waterman portable meter) this reading will be recorded each month by Contractor and given to Project Manager to arrange invoice from TNPA. The Contractor shall supply his own connections and hoses or other methods of distribution. Under no circumstances will the use of the employer's hoses be permitted. The Contractor will meter the usage and pay thereof to the employer.

PS A 5.6 POLLUTION

Add the following paragraph:

Measures to minimize dust shall include regular and effective treatment and watering of working areas. No additional payment will be made for such measures and the Contractor shall allow for them in his tendered rates.

The Contractor shall ensure that all construction debris (e.g. cement bags, timber, wire, nails, etc) waste and surplus food, food packaging, litter and organic waste are not deposited by his employees anywhere on, or off, the site except in refuse bins for removal on a regular basis by the Contractor. Refuse collected must be disposed of only at a site(s) approved by the Engineer and local authority.

The Contractor shall provide labour to clean up the Contractor's camp and working areas at least once a week, or as deemed necessary.

PS A 5.7 SAFETY

Add the following:

The Contractor shall at all times observe the provisions of the Occupational Health and Safety Act, Act No. 85 of 1993 and the Construction Regulations 2003.

The Contractor under this Contract is the "Employer" in terms of Act No. 85 of 1993.

In compiling his Health and Safety Plan the Contractor is advised that the risks associated with the execution of the contract include but are not necessarily limited to the following:

- (a) The stability of the sides of excavations.
- (b) Open excavations.
- (c) The movements of heavy construction equipment.
- (d) The use of explosives.
- (e) The loading, transport and off-loading of heavy equipment and components.
- (f) Traffic on public roads.
- (g) The generation of dust and noise pollution.
- (h) The possibility of exposing and working around live electrical cables.
- (i) The effects of high pressures and volumes of water in mains associated with the Works.

All personnel engaged on the site, including the Engineer and his Representatives, Sub-Contractors, suppliers and other visitors, shall be issued with Personal Protection Equipment (PPE) comprising at least two (2) overalls, a safety hat (hard-hat) and a pair of safety-boots. With the exception of those provided to the Engineer and his Representatives, the overalls and hard hats shall be of uniform colour and shall have the Contractor's name clearly displayed thereon. The overalls and hard-hats provided for the Engineer shall be of a different colour to those of the Contractor and shall be embossed with the Engineer's name and logo, all to the approval of the Engineer. When working close to the quay walls, life jackets are mandatory and shall be provided by the Contractor.

It shall be incumbent on the Contractor to ensure that all personnel wear the specified PPE at all times while engaged on the Works and the Engineer shall have the authority to order from the site of the Works any person not wearing the correct PPE and/or not clearly identifiable as being in the employ of the Contractor.

Add the following Clause:

PS A 5.9 RECORD DRAWINGS

As the Works is progressing, the Contractor shall record and neatly mark up all as-built details on a dedicated set of construction drawings provided by him and submit it on a monthly basis to the Engineer's Representative. "Record Drawings" shall have the same meaning as "As-built" drawings.

The as-built information shall include the survey (by a qualified surveyor) of the co-ordinates and levels of all structures, buildings, manholes, pipelines, fences, etc. For pipelines the crowns of pipes and fittings shall be surveyed on all connections and inflection points (changes in horizontal and vertical alignment) and on straight lengths at maximum 6 m intervals.

The Completion Certificate shall not be issued before the submission of all the Record Drawings to the satisfaction of the Engineer.

Add the following Clause:

PS A 5.10 ACCOMMODATION OF TRAFFIC

PS A 5.10.1 Safety

Add the following:

The Contractor shall be responsible for maintaining the existing road surface both within the works area and the advance warning and termination areas in a safe and trafficable condition for the duration of the contract.

PS A 5.10.2 Approval of temporary deviations

Add the following:

If, after any temporary deviation has been constructed, any changes are considered necessary or desirable, the proposal shall be submitted to the Engineer for his approval.

PS A 5.10.3 Traffic Safety Officer

Add the following to the end of the second paragraph:

The Contractor shall submit a CV of the candidate to the Engineer for approval before the candidate is appointed as the traffic safety officer.

Add the following:

PS A 5.10.4 Failure to comply with provisions.

Failure or refusal on the part of the Contractor to take the necessary steps to ensure the safety and convenience of the travelling public, accommodation of traffic, plant and personnel in accordance with these specifications or as required by statutory authorities or ordered by the Engineer, shall be sufficient cause for the Engineer to apply penalties as follows:

A fixed penalty of R1 000 per occurrence shall be deducted for each and every occurrence of non-compliance with any of the requirements.

In addition, a time-related penalty of R500 per hour over and above the fixed penalty shall be deducted for non-compliance to rectify any defects in the accommodation of traffic within the allowable time after the Engineer has given an instruction to this effect. The Engineer's instruction shall state the allowable time, which shall be the time in hours for reinstatement of the defects. Should the Contractor fail to adhere to this instruction, the time-related penalty shall be applied from the time the instruction was given.

PS A 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 Engineer, 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 Engineer 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.

PS A 7.1.1 Checking

Once the Contractor has satisfied himself with the standard of his work, he shall notify the Engineer at least 24 hours in advance to enable the Engineer to witness the Contractor's checks and/or tests or to perform his own checks, inspections and/or tests. At least the following particular stages of checking of constructed Works shall apply:

Pipe trenches:

- Excavated pipe trenches: Before placing of bedding material.
- Backfilled pipe trenches: When each respective 300 mm deep layer of bedding and backfill has been completed for maximum distances of 100 m, unless otherwise agreed distances.

Pipework (i.e., pressure pipes, stormwater pipes, sewers, and ducts):

- Installed pipework, thrust blocks and supports: Before covering up.
- Pressure tests: After partial backfill (joints and fittings to remain exposed).
- Pressure re-tests: On completion of final backfill.

Structures:

- Excavations and foundations: Before casting of any blinding, erection of reinforcement and formwork and/or construction of bases.
- Tied reinforcement: Before closing of formwork or where there is no closed formwork, casting of concrete.
- Erected formwork: Before casting of concrete for each structural element that is to be cast separately.
- Structural steelwork: Similar to steel pipework (see Clause PSL 7.1).

Earthworks:

- Excavations: After preparation of excavated surfaces
- Backfill/fill: After completion of each layer of fill

Roadworks:

- Roadbed preparation: After completion of roadbed preparation.
- Subgrade, subbase, basecourse and wearing course: After completion of each layer.
- Bituminous and asphalt surfacing: Before and after application of each coat of prime, tack or spray and placement layers of aggregate or asphalt.

The Contractor shall obtain the approval of the Engineer before proceeding with subsequent stages of work.

When giving notification, the Contractor shall provide the Engineer with the results of his own checks and tests indicating that the work is to specification. Failure by the Contractor to notify the Engineer or to provide the required information or, where specified, to perform the required checks or tests, will be grounds for the Engineer not to certify the work as being complete, as well as any subsequent affected work.

The Engineer shall be under no obligation to the Contractor to perform checks, inspections and/or tests. If the Engineer elects not to perform a particular check, inspection and/or test after notification by the Contractor, he will notify the Contractor in writing after which the Contractor can proceed with the relevant work without the Engineer's checks, inspections and/or tests having been performed.

Nothing contained in this Clause shall relieve the Contractor of his responsibilities under the Contract or in any way limit the checks, inspections and/or tests which the Engineer may request or perform in terms of the Scope of Works. The Contractor shall make due allowance for his own and the Engineer's checking, inspection and/or testing procedures in the rates of scheduled payment items and in the construction programme.

PS A 7.2 APPROVED LABORATORIES

A Provisional Sum has been provided in Bill A of the Bills of Quantities to allow for the cost of the Engineer's acceptance tests which meet the specification requirements. The cost of all other testing shall be borne by the Contractor.

The procedure for payment of the Engineer's acceptance testing will be as follows:

- The Engineer's laboratory shall invoice the Contractor with all acceptance testing costs including unsuccessful tests.
- The Contractor shall be reimbursed for all acceptance tests which meet the specification requirements via the interim Payment Certificates.

PS A 8 MEASUREMENT AND PAYMENT

PS A 8.1.2.1 Contents (Sub-clause 8.1.2.1)

Replace item c) with the following:

The 'duration of construction' shall be the time for completion stated in the contract data.

PS A 8.2 PAYMENT

PS A 8.2.1 Fixed-charge and Value –related items

Replace the contents of this item with the following:

Saving the stipulations of 8.2.3 and 8.2.4, payment for fixed-charge and value-related items shall be made in two equal instalments. The first instalment equal to half of the tendered amount shall be made payable in the first certificate after completion of the Contractor's obligations under each respective item. The second instalment shall be paid as soon as the total value certified for payment, including retention moneys, but excluding the second payment referred to above, exceeds 50% of the Tender Amount for the Contract.

PSA 8.2.2 Time –related items

Replace the contents of this item with the following:

Saving the stipulations of 8.2.3 and 8.2.4, payment for time-related items shall be made on a monthly basis calculated by multiplying the respective tendered amounts with the fraction which the total amount (excluding all payments for time-related items) certified for payment comprises of the final, estimated (if necessary) Contract Amount (excluding all payments for time-related items). Tendered amounts for time-related items shall be

adjusted pro rata for any official reduction or extension of time granted on the agreed duration of construction.

PS A 8.2.3 Adjusted payment for time-related items

The payment to the Contractor for time-related items shall be adjusted in accordance with the following formula in the event of the contract being extended:

Sum of Tendered amounts for time-related items = $\frac{\text{Extended contract period as authorised by compensation event/}}{\text{tender contract period}}$

The abovementioned adjustment of the payment for time-related items shall be made in the Completion Payment Certificate and shall be the only payment for additional time-related costs.

PS A 8.3 ESTABLISHMENT OF FACILITIES ON THE SITE (SUBCLAUSE 8.3.2.1 AND 8.3.2.2)

PSA 8.3.2.1 Facilities for Engineer

Amend Clause PSA 8.3.2.1

PSA 8.3.2.1(a) Facilities

This item shall take into account all requirements listed in PSAB, no additional Payment shall be made for items listed within PSAB.

Delete Payment Item 8.3.2.1(b)

Add the following new payment items:

- | | |
|----------------------|------------------|
| (d) Survey assistant | Unit: Sum |
| (e) Survey equipment | Unit: Sum |

The tendered rate shall include all costs and charges, including provision for overheads and profits related to providing the required facilities, complete as specified. The tendered rate shall also include provision for repairing or replacing the facilities should they be lost, stolen or damaged, but should exclude provision for any running costs.

PS A 8.3.2.2 Facilities for Contractor

Add the following new payment item:

- | | |
|---|------------------|
| (k) PPE for all Contractor personnel, including Sub-Contractors, Engineers, Client, suppliers and visitors, as specified in PSA 5.7 | Unit: Sum |
|---|------------------|

PS A 8.3.3 Other fixed-charge obligations

Amend the description of the payment item as follows:

The sum shall cover the fixed costs of all other obligations, excluding all safety provisions as prescribed by the Occupation Health and Safety Act, (Act No. 85 of 1993) and the Construction Regulations, 2003, that are required for the proper execution of the Works in accordance with the requirements of the specification and the conditions of contract, and that are not specifically covered in 8.3.1, 8.3.2 and 8.3.4.

PS A 8.3.4 Removal of Site Establishment	Unit: Sum
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The sum shall not be less than 15% of the total value of the tendered sums under Payment Clause 8.3.2: Establishment of facilities on the Site.

If the tendered sum is less than the specified percentage above the Engineer shall hold back, for the duration of the contract, the sum tendered for item PSA 8.3.4, as well as the balance required to achieve the specified 15%, from item PSA 8.3.2, until the removal of site establishment has been completed to the satisfaction of the Engineer and item PSA 8.3.4 becomes payable.

PS A 8.3.5 Provision of a Safety Plan in terms of OHS Act and Safety Regulations

Add the following new payment item:

Provision of a Safety Plan in terms of OHS Act and Safety Regulations **Unit: Sum**

The sum shall cover the fixed costs of all safety provisions as prescribed by the Occupation Health and Safety Act, (Act No 85 of 1993) and the Construction Regulations, 2003, that are required for the proper execution of the Works in accordance with the requirements of the specification and the conditions of contact, and that are not specifically covered in 8.3.1, 8.3.2 and 8.3.4.

PS A 8.4 SCHEDULED TIME-RELATED ITEMS

PS A 8.4.2 Operation of Facilities on the Site

PS A 8.4.2.1 Facilities for Engineer

PSA 8.4.2.1(a) Facilities

This item shall take into account all requirements listed in PSAB, no additional Payment shall be made for items listed within PSAB. The tendered Sum shall include all time related costs and charges, including provision for overheads and profits related to operating the required facilities as specified.

Delete Payment Item 8.4.2.1(b)

PS A 8.4.2.2 Facilities for Contractor

Add the following new payment item:

(k) PPE for all Contractor personnel, including Sub-Contractors, Engineers, Client, suppliers and visitors, as specified in PSA 5.7 **Unit: Sum**

PS A 8.4.5 Other time-related obligations

The sum shall cover the time-related costs of all other obligations, excluding all safety provisions as prescribed by the Occupation Health and Safety Act, (Act No. 85 of 1993) and the Construction Regulations, 2003, that are required for the proper execution of the Works in accordance with the requirements of the specification and the conditions of contact, and that are not specifically covered in 8.4.1 - 8.4.4 (inclusive).

PS A 8.4.6 Compliance with approved Safety Plan and Occupational Health and Safety Act and Construction Regulations

Add the following new payment items:

Compliance with approved Safety Plan and Occupational Health and Safety Act and Construction Regulations **Unit: Sum**

The sum shall cover the time-related costs of all safety provisions as prescribed by the Occupation Health and Safety Act, (Act No 85 of 1993) and the Construction Regulations, 2003, that are required for the proper execution of the Works in accordance with the requirements of the specification and the conditions of contract, and that are not specifically covered in 8.4.1 - 8.4.4 (inclusive).

PS A 8.4.7 Compliance with Record of Decision issued by TNPA

Add the following new payment items:

Compliance with Record of Decision issued by TPNA

Unit: Sum

Add the following Payment Item PSA 8.4.8

PS A 8.4.8 Project Management

Unit: Sum

The Sum tendered shall cover the cost of co-ordinating all construction activities on site, programming of the construction activities and ensuring timeous completion of those activities.

PS A 8.5 SUMS STATED PROVISIONALLY BY ENGINEER

Add the following sub-clauses:

Add the following:

Sums allowed will be all inclusive and be paid on approval of the required proof of cost/expense incurred by the Contractor.

All overhead mark-ups shall be limited to 10%.

Replace the second paragraph with the following:

Control Testing requested by Project Manager

Provisional Sum for testing requested by the Engineer by an approved independent laboratory including travelling expenses and supply of a certified copy of test results.

Electrical Contractor

Electrical Contractor to be on stand-by for relocation and protection of any electrical services encountered

Asbestos Contractor

Sub-Contractor dealing with Asbestos pipes and contaminated soil - H & S, site establishment, executing work, testing, training and de-establishment.

Petroleum Contractor

Sub-Contractor dealing with Hazardous petroleum product - H & S, site establishment executing work, testing and de-establishment.

Gas Contractor

Sub-Contractor dealing with Gas products and installation - H & S, site establishment executing work, testing and de-establishment

Training

Training allowance paid to targeted labour in terms of formal training

Specialist Assessments

Sub-Contractor dealing with specialist assessments that may be required during the project.

Special ventilation equipment for tunnel extraction specification

Tunnel extraction fan - PVT Portable ventilator with spiral flexible ducting to be used whilst working in services tunnels.

Survey of Existing Bridges

Surveying of existing bridges for installation of pipe specials and attachments.

Condition Assessment of Existing Concrete

Invasive testing and scanning of existing structural elements.

Protection of structures, etc. until construction in vicinity is complete.

Overhead steel gantries next to rail lines

Excavate in vicinity of buildings

Protection of Rail logs and stone

Breaking into Existing Structures

Breaking into existing concrete tunnels and installing a new access manhole

Professional Diver

Supplying a professional registered diver and diving company, including all related H & S responsibilities, boat, suites, air, etc for Installing landing valve pipelines, brackets complete and coring if required under deck sections, to be done under low tide conditions.

Additional Buildings Plumbing/ Meter Supply

Supplying and installing additional plumbing for buildings and or meters.

PS A 8.8 TEMPORARY WORKS

PS A 8.8.2(a) Accommodation of Traffic in General Unit: Sum

PS A 8.8.2(b) Accommodation of Traffic in Road Reserve Unit: Sum

PS A 8.8.2(c) Accommodation of Traffic Quay Side Unit: Sum

A provisional sum is allowed for, for unforeseen instances not allowed for in the contract.

The tendered Sums shall include full compensation for all requirements in terms of the specifications, including Clause 5.8 of SANS 1200 A and Clauses 5.1 of SANS 1200 D and 1200 DB for the provision of temporary bypasses and accesses to properties and for the general control of traffic, including the installation and all subsequent moving and re-establishment and final removal of lighting, signboards, traffic signs, barricades, drums, flashing lights, labour, transport or any other item required for the safe accommodation of traffic on public roads, all to the satisfaction of the Engineer and, where applicable, in accordance with the requirements of the Employer.

The tendered Sums shall also cover all cost relating to liaising with the owners or land occupiers and the dealing of traffic during half width construction, including any temporary bypasses to be constructed from G7 fill and G5 subbase material compacted to 95% Mod AASHTO.

The tendered sum shall include all or any of the following methods of accommodation of traffic including temporary traffic signs and markings and construction of temporary access crossings for properties.

- i) Construction of temporary bypasses as may be required to deviate traffic from portions of the road that are affected by the construction; or
- ii) Where half width construction is ordered or approved by the Engineer, the contractor shall arrange the construction work so that general traffic will have free one-lane access at all times to at least half the width of the roadway.
- iii) Wherever possible, where half width construction is used, the Contractor shall ensure that the whole roadway is open at night and, at the end of each working day, is left in a safe and good trafficable condition, complete with traffic signs and the required protection facilities specified in Sub-clause 5.1.6 of SANS 1200 D and Sub-clause 5.1.8 of SANS 1200 DA, as applicable;
- iv) Ensure the usable width of the road is:
 - a. At least 6.0 m for two-way traffic, and
 - b. At least 4.0 m for each lane for single-lane traffic.

Where pipeline routes are along residential roads and may on occasion obstruct driveways to private properties, no pipeline trenches shall remain open overnight with the approval of the Supervisor. The Supervisor's approval will only be obtained when the Contractor, in addition to complying with the relevant requirements of Sub-clause 5.1.6 of SANS 1200 D or Sub-clause 5.1.8 of SANS 1200 DA, as applicable, complies with the following:

- i) The Contractor shall provide and allow reasonable access to persons occupying properties that fall within or adjoin the area over which he is working.
- ii) If, for any reason, such access be closed for any period(s) during the construction period, it is a requirement of the Contractor to give the affected property owners reasonable notice in writing of each period of closure.

The Contractor will be required to submit "Traffic Accommodation Plans" for approval to the Engineer, before construction commence.

The Contractor shall be responsible to assess the different possibilities for the methods of construction, associated traffic accommodation and the detail design and implementation of the works which shall be required for this Contract, and to price accordingly.

PS A 8.8.4	Existing services	Unit:m³
	<p>The rate shall cover the cost of excavating by means of hand tools within authorised dimensions, for all precautionary measures necessary to protect the services from damage during excavation and backfilling and for subsequent backfilling and compacting. Compaction of all material shall be in accordance with SANS 1200D. Reinstating layer works and surfacing for roads shall be measured elsewhere.</p> <p>The tendered rate shall also include for keeping excavations safe, for dealing with surface and subsurface water, for removal of surplus excavated material from the Site, for transporting all material regardless of the distance involved (no overhaul shall apply to materials transported to and from site) and for supplying adequate supervision during both excavation and backfilling operations.</p>	
PS A 8.8.5	Cost of Survey in Terms of the Land Survey Act	
	<p>An additional item is allowed for survey work.</p> <p>Trigonometrical survey and plot boundary pegs – locate, record and verify reference beacon</p> <p>Trigonometrical survey and plot setting-out pegs - protect and re-establish if needed</p>	
PS A 8.8.7	Security Guards	
	<p>Provide Security guard (armed response) for duration of the construction works after hours, and on instruction by the Engineer.</p> <p>(i) Payment of weekly wage, communication, and transport</p>	
PS A 8.8.8	Liaison with Service Providers, Landowners, Other Contractors and Stakeholders	Unit: Sum
	<p>The tendered Sum shall include full compensation for all requirements over and above the general contractual requirements, including the requirements for the identification and location of existing services, wayleave conditions, etc. to liaise with Service Providers, Land users, Landowners, and other Contractors. Unless different items are scheduled, the sum tendered shall be deemed to include all these parties. Payment shall be made on a pro-rata basis in terms of Clause 8.2.2 of SANS 1200 A, but the tendered Sum shall not be subject to adjustment due to extensions of time.</p>	
PS A 8.8.9	Provision of Record/ As-Built Drawings	Unit: Sum
	<p>The tendered Sum shall include full compensation for the provision of Record Drawings as specified in Clause PSA 5.9. Payment shall be made on a pro-rata basis in terms of Clause 8.2.2 of SANS 1200 A. Failure to conform to the specified requirements shall result in non-payment and deduction from due contractual payments all reasonable costs, including survey costs, incurred by the Engineer to provide Record Drawings.</p>	
PS A 8.8.10	GPR of Existing Services	Unit: m
	<p>The tendered rate shall include full compensation for conducting Ground Penetrating Radar Surveys in the existing Port Area as directed by the NEC Supervisor or Project Manager. The rate shall be per linear metre of survey conducted for a 10m strip. The survey shall abide by the requirements stated in Clause 5.1.3.</p>	

PS A 8.8.11 Provision of Operation and Maintenance Manual Unit: Sum

The tendered Sum shall include for all requirements involved in the preparation and submission of Operation and Maintenance Manuals. Payment shall only be made upon handing over of the final manuals to the Employer.

Three (3)-off draft copies of the O&M Manuals shall be submitted for approval (2 weeks prior to commissioning) and three (3)-off final copies (2 electronic and 1 paper) of the O&M Manuals, hard copies, and electronic copies, shall be provided.

The manuals shall be all inclusive of the requirements of the Specifications and the following minimum information shall be provided:

- Contact information for all parties involved
- Description of Works
- Equipment List
- Drawings
- Electrical Cable Schedule
- Electrical Certificates
- Pipe and Valve Test Records
- Process and Control System Description and Operating Manual
- Maintenance Schedule of Mechanical Equipment
- Specification Sheets and Part Lists for all Mechanical Equipment
- Specification Sheets and Part Lists for all Electrical Equipment
- Specification Sheets and Part Lists for all Electronic Equipment

The Contractors attention is drawn to the fact that the above list is not exhaustive and serves merely as a guideline to assist the Contractor.

The Contractor shall also take cognisance of the specific requirements in the Specifications of the various parts of the works i.e., mechanical, electrical, electronic, etc.

PS A 8.8.12 Training of Employers Operating Staff Unit: Sum

The tendered Sum shall include for all requirements of the Mechanical Specifications and the Electrical Specifications related to the training of the Employer's operating staff during the commissioning period.

During the operational acceptance period/commissioning and trial operation period the Contractor shall train the Employer's operating staff and instruct them in the proper operating and maintenance procedures for the equipment concerned. This shall include troubleshooting procedures in the case of malfunction of equipment.

Training shall take place for the duration of the commissioning period and the Contractor shall submit a comprehensive training schedule to the Engineer for approval. The schedule shall indicate the time and date of the training, type of training, the target group for the training, the duration of the training, training materials provided, name of person presenting the training etc.

The training schedule shall be submitted to the Engineer not less than 4 weeks prior to the intended commencement date of the training, to allow comments to be made and incorporated. This period is also required to allow the Employer to make scheduling arrangements in order to ensure the availability of staff members for training.

Where the Employer's staff works on a shift basis the Contractor shall allow for the fact that certain training sessions may have to be presented more than once in order to allow all relevant staff members to attend.

The Contractor shall also take cognisance of the specific requirements in the Specifications of the various parts of the works i.e., mechanical, electrical, electronic, etc.

PS A 8.8.13 28 Day Trial Operational Acceptance Period Unit: Sum

The 28-day Operational Acceptance Period shall commence once the works is commissioned to the satisfaction of the Engineer. The tendered Sum be held to include all necessary items during the trial period (e.g. servicing of equipment, adjustments to plant, monitoring and recording of performance, supervision, etc.) for all Mechanical and Electrical Works. The sum shall also include for the provision of all chemicals required for the appropriate operation of the Plant.

PS A 8.8.14 Provision of Contractor's Design Documents Unit: Sum

The tendered Sum shall include full compensation for all requirements of the Mechanical Specifications and the Electrical Specifications in relation to the Contractor's Documents. The Contractor shall provide the necessary designs, drawings, etc. as stipulated in Works Information of the Works information as well as the NEC Conditions of Contract. This item shall be paid once the Contractor's Design Documents have been accepted by the Engineer. No additional payment shall be made for design of items/ systems indicated in the Scope of Works.

PS A 8.8.15 Flow and pressure logging at identified connection points to eThekweni network Unit: No.

The tendered rate shall include full compensation for installation and maintenance of the flow and pressure loggers for the full duration of 28 days. The rate includes all work and appurtenances required to fully install the loggers, as well arranging any shutdowns required.

- Separate logging points, all to be logged simultaneously.
- Duration: seven (28) consecutive days. Logging data intervals: 15min
- Date and Time Stamp: Each logged value must have a date and time stamp.
- Pressure Unit: Meters head (m)
- Flow Unit: kl/hour
- Pulse Value: The Contractor must confirm that the correct pulse value is applied for the meter and reed switch / pulsar used for the logging exercise. Service provider must have the relevant experience to obtain the correct pulse value.
- Data Submission: Data must be submitted in MS Excel format where the combined date and time stamp appears in column A and the pressure data appears in column B and flow data appears in column C. Each Location must appear in a separate tab.
- Gaps in Data: Data should have no data gaps.
- Pressure Gauge: Contractor must use a manual pressure gauge to verify the pressure being recorded on the data logger is correct, during the installation and removal of the logger.
- Water meter: Contractor must provide ultrasonic clamp on water meter; the service provider shall carry out spot checks on the existing TNPA meter to compare readings.
- Photographs: Contractor must provide photographs of the logger installation and of the pressure gauge reading at the time of installation and removal of the data logger.

PS A 8.8.16 SPECIAL CORE DRILLING EQUIPMENT FOR VARIOUS SLEEVES AND ACCESS HOLES IN CONCRETE: SUPPLY, ESTABLISH, DRILL AND DE-ESTABLISH FROM SITE:

An additional item is allowed for work to be executed for core drilling for

(a) Supply equipment and drill Horizontal cores for the sizes of holes through concrete

(i) 50mm dia. hole - 300 to 500mm long	Unit: No
(ii) 100mm dia. hole - 300 to 500mm long	Unit: No
(iii) 150mm dia. hole - 300 to 500mm long	Unit: No
(iv) 250mm dia. hole - 300 to 500mm long	Unit: No

(b) Supply equipment and drill Vertical cores for the sizes of holes through concrete

(i) 50mm dia. hole - 300 to 500mm long	Unit: No
(ii) 100mm dia. hole - 300 to 500mm long	Unit: No
(iii) 150mm dia. hole - 300 to 500mm long	Unit: No
(iv) 250mm dia. hole - 300 to 500mm long	Unit: No

(c) Extra over for all core drilling in confined spaces:

(i) In services ducts	Unit: No
(ii) Restricted excavated trenches	Unit: No

The tendered rate shall include all costs and charges, including provision for overheads and profits related to providing the required equipment, labour, handling, drilling, removal of core material, complete as specified.

PS A 8.8.17 Locate, Draw, Survey and Design Meter Bulk Connections Unit: No.

The tendered rate shall include full compensation for locating, surveying, sketching up and designing connections from existing EWS Bulk meters to new TNPA Check meters. The rate includes all work necessary to finalise designs.

SANS 1200 PSAB: ENGINEER'S OFFICE

PS AB 3 MATERIAL

PS AB 3.1 Name board

Substitute "South African Institution of Civil Engineers" in the first paragraph of AB 3.1 with "South African Association of Consulting Engineers".

One Name board must be erected on site, situated as specified by the Engineer. The layout of the boards is shown in the drawings.

Replace the contents of the clause with:

The Contractor shall supply and erect at an approved site a name board complying with the SAICE's standards. The Engineer shall provide the required wording.

The size of the board shall be 4.88m x 1.8m.

PS AB 3.2 OFFICE BUILDINGS

Replace the contents of the clause with:

The Contractor shall provide and furnish 1 x office for the use of the Engineer and his representatives in each zone. The office shall have a floor area of at least **2 x 12m²** and the floor to ceiling height shall be not less than 2,5m. The office shall be weatherproof, have a wooden boarded floor that is at least 150mm above the ground and be provided with a ceiling and a lining to the walls or equivalent insulation with a robust door fitted with a secure lock. Two keys shall be provided. The office shall have windows of combined glazed area of 15% of the floor area of which 50% shall be open able windows shall be fitted with robust burglar bars. The office shall be well ventilated and insulated to provide comfortable working conditions.

The internal furnishings for each office shall include the following:

- (a) office table 2,6 m long x 0,9 m wide
- (b) six office chairs
- (c) blinds to each window
- (d) acceptable lighting
- (e) two desks 1,5 m long x 0,9 m wide 6 drawers
- (f) lockable upright steel stationary cabinet 0,9 m wide x 1,7 m high x 0,4 m deep
- (g) lockable four drawer steel filing cabinet.

The Contractor shall provide and furnish 1 x main meeting/board room. The office shall have a floor area of at least **25m²** and the floor to ceiling height shall be not less than 2,5m. The office shall be weatherproof, have a wooden boarded floor that is at least 150mm above the ground and be provided with a ceiling and a lining to the walls or equivalent insulation with a robust door fitted with a secure lock. Two keys shall be provided. The office shall have windows of combined glazed area of 15% of the floor area of which 50% shall be open able windows shall be fitted with robust burglar bars. The office shall be well ventilated and insulated to provide comfortable working conditions.

The internal furnishings for meet/boardroom shall include the following:

- (a) office table 2,6 m long x 1,2 m wide
- (b) 15 office chairs
- (c) blinds to each window

- d) acceptable lighting and ventilation

Rainfall recorded by the weather station at Durban Harbour shall be applicable on this contract.

PS AB 3.3 SITE INSTRUCTION BOOKS (CONTRACT INSTRUCTION BOOK)

Replace with the following:

Throughout the construction period the Contractor shall document all Construction activities on Autodesk Construction Cloud (ACC). All Site instructions from the NEC Supervisor and Project Manager shall be documented and issued on the ACC Platform

PS AB 4 PLANT

PS AB 4.1 TELEPHONE

Delete Clause and replace with:

A Telkom telephone is not required for use by the Engineer.

PS AB 4.2 COMMUNICATION AND OFFICE EQUIPMENT

The Contractor shall supply and install the following for use by the Engineer's and Employer's representatives:

- Multi-functional colour A3 laser printer/copies/scanner/fax with Wifi direct.
- Internet connectivity (10 Mbps uncapped ADSL or LTE or equivalent).
- Five iPad Pro 9.7 inch Wi-Fi cell 128 Gb
- Five personal lightweight travel laptop (Dell Latitude 7390 or equivalent) complete with docking station, cordless mouse, keyboard and 23" monitor. The laptop shall meet the following specifications:
 - 10th Gen Intel Core i7-8650U (8M Cache, Quad Core, 1.9GHz), vPro
 - 16GB, 1x16GB, 2400Mhz DDR4 Memory
 - 13.3" FHD WVA (1920 x 1080) Anti-Glare, Camera & Mic, WLAN/WWAN Capable
 - M.2 512GB PCIe NVMe Class 40 Solid State Drive
 - Integrated UHD Graphics 620 with Thunderbolt
- Windows 10 64 bit software shall be installed on the laptop.
- Standard software to be installed on the four laptops:
 - MS Office and MS Lync shall be installed by the Service Provider (WSP) at no additional cost for the period of the contract.
 - VPN software shall be installed by the Service Provider (WSP) at no additional cost for the period of the contract.
- One licence for each of the following software packages for the laptops:
 - MS Projects 2013
 - 1 x AutoCAD Civils 3D 2018 and 2 x AutoCAD Lite 2018
- A data projector and screen for sharing by the Contractor and Engineer to make presentations at site meetings and technical meetings.

The ACC system must be accessible by both foremen and higher management. The system should be available through:

- a) Smartphones: Native mobile applications compatible with Android and iOS devices will be used to access the system on smartphones.

b) Web Browsers: Access to the system will be available through commonly used web browsers (e.g., Chrome, Firefox, Safari) on laptops or desktops.

All these items shall be paid under SANS 1200A, Payment Items 8.3.2.2 and 8.4.2.2. Upon completion of the Works, ownership of the equipment shall revert to the Contractor.

PS AB 4.3 SURVEY INSTRUMENTS

Add Clause:

The Contractor shall have the following instruments available in good condition and adjustment for use by the Engineer or his Representative on the Works:

- (a) Level; tripod and 5m staff
- (b) 100 m Steel tape
- (c) 30 m Steel Tape
- (d) 5 m Builders steel tape
- (e) 6 Ranging Rods
- (f) Spirit Level 1m long

The Contractor shall keep the equipment continuously insured against any loss, damage or breakage and shall indemnify the Engineer and the Employer against any claims in this regard. This equipment may be shared between the Contractor and the Engineer by agreement but shall remain on site permanently. Ownership of the survey equipment shall remain with the Contractor.

PS AB 5 CONSTRUCTION

PS AB 5.1 NAME BOARDS

Add the following to PSAB 5.1:

The name board shall be erected within a month of the commencement date of the contract and shall be placed at the positions indicated by the Engineer. Any damage to this board shall be repaired within fourteen days of a written instruction issued by the Engineer. No payment shall be made in terms of the contract prior to the erection of the name board.

The Contractor will be permitted to erect a maximum of two of his own name board, in positions approved by the Engineer. The Engineer reserves the right to order the removal of these boards if they are not kept in good repair.

Add the following Clauses:

PS AB 5.6 COMMUNICATION AND OFFICE EQUIPMENT

The Contractor shall provide the following for the duration of the contract period:

- a) Cash reimbursement to the EAR's of proven cellular calls and cellular data usage. An allowance shall be made of R1000 per month (times 5 persons).
- b) Data of 10 GB per month for the duration of the contract
- c) Consumables (paper, ink, etc.).
- d) All rentals, subscriptions, etc.
- e) Support and maintenance of all equipment, software and office systems.
- f) Insurance against any loss, damage or breakage and indemnification

PS AB 5.7 VEHICLE

The Contractor shall provide the following for the duration of the contract period:

- a) 1 no double cab 2 litre diesel bakkie, 4x2 drive configuration
- b) Secure parking area
- c) Insurances
- d) Fuel

SANS 1200 PSC: SITE CLEARANCE

PS C 3 MATERIAL

PS C 3.1 DISPOSAL OF MATERIAL

Substitute the first sentence of C 3.1 with the following:

Material obtained from clearing and grubbing are to be stockpiled for later use and reinstatement. Surplus material will be spoiled off site to the Contractors approved spoil site. The Contractor is responsible for selection of the spoil and stockpile areas, subject to the approval by the Engineer and Client.

Special care and attention must be given to the following areas in relation to the "Occupational Health and Safety Act 1993 (Act No 85 of 1993), and bylaws and regulations stipulated in "ANNEXURE A" by the client (TNPA) for:

- i) Sections 1 to 4 with hazardous and contaminated materials including Asbestos and Hydrocarbons**
- ii) Section 4 with potential hydrocarbon products.**

PS C 3.2 METHOD OF MEASUREMENT

Notwithstanding the provisions of sub clause 8.2.8 of SANS 1200 C, demolition of various structures will be measured and paid for in accordance with the items in the schedule of quantities.

Volumes will be computed according to the net dimensions of the elements to be demolished with no allowance being made for bulking. The cost of removal of demolition rubble off site to waste shall be included in the rates for demolition.

PS C 3.3 OWNERSHIP OF DEMOLISHED MATERIALS

Where identified items are to be demolished or dismantled and stockpiled on site, the items shall remain the property of the Employer and may be re-used in the permanent Works.

Where items are to be demolished or dismantled and removed off site, the items shall become the property of the Contractor.

All reimbursable material shall be taken to a relevant declassifier company, if so, ordered by the client and the Contractor can claim 20% for handling and overhead charges on Item 8.2.7

PS C 5.3 CLEARING

Add the following to subclause C5.3e:

The rate shall cover the cost of taking down the fences, coiling wire, sorting and stacking all material at sites indicated by the Engineer, and shall include the cost of re-erecting/installing the fences to at least the condition it was prior to removal. The rate shall include the cost of all materials as well as the cost of installation.

PS C 5.3(g) Boundary Walls

The rate shall include the cost of demolition, cleaning, clearing, loading, transporting and disposal of all rubble at an approved dump site. The rate shall cover the cost of all labour and material required to reconstruct demolished walls to match existing.

PS C 8 MEASUREMENT AND PAYMENT

PS C 8.2 SCHEDULED ITEMS

PS C 8.2.1.(a) Clear and grub area in unsurfaced areas for

Pipeline 3m wide

Unit: m

The rate tendered shall cover the provision for all labour and construction methods in Hazardous areas, particularly to Sections 3 and 4.

PS C 8.2.1.(b) Clear and grub for rail ballast stone

Pipeline 3m wide

Unit: m

The rate tendered shall cover the provision for all labour and construction methods to carefully clear around rail track ballasts and neatly stockpile in the area for re-use.

PS C 8.2.4 Reclear surfaces

The rate tendered shall cover the provision for all labour, construction methods and machinery required, should it be instructed.

PS C 8.2.5a Take down existing fences and re-erect.

Change unit of measurement to

Unit: m

For re-erection of fencing, add the following.

Add the following:

The rate shall cover the cost of taking down the fences, coiling wire, sorting and stacking all material at sites indicated by the Engineer, clearing the surface, doing necessary excavations, transport, handing, backfilling, re-erection of fences including all materials to restore the fences to its original condition at least. The surface around shall be made good to the satisfaction of the Engineer.

Separate items shall be scheduled for the fences to be taken down and to be re-erected. The unit of measurement shall be the linear metre of fence removed. The rate shall include the cost of re-erecting all fencing to its original standard and in its original position. The fence shall be described in the Bills of Quantities and/or detailed on the drawings. An allowance for replacement of 15% of damaged or lost materials with new materials.

PS C 8.2.7 Removal of services:

Add the following:

(a) Dismantle remove and spoil pipelines

63mm to 315mm PVC water pipeline

Unit: m

75mm to 315mm CI and steel water pipeline

Unit: m

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	75mm to 315mm AC and steel water pipeline	Unit: m
	(b) Final hand excavation around service, lift, recover and deliver to area designated by the Engineer and neatly stack and maintain. The area will be within the Port bounds (10km).	
	Existing landing valves	Unit: No.
	Other services - including but not limited to valves, meters, hydrants, etc.	Unit: No.
PS C 8.2.8	Demolish and remove structures/buildings and dismantle steelwork, etc:	
	<i>Add the following:</i>	
	230mm Thick concrete approximately 1100mm wide x 230mm Deep	Unit: m
	300 to 500mm Thick concrete beams size approximately between 500mm to 1 500 mm	Unit: m
	190mm to 300mm thick reinforced concrete	Unit: m²
	Existing manhole and landing valve covers	Unit: No.
	Cut and remove existing steel rail beams in duct	Unit: No.
	Boundary Walls	Unit:m²
	All tendered rates shall include for all relevant construction methods and equipment needed to execute the billed items. The rate shall include the cost of demolition, cleaning, clearing, loading, transporting and disposal of all rubble at an approved dump site.	
	The rate for Boundary walls shall cover the cost of all labour and material required to reconstruct demolished walls to match existing.	
PS C 8.2.11	Preparation and stripping of site	
	(a) Remove existing asphalt to a depth of 50mm and	
	Neatly cut in straight lines the edge lines of specified trench positions	Unit: m
	Spoil at designated spoil site	Unit: m³
	(b) For the removal of existing concrete to a depth of 190mm and 230mm	
	Neatly cut in straight lines the edge lines of specified trench positions	Unit: m
	Spoil at designated spoil site	Unit: m³
	(c) Extra over item 8.2.11 (a) for cutting depth exceeding 50mm to 100mm	
	Neatly cut in straight lines the edge lines of specified trench positions	Unit: m
	Spoil at designated spoil site	Unit: m³

(d) Extra over item 8.2.11 (b) for cutting depth exceeding 230mm and

Neatly cut in straight lines and work the edge lines for specified trench positions

Unit: m

Spoil at designated spoil site

Unit: m³

All tendered rates shall include for all related actions, equipment, and necessary H & S requirements.

PS C 8.2.12 Cleaning of Tunnels

Unit: m³

All tendered rates shall be per cubic meter of debris removed from tunnels and include for all relevant construction methods and equipment needed to clean out the existing tunnels. The tunnel shall be swept clean, and the silts/ debris shall be removed. Typical Debris expected includes sand, grit, stripped cables, cables sleeves, etc. The rate shall include the cost of equipment, transport, H&S and disposal of all rubble at an approved dump site.

SANS 1200 PSDB: EARTHWORKS (PIPE TRENCHES)

PS DB 3.5 BACKFILL MATERIALS

Replace the following Clause 3.5(b):

- (b) For bedding, cradle, fill blanket, selected fill, subbase, base, and surface finish, see related sections in the bill for them.

PS DB 4 PLANT

PS DB 4.1 EXCAVATION EQUIPMENT

Add the following to DB 4.1:

All excavations exceeding the specified widths shall be backfilled with approved selected material. No payment shall be made for this, and all relevant costs shall be deemed to be included in the tendered rates.

Special care and attention must be given to the following areas in relation to the "Occupational Health and Safety Act 1993 (Act No 85 of 1993), and bylaws and regulations stipulated in "ANNEXURE A" by the client (TNPA) for:

- i) **Sections 1 to 4 with hazardous Asbestos materials,**
- ii) **Section 4 with potential hydrocarbon products.**

PS DB 5 CONSTRUCTION

PS DB 5.5 TRENCH BOTTOM

The onus is on the Contractor to control the depth of excavation so as to provide the specified thickness of bedding. Over-excavation shall be replaced with bedding material as instructed by the Engineer at the cost of the Contractor.

Unsuitable material in the trench bottom shall be removed and replaced with granular bedding material, or if the trench bottom conditions remain unstable due to the nature of the soil and the degree of saturation, with 19 mm building aggregate or dump rock. This will be carried out upon instruction by the Engineer.

If further required, as instructed by the Engineer, the stone shall be wrapped in 210g/m² polyester filter fabric that complies with the requirements of SANS 1200 DK. The filter fabric shall be laid on the trench bottom prior to the provision of the stone layer. After placing the stone on top of the filter fabric, it shall be folded over the stone with a minimum overlap of 300 mm to form an enclosed drain. The specified bedding material shall then be used to further bed the pipe.

Replaced material shall be measured by volume calculated according to length multiplied by the specified minimum base width and specified thickness and filter fabric by area according to length x 2 x (specified minimum trench base width + specified depth of stone bedding). Payment for replaced material and filter fabric shall only be considered if it was accepted by the Engineer prior to installation.

Where the Contractor's method of working results in quagmire conditions in the trench bottom, the Contractor shall excavate and stabilise the trench as described above at his own cost.

PS DB 5.6 BACKFILLING

PS DB 5.6.3 Disposal of soft and unsuitable excavation material

Replace the contents of this item with the following:

Excavation material from the trench, which is unsuitable or has become surplus because of bulking, displacement by the pipe and importation, shall be disposed of at no additional cost to an approved municipal dump site.

The Contractor shall provide the necessary spoil site and shall make the necessary arrangements with the owner of the site where the material is disposed of, and shall make provision in the scheduled rates in the Bills of Quantities for all charges in this regard and for all costs for transporting the material regardless of the distance involved. Should the Contractor select to use a private dump site, the Contractor shall indemnify the Client from any and all obligations.

Where contaminated soil is excavated, suitable dump sites or Contractors specializing in that field must be contracted to remove such material. Allowance in the rates in Section 3 and 4 must be made for these actions:

- a) Section 3 – Asbestos
- b) Section 4 – Hydrocarbon contaminated materials

PS DB 5.7 COMPACTION

PS DB 5.7.2 Areas subject to traffic loads

Add the following to DB 5.7.2:

All pipe trenches that fall under the road pavement layers will be regarded as areas subject to traffic loads and will be in accordance with the typical trench details supplied by the Engineer in relation to the surface finish required.

PS DB 5.9 REINSTATEMENT OF SURFACES

PS DB 5.9.2 Private Property and Commonage

Add the following to sub-clause:

The reinstated surfaces shall be finished in accordance with the final finishes required and specified for Asphalt, concrete, concrete paving, rail and others.

PS DB 7 TESTING

Renumber sub-clause “7.1” as “7.2” and insert the following new sub-clause 7.1:

- 7.1 During the backfilling of the trench, the Contractor shall undertake sufficient density tests on each layer of backfill above the bedding material to prove that the specified density of the backfill has been achieved. Provision for the cost of such testing shall be deemed to be included in the rates for the relevant scheduled items and no additional payment will be made as part of his quality methods.”

Delete the first sentence of the original sub-clause 7.1 (now 7.2) and replace with the following:

The Engineer may order additional density tests to confirm the Contractor’s test results.

PS DB 8 MEASUREMENT AND PAYMENT

PS DB 8.1 BASIC PRINCIPLES

Delete Sub-Clauses 8.1.1 and 8.1.2 and replace with:

PS DB 8.1.1 The Contractor shall select the sources of imported material and borrow pits and the sites for stockpiling and disposal of material. All haul of imported and disposed material and of all other moved material shall be regarded as freehaul. No overhaul shall apply, regardless of the distance involved.

All excavations shall include for dewatering, no separate payment shall be made for dewatering in the Bill of Quantities.

PS DB 8.1.2 The following shall apply to the measurement of excavations for trenches:

Trench excavations for pipelines will be measured per meter length.

Separate items will be scheduled for varying depths.

Depth will be measured from the surface of the ground after clearing and grubbing along the centre line of the trench to the bottom of the specified bedding layer (if any).

PS DB 8.3 SCHEDULED ITEMS

PS DB 8.3.2 Excavate in all materials for trenches and backfill, compact and dispose of surplus material

ADD THE FOLLOWING:

The rate shall include temporary stockpiling of the material on a site selected by the Contractor, handling, excavating from stockpiles and all transportation. No overhaul shall apply.

Note: This item includes for restricted excavation and backfilling.

Progress payments shall be limited to the following:

- Excavation only: 40 % of the tendered rate
- Backfill 30% of the tendered rate
- Dispose of surplus material or reinstatement of surfaces 30% of the tendered rate

PS DB 8.3.2(a) Excavate in all materials for trenches and backfill, compact, and dispose of surplus and unsuitable materials for trenches for

- 1) Up to 1.0m wide applies to all pipe sizes with the execution of surface finishes as required, measured elsewhere in the bill.

PS DB 8.3.2(b) Hard rock Excavation

- 2) Hard excavation shall include concrete, boulders, ballast stones, etc. Intermediate excavation shall not apply to this Contract, only normal and hard excavation shall be measured and paid.

PSDB 8.3.2(c) Excavate and dispose of unsuitable material from trench bottom **Unit: m³**

A provisional quantity has been allowed in the Bill of Quantities for removal of unsuitable material and replacement with imported G7. This shall only be done upon instruction by the Engineer.

PSDB 8.3.2(d) Excavate and dispose of contaminated material **Unit: m³**

An extra over item has been included in the Bill of Quantities for excavation by hand, this is the extra over amount for labour required to excavate by hand.

PSDB 8.3.2(e) Excavate and dispose of contaminated material **Unit: m³**

A provisional quantity has been allowed in the Bill of Quantities for removal of contaminated (e.g. asbestos, hydro carbons, etc.) material, disposal at an approved dump site and replacement with imported G7. This shall only be done upon instruction by the Engineer.

PS DB 8.3.3.4 Overhaul

All rates supplied in the bill must include for haul, limited haul and overhaul. All haul is regarded as free haul

PS DB 8.3.4 Shoring

The Contractor shall make provision for proper shoring and all related actions and construction methods for this item. The rate for Shoring shall be deemed to be included in PS DB 8.3.2.

PS DB 8.3.5 Existing services

Items 8.3.5 (a) and (b) will be remeasurable and the following services has been made provision for:

Electric cable and manholes

Telephone cable and manholes

Fibre optic cable and manholes

House water connection

Water main not exceeding 500mm diameter

Sewer main not exceeding 300mm diameter
and structures

Stormwater pipe not exceeding 1050mm
diameter and structures

Rail lines and structures (high mast, OHTE)

Petroleum services

Product lines

Gas mains

PS DB 8.3.6 Finishing

Reinstate surfaces complete (measured elsewhere in the bill)

KEEP A PHOTOGRAPHIC RECORD OF BEFORE AND AFTER.

PS DB 8.3.8 Dump Rock

Unit: m³

The Contractor shall where conditions permit for no other solution, the Contractor shall identify, mark, and get approval from the Engineer to over excavate 300mm deep, to install a dump rock layer in the bottom of the trench.

The rate shall include for all excavation, supply and bed dump rock layer imported from commercial source with relevant geo fabric.

The rate for removing and spoil any unsuitable material is measured elsewhere in the bill.

SANS 1200 PSDM: EARTHWORKS (ROADS, SUBGRADE)

Where required for drainage purposes, the Engineer may instruct that free draining layer be used in the bedding layer.

PS DM 3.2 CLASIFICACION FOR PLACING PURPOSES

PS DM 3.2.3 Selected Layers

Substitute c) "CBR at 93" with "Minimum CBR of 95%" and is applicable to Items 8.3.5 (a), (b), (c) and (d), irrespective if from cut or importation.

PS DM 5 CONSTRUCTION

PS DM 5.2 METHODS AND PROCEDURES

PS DM 5.2.2 Cut and borrow

PS DM 5.2.2.2 Dimensions of cuts

Substitute "subbase" in the second paragraph of DM 5.2.2.2 with "subbase or selected layer, whichever may be applicable" and

Add the following paragraph:

The cost for shaping cuttings to the required levels and tolerances will be deemed to be included in the relevant pay items. No separate payment will be made for any operation the Contractor may require to meet the required level and tolerance."

PS DM 5.2.2.3 (b) Cut to spoil

Add the following:

Granular material obtained from excavations that is not of the same quality as required minimum, shall be spoiled of site as instructed by the Engineer, or directed by the client.

PS DM 5.2.2.4 Temporary stockpiling of materials

Add the following to DM 5.2.2.4:

The Contractor shall program the works in such a manner that suitable excavated material shall, if practically possible, be placed directly in the appropriate position to ensure that temporary stockpiling is limited to an absolute minimum. No payment shall be made for the temporary stockpiling of material where such material is to be used for backfilling of pipe trenches, except when so ordered in writing by the Engineer.

Where trenches are being excavated next to, or underneath rail lines, the stone must be neatly placed as directed by the Engineer.

PS DM 5.2.4.3 Finishing

In general, the finishes to the trench should conform to the area in which the excavation has been done and to specifications elsewhere in the bill to suite the relevant finish.

(e) Topsoiling

Replace the second portion of the first sentence with the following:

The thickness of the topsoil layer shall be as directed by the Engineer.

PS DM 7 TESTING

PSDM 7.2 PROCESS CONTROL

Amend Table 1 of Clause 7.2 as follows:

Replace “2000m² and 1500m²” in column 3, “1000m²” in column 3 opposite Indicator tests, “5000m²” in column 3 opposite CBR/UCS with “100m²”.

Replace “1” in column 4 opposite Indicator Tests with “2”. Replace “-” in column 4 opposite CBR/UCS with “2”.

PS DM 7.3 ROUTINE INSPECTION AND TESTING

Substitute DM 7.3.2 with the following:

No density shall be less than the specified minimum density for each of the relevant layers. The Contractor will keep updated plans on site indicating the following information:

- Each type of lot and the number of tests taken with the test date.
- The report date of the test results.
- Lot number as contained on the test reports.

All the test results are to be copied to the Engineer immediately on receipt via the online platform provided (ACC). The on-site file containing all the test results along with the marked-up plans will be submitted to the Engineer on completion of the contract.

The cost of all routine testing done shall be included in the tendered rates. The results that do not comply with the specified minimum requirement for the material shall be borne by the Contractor and related works will be subtracted from the monthly payment certificates.

PS DM 8 MEASUREMENT AND PAYMENT

PSDM 8.2 COMPUTATION OF QUANTITIES

PSDM 8.2.1 Compensation for work in restricted areas

No extra-over rates shall apply to work in restricted areas such as, for example, the widening of existing fills or to existing pavements, or repair, excavation or backfilling within the boundaries of an existing road carriageway. The only exceptions shall be those for which explicit provisions are made in the Scope of Works specifications and the Bills of Quantities.

Allowance for work in restricted areas shall, under normal circumstances, be deemed to be included in the rate tendered for each item of work concerned. Such rates shall include for all extra measuring and setting-out; all manual work of whatever nature; double handling of material; special methods of excavation, application, placing, mixing and compacting; as well as all extra and/or special supervision, labour, equipment, tools, transport and incidentals over the above those usually required for work in normal working areas.

PSDM 8.3 SCHEDULED ITEMS

Add the following:

PS DM 8.3.5 Selected Layers

Replace the first section heading with the following:

Selected layer compacted to 95% of modified AASHTO maximum density.

The Contractor shall where directed by the Engineer, modify the selected layers as per the Typical Section Details and Types on drawing XDNE028-1-000-C-DE-0005-01.

PS DM 8.3.8 Stabilisation

Stabilisation agent

(a) Portland cement CEM II A-L (32,5)

Unit: ton

Add the following:

The selected layer shall be mixed with 3% cement (based on volume) and shall be compacted in layers of 150mm thick to 95% of modified AASHTO density.

The rate shall be per ton and include mixing, placing, compacting and all necessary activities to provide a sound finish.

SANS 1200 PSG: CONCRETE (STRUCTURAL)

PS G 1 SCOPE

PS G 2 INTERPRETATION

PS G 3 MATERIAL

PS G 3.2 CEMENT

PS G 3.2.1 Applicable Specifications

Delete Sub-clause 3.2.1 and replace with:

Only Portland cement complying with SANS EN 197-1 of type CEM II shall be used on the Works.

PS G 3.2.3 Storage of cement

Cement shall not be kept in storage for more than 10 weeks without the Engineer's permission.

PS G 3.4.3 Storage of aggregates

Where aggregates of differing chloride content are stockpiled on the site, strict control shall be exercised over their use for differing classes of concrete.

PS G 3.4 AGGREGATES

PS G 3.4.1 Applicable Specification

Add the following to G3.4.1:

The fineness modulus of the sand must be between 1.7 and 2.8 with a standard deviation of not more than 0.1.

PS G 3.4.4 Alkali-aggregate reaction

Reactive aggregates shall not be used in conjunction with a high alkali cement in concrete in any part of the Works. For the purposes of this clause, a high alkali cement is one in which the equivalent alkali content ($\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$) exceeds $2,1 \text{ kg/m}^3$.

PS G 3.9 CURING COMPOUND

Add the following:

The curing compound used shall be a resin-based curing compound, which complies with the requirements of AASHTO M148, except that the water loss as determined by the water-retention test shall not exceed $0,40 \text{ g/cm}^2$ within 72 hours. A recent certificate from an approved testing laboratory shall be submitted, certifying that the curing compound complies with the specifications. Further testing shall be conducted at regular intervals.

The curing compound shall be capable of hardening within 30 minutes of having been applied and of being sprayed onto a wet surface without loss of stability, change in colour or becoming less efficacious. This characteristic shall also be confirmed by the approved testing laboratory.

PS G 4 PLANT

PS G 4.5 FORMWORK

Side Forms

Side forms and rails shall be so designed, manufactured, set, and supported that the completed concrete pavement will comply with all the requirements of clause 6.2.3 of SANS 1200G. Where the forms are tested with a 3 m straight edge, the top edge shall not deviate by more than 3 mm at any place, neither the sides by more than 6 mm. The sides shall not deviate by more than 3 mm from the vertical. The height of the side forms shall not be less than the nominal thickness of the concrete slab less 15 mm and the resulting opening between the side forms and the layer on which it is supported shall be caulked with a stiff mortar consisting of one part of rapid-hardening cement and 3 parts of sand and finished vertically on the inside and the mortar shall have hardened before any concrete may be cast against it.

Side forms shall not be removed before the concrete has hardened sufficiently to prevent damage being done to the sides.

Projecting tie bars and/or the concrete shall not be damaged during removal of the formwork.

Before any side forms may be ordered or brought onto the site, particulars regarding the side forms shall have been approved by the Engineer.

PS G 5 CONSTRUCTION

PS G 5.1 REINFORCEMENT

PS G 5.1.2 Fixing of reinforcement and spacer-blocks

The welding of reinforcement steel is not permitted.

Spacer-blocks must be of an approved design.

Where mortar blocks are used, they must be properly shaped so that they do not slip out of position, and they must be made of the same mortar mix as the concrete into which it is cast. The mortar must be compacted by using approved methods in order to give blocks that have a density of at least 2 300 kg per m³ and that are free of honeycombing. They must be cured in water for at least 7 days.

PS G 5.1.3 Cover

The exposure conditions for all structures in the works shall be deemed to be "very severe". The minimum cover to reinforcement shall be 60 mm for water retaining concrete and 50 mm for all other concrete, unless otherwise specified on the Engineers drawings and bending schedules.

PS G 5.1.6 Tie Bars

Add the following:

Tie bars shall be placed at right angles to joints. Tie bars shall be free from paint, grease or other matter which may affect bonding with the concrete.

At construction joints the one half of each tie bar shall be supported on the subbase by means of suitable stools, while the other half shall project into the adjacent lane. Tie bars at longitudinal joints may be bent parallel to the edge of the first lane constructed and

later on straightened into its final position before the concrete of the adjacent lane is placed, if the method of fixing and supporting the tie bars is approved by the Engineer.

At weakened plane hinge joints the bars shall be firmly supported in position by steel supporting devices fixed to the subbase. If the paver or other paving equipment is equipped with a device for placing tie bars into the plastic concrete, such device may be used after it has been demonstrated that the tie bars will be located in their correct positions after the slab has been compacted and finished.

PS G 5.2 FORMWORK

PS G 5.2.1(d) Special smooth finishes

Wherever it is instructed in writing by the Engineer certain exposed concrete surfaces above final ground level must have a special smooth surface finish. The forms used shall be unblemished and the panels regular. Joints shall be a feature of the pattern and shall be handled with care. The finished concrete shall be accurate to Degree of Accuracy I. After removing the formwork, the surfaces must receive no after-treatment except in the positions of the formwork anchor bolts. These must be placed in a regular and precise pattern.

PS G 5.2.5 Removal of Formwork

The Contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and/or for back-propping of beams, slabs, etc. The propping may be required simultaneously on more than one level directly underneath one another. The requirements for continuous propping and/or back propping shall be calculated to a theoretical model that is acceptable to the Engineer, and details shall be submitted for the Engineer's approval. Data required for such calculations, e.g., design loads and structural dimensions, will be supplied by the Engineer on request.

Add the following new clauses:

PS G 5.2.6 Chamfers and Fillets

All internal and external corners in the concrete must be formed with chamfers or fillets, except where otherwise specified or instructed. An exception is to the top of slabs that must receive a specific finishing and where no chamfering must be done. This requirement is normally not shown on drawings and is required for exposed concrete only.

PS G 5.2.7 Surface finishes of formwork

Surfaces against which soil is placed must have a rough finish unless concrete is cast against the soil as specified. All other formed surfaces must receive a smooth finish, unless otherwise specified somewhere else in this document or on the drawings.

PS G 5.3 HOLES, CHASES AND FIXING BLOCKS

Substitute the contents of the clause with:

(a) General

Holes, recesses, and boxed-out openings shall be allowed in concrete structures, as specified, for the subsequent installation of mechanical equipment and/or pipe work.

(b) Preparation of openings for the installation of equipment

Before commencing the positioning in holes of any pipes/specials the Contractor shall:

- (i) Remove all shuttering and boxing remaining in the holes.
- (ii) Make any alterations required to the position and shape of the holes.
- (iii) Thoroughly clean the sides of the holes so as to obtain a satisfactory bond surface for the new concrete; and
- (iv) Free all surfaces of the pipes/specials of all coatings, and thoroughly scrape and clean the pipes/specials.
- (v) Apply a wet-to-dry concrete adhesive (two component, solvent free, polysulphide modified epoxy compound) immediately before grouting.

(c) Grouting of voids

The concrete ingredients shall be mixed and placed as dry as possible to obtain a dense, waterproof concrete. Where a watertight seal is required, the concrete shall be carefully worked around the puddle flange, if any, and the pipe barrel or body of the special, and shall be vibrated in layers so as to obviate any falling away from pipe/special surface of the concrete already placed. The whole shall, when set, form a dense, homogeneous, and waterproof mass. A spare vibrator with an independent power source shall be kept in readiness to ensure continuity of placing in the event of the breakdown of the duty vibrator.

Smooth form work that has been suitably strengthened for use with a vibrator shall be provided for facing the concrete around each pipe/special.

PS G 5.4 PIPES AND CONDUITS EMBEDDED IN CONCRETE

Except with the written approval of the Engineer, no pipes other than those shown on the drawings shall be embedded in concrete, and the approval of the Engineer for the position of all services to be embedded shall be obtained before concreting commences. The clear space between pipes of any kind embedded in reinforced concrete and the clear space between such pipes and reinforcement shall not at any point be less than:

- (a) 40mm or
- (b) 5mm plus the maximum size of coarse aggregate, whichever is the greater.

PS G 5.5.1.7(a) Strength Concrete

Required strengths for unreinforced concrete work are the following:

- a. 15 MPa for blinding and beddings.
- b. 25 MPa for encasement and thrust blocks.
- c. 30 MPa for manholes.
- d. 35MPa for floor slabs.

The production of concrete at a central concrete production site is permitted.

PS G 5.5.1.7(c) Design of concrete mixes

Delete the contents of the sub-clause and replace with:

The Contractor shall be responsible for the design of Strength Concrete and shall appoint an approved materials laboratory to prepare and test all Strength Concrete designs on his behalf.

The Strength Concrete to be utilised for all reinforced concrete on the Contract shall be Class 35/19 and shall conform to the following requirements:

- (a) The characteristic strength of the mix shall be the highest of the following:
 - (i) the specified 28-day characteristic cube compressive strength (i.e., 35 MPa).
 - (ii) the characteristic cube compressive strength corresponding to the specified maximum water: cement ratio.
 - (iii) the characteristic cube compressive strength corresponding to the specified minimum cement content.
- (b) The cement content shall not be less than 350 kg/m³.
- (c) The water: cement ratio shall be less than 0.48.

Before starting with any concrete work on the site, the Contractor shall submit for approval, samples of the constituent materials of the concrete and a statement of the mix proportions which he proposes to use for each class of concrete indicated in the schedule of quantities.

The samples shall be accompanied by evidence that both the constituent materials and the proposed mix comply with the specifications, which evidence shall be in the form of:

- (i) a copy of all test results on both the constituent materials and the mix itself, plus a statement regarding the test results, furnished by the approved materials laboratory; or
- (ii) an authoritative report on the previous use, experience, and performance of both the constituent materials and the proposed mix.

Where any change occurs in the materials sources, aggregate sizes, or any other component of the concrete, the above procedures shall be repeated at the Contractor's cost.

The actual mix proportions used as well as any changes thereto shall be subject to the Engineer's approval, but such approval shall in no way relieve the Contractor of his responsibility for producing concrete with the specified properties."

PS G 5.5.7 Construction Joints

Notwithstanding Sub-clause 2.4.3, "designated joints" shall only be joints shown on the drawings and in the Schedule. Further joints required by the Contractor because of construction limitations or any other reason, shall be deemed to be "undesigned joints".

The position and pattern of all joints (designated or undesigned) shall be to the Engineer's approval.

All joints other than expansion, contraction, or other movement joints, shall be treated as follows:

As soon as practical, but not before 15 hours after placing, the joint surface shall be prepared to receive fresh concrete.

This preparation, as specified in Sub-clause 5.5.7.3 (a) to (d) shall be such as to remove all laitance or inert and strengthless material which may have formed, and the specified chipping and sand blasting shall be such as to produce a roughened surface all over. Concrete surfaces, where concreting is interrupted, shall be protected from the sun as specified in Sub-clause 5.5.8 (d).

Horizontal construction joints may be formed if the method of construction does not allow for one continuous pour. However, these construction joint will be indicated to and approved by the Engineer. It must be noted that should the Contractor wish to form a

construction joint in water retaining concrete, the watertightness of this joint will remain the responsibility of the Contractor. In addition to the precautions to be taken as prescribed under clause 5.5.7.3, the Contractor may ensure watertightness by providing additional means (such as a bandage on the joints or wet to dry epoxy) to the approval of the Engineer. No additional payment will be made to the Contractor for ensuring that construction joints are watertight, and the Contractor will have to include such costs in the rate for the concrete.

All joints shall conform to the existing hardstand/ slabs present on site from an aesthetic point of view. Where joints are constructed and this presents an issue with the integrity of the existing concrete, the joints will need to be redone and new concrete shall be cast.

PS G 5.5.7.4 The Sawing of Joints

Excessive spalling of the arises will not be allowed during the sawing of the joints and the Contractor shall use the type of blade and equipment best suited to the hardness of the concrete and type of aggregate being sawn.

Sufficient standby power saws shall be held available by the Contractor, ready for use, at all times when concrete is being placed in the pavement.

Immediately after sawing, the joint grooves shall be washed out with a jet of clean water to remove all fine material and the joints shall then be sealed temporarily by means of approved paper rope.

No traffic of any kind shall be allowed on the pavement until all the joints have been permanently sealed.

PS G 5.5.7.5 Installation of Silicone Sealant

Shortly before joint-sealing is done, the joint grooves shall be reamed to their prescribed final dimensions and shall then be cleaned by means of a strong jet of water over the full depth of the joints to remove all fine matter and to produce dust-free joint grooves. Immediately before the supporting material is supplied, the grooves shall be dried by means of oil-free compressed air at a pressure of 700 kPa. Compressors shall be equipped with an apparatus which removes water and oil from the compressed air. Where a primer is required, it shall be applied before the supporting materials are installed.

After the joints have been finally cleaned and the primer (if any) has been applied, the supporting materials shall be installed by means of an approved rolling tool in the prescribed positions. Where the joints are dirty, wet, or moist, the supporting material shall be removed, the joints cleaned and dried and fresh material applied.

The procedure(s) to be followed by the Contractor to prevent the sealant from being spilt onto the concrete pavement shall be subject to approval by the Engineer.

The silicone sealant shall be pumped continuously directly into the joints with a suitable pneumatically driven pump. Sealing shall be done from the upper surface of the supporting material. Immediately after installation and before a skin appears, the surface of the sealant shall be worked to compact the sealant and to press it against the sides of the joint so as to ensure that the prescribed clearance under the road surface is obtained.

As an alternative to separate installation and finishing of the sealant, an approved injection nozzle incorporating a finishing apparatus may be used, in which case only closed-cell polyethylene may be used as supporting material. Further directions supplied by the manufacturer shall be strictly complied with, particularly in regard to temperatures for application, opening to traffic and safety aspects. No traffic

shall be permitted to pass over a sealed joint before the sealant will be able to withstand the penetration of foreign matter.

All surplus sealant and other foreign matter shall be removed from the concrete pavement surface in accordance with the directions of the manufacturer.

PS G 5.5.8(e) Curing and Protection

Add the following:

The exposed surfaces, including the sides of the slab, shall be treated immediately after the required texturing of the surface has been affected and after the side formwork has been removed by the application of a white-pigmented curing compound as specified in clause PSG 3.9 in accordance with the directions of the manufacturer.

The curing compound shall be sprayed onto the surface at a rate of 0,45 l/m² or as directed by the Engineer by means of a mechanical distributor capable of producing a fine fog-type of spray which will not damage the surface of the concrete. The curing compound shall be applied in two layers with the distributor moving in opposite directions for the two applications. Coverage shall be uniform over the entire surface and the rate of application of the curing compound shall be carefully controlled.

During spraying operations, the curing compound shall be continuously stirred mechanically to keep the pigmentation in suspension. The spray nozzles shall be adequately protected against wind.

After shutting off the spray nozzles, no dripping of curing compound on the concrete surface may occur. If necessary, the Contractor shall provide drip pans suspended below the nozzles to prevent dripping of the curing compound onto the pavement.

The curing membrane shall be maintained intact for at least seven days after the concrete has been placed. Any damage to the curing membrane, caused by the Contractor's activities, shall be repaired by hand-spraying the affected areas.

Areas inaccessible to the mechanical distributor such as odd-shaped areas, or those with varying widths or shapes, shall be sprayed with curing compound by means of approved hand spraying equipment, at the specified rate of application.

Add the following Clauses PSG 5.5.16 to PSG 5.5.20:

PSG 5.5.16 Screeds

Granolithic Screed

Granolithic screed shall consist of: Cement - 1 part; Sand - 1.25 part; Coarse aggregate - 2 parts.

The coarse aggregate shall consist of granite or other approved chips which shall pass a 10 mm sieve and be retained on a 5mm sieve.

The cement/water ration of the mix shall be at least 2,0 mass.

PSG 5.5.17 Repairs and defects

All defects to the concrete shall be attended to, in full, as soon as possible after the formwork is removed. Further concreting of the element concerned may be prohibited

by the Engineer until he is satisfied that this remedial work has been satisfactorily attended to.

PSG 5.5.18 Formwork Ties

The use of sleeves through the concrete for formwork ties will not be permitted. Ties, when cast in, shall have some form of positive shear key to prevent any rotation when loosening formwork.

The formwork ties and bolt holes shall be placed with regularity and precision.

The finish of exposed concrete surfaces of concrete structures shall be “smooth” as detailed in (b) of sub-clause 5.2.1.

PSG 5.5.19 Fillets and Chamfers

All internal and external angles in concrete works shall have 25 mm x 25 mm fillets and chamfers unless shown otherwise on the drawings.

The units rate tendered for formwork shall cover the cost of forming these chamfers and fillets.

PSG 5.5.20 Breaking Into and Repairing Existing Structures

PSG 5.5.20.1 Cutting and Removal of Existing Structures

The existing structures shall be saw cut carefully to the extremities indicated on the drawings plus allowing for an additional 25 – 50 mm to ensure that the cover to reinforcement is maintained.

The unit rate tendered for cutting into and removing existing structures shall cover the cost of the substrate preparation.

PSG 5.5.20.2 Substrate Preparation

The concrete substrate must be sound and of sufficient compressive strength (min 20 MPa with a minimum of pull strength of 1.5 MPa). The substrate must be dry and free of all contaminants such as oils, grease, coatings, surface treatments, etc.

The substrate must be prepared mechanically to remove cement laitance and achieve a profile open textured surface. Weak concrete shall be removed and surface defects such as honeycombed areas; blowholes and voids must be fully exposed.

In general, the substrate surface must be sound and clean. All loose material shall be removed mechanically with a wire brush or by high pressure water jetting or and blasting. Embedded reinforcement steel shall be free from scale, rust, oil and grease and shall be treated a suitable protective coating and bonding agent.

PSG 5.5.20.3 Repair Systems

The reinforcement steel shall be treated with SikaTop Armatec 110 EpoCem (or similar approved) for protection against corrosion and to act as a bonding agent. The product shall be applied in two phase:

- a) Two layers of 1 mm thick layers for corrosion protection
- b) 1.5 – 2.0 kg/m² as a bonding agent

The product shall be applied in accordance with the manufacturer's specifications.

The broken/ cut concrete shall be repaired with Sikacrete -214 (or similar approved repair mortar). The unit rate tendered shall cover the cost of any special formwork required.

PS G 5.5.11 Watertight Concrete

PS G 5.5.11.1 Construction Joints

a. General

Construction joints in the reinforced concrete walls shall consist only of horizontal joints. If under abnormal conditions a vertical construction joint is unavoidable it may only be constructed with the approval of the Engineer. The contractor shall propose the type and detail of joint to the Engineer, note there shall be no additional payment made for construction joints.

The exact position of construction joints shall be determined by the Contractor and marked on the form work in order to obtain truly horizontal joints.

b. Preparation of Surface

Prior to placing any further concrete, the joint must be clean, damp and free of laitance. During the period when the concrete has set but is still green all loose material shall be removed, without disturbing the aggregates, by light brushing. Where this is not possible, or if the concrete has already set, the surface film shall be removed by mechanical means appropriate to the degree of hardness of concrete so as to expose the aggregate over the entire surface and leave a sound, irregular surface.

PS G 5.5.11.2 Ferrule Cup Holes

No system leaving holes passing through the walls will be permitted. Ferrules shall be of the permanent sacrificial type.

Holes forming in reinforced concrete walls during the fixing of formwork shall be repaired with an approved epoxy or non-shrink grout. On the dry face the holes left in the concrete shall be repaired with 1:3 cement-sand mortar. All grouting material shall be thoroughly punned in.

PS G 6 TOLERANCES

PS G 6.1 BASIS OF MEASUREMENT

PS G 6.1.1 General

The general degree of accuracy must be grade II, except for smooth shuttering which must be accurate to grade I.

PS G 7.3 ACCEPTANCE CRITERIA FOR STRENGTH CONCRETE

Test results obtained by a ready-mixed concrete production plant as part of its quality-control system are not acceptable for evaluation purposes in terms of subclause 7.3, but test samples shall be taken from ready-mixed concrete on location.

PS G 8 MEASUREMENT AND PAYMENT

Add the following:

PS G 8.3 SCHEDULED REINFORCEMENT ITEMS

PS G 8.3.2 High-Tensile Welded Mesh

PS G 8.3.2 (a) Ref No. 888 **Unit: m²**

Where new concrete slab section needs to be constructed on Quay areas, mesh must be placed to top and bottom of slabs with 50mm cover. Other areas, except on instruction by the Engineer, only one layer will of mesh shall be placed to the bottom of the slabs with 50mm cover.

PS G 8.3.3 Dowels/guides

PS G 8.3.3 (b) 25mm diameter Grade 304 stainless steel dowels, 410mm long **Unit: No.**

The Contractor shall include in his rate for placing dowels between existing and new construction joints at 300mm spacing, including 32mm polyethylene sleeve and plug for, procurement, cutting to size, delivery, drilling and fixing complete.

PS G 8.4.8 Construct Small Structures sum/number (No.)

The sum tendered shall include full compensation for constructing the structure according to the details and specifications on the drawings and/or description in the Bill of Quantities. The description of the structure shall be stated, where applicable.

The sum tendered shall include full compensation for all materials, plant, equipment and labour required to complete the structure in general compliance with the applicable SANS 1200 standardised specifications as amended (e.g. earthworks (SANS 1200 D), concrete (SANS 1200 G), structural steel (SANS 1200 H)), Particular Specifications PB and the National Building Regulations (SANS 0400).

All finishes and detailed manufactured steel items (manhole covers and frames, step irons, etc.) shall be included in the sum unless otherwise stated.

Where reinforcing bending schedules are not given at tender stage for reinforced concrete structures, an allowance of 130 kg/m³ of concrete shall be made in the tendered sum for reinforcing bars.

Unless otherwise scheduled, measurement of excavation and backfill shall be included under SANS 1200D.

The sum shall also include the casting in of pipes through walls. Unless otherwise described in the Schedule/Bills of Quantities the sum shall not include the supply and installation of pipe specials, valves and fittings, which shall be measured separately in the Schedule/Bills of Quantities.

PSG 8.5 JOINTS

Change the unit of measurement of this item to: "m or m²".

Where the unit is scheduled as m², the type of joint shall be described in the Bills of Quantities or specifications. In that case the m² shall cover the collective cost of all the relevant joints.

PS G 8.6 MANUFACTURE (OR SUPPLY) AND ERECT PRECAST ELEMENTS

The Contractor shall include in his rate for formwork, steel, fixing, concrete, casting, curing, delivery to site, temporary stockpile/storage and maintain, and for installing each unit.

The panels shall be 35MPa concrete, 700x700x190mm thick including Ref888 mesh.

PS G 8.7 GROUTING **Unit:m³**

PS G 8.7(a) The Contractor shall supply and apply grout of smooth 35MPa strength or similar approved to:

- i) Filling and sealing voids in core drilled holes,
- ii) Finishing of manhole covers, valve covers, and any other frame fixed to or in concrete,
- iii) Finishes for neatness along saw cut lines in concrete slabs.

The Contractor shall include in his rate for procurement, supply and deliver to site, install and place, and for smooth finishing of.

PS G 8.9 BREAK INTO EXISTING STRUCTURES **Unit: m/m³**

Separate items shall be scheduled in the Bill of quantities for breaking into existing structures and demolishing and removing existing structures.

- a) The breaking into existing structures shall be per meter length of cutting required. The Bill of Quantities shall state thickness of concrete surface to be cut into. The rate shall include all costs for saw cutting and substrate preparation as described in Clause PSG 5.5.20.1 and 5.5.20.2.
- b) The demolishing and removing of existing structures shall be per m³ of demolition required. The rate shall include all costs for demolition and removal of the demolished material to a suitable location.

PS G 8.10 REPAIRING STRUCTURES **Unit: m²**

Separate items shall be scheduled in the Bill of quantities for the application of the reinforcement treatment and repair mortar. Both the items shall be in accordance with Clause PSG 5.5.20.3.

- a) The treatment of reinforcement shall be per m² requiring treatment. The rate shall include for the two part application as stated in PSG 5.5.20.3. 2.0 kg/m² as a bonding agent shall be used in the rates.

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- b) The repair mortar shall be per m² required to be filled/ repaired. The rate shall include for any special formwork required to ensure the correct form of the final surface. The Bill of Quantities shall state the thickness of the repair mortar to be applied e.g. 25 mm, 50 mm, etc.

SANS 1200 PSH: STRUCTURAL STEELWORK

PS H 3.1.1 Material

Mild Steel:

Pipes and fittings shall be to SANS 1431 – Grade 300 WA, and flanges to SANS 1123, Table 1600/3,

And

Stainless Steel:

Pipes and most fittings shall be to Grade 316L to ASTM A 312 or ANSI B36.19 Table Schedule 10,

For Brackets to SANS 50025/ EN 10025 S255 JR,

For Gaskets from flat bar and sheeting to SANS 50025/ EN 10025 S 355 JR.

Add the following to Clause 3.1.2

Alternative sections will be accepted (after consultation with the Engineer), to suit available supplies, provided there is no loss of strength or stiffness or, where relevant, appearance.

PS H 5.1.2 Contractor Provides Shop Details

The Contractor shall provide shop details and shall allow for all costs associated with the provision of drawings as specified in his tendered rates.

The submission of drawings shall adhere to the Works information document.

PS H 5.3.4 Welding

All welding shall be fully continuous fillet. Minimum weld size is 6mm. All welding to be in accordance with SANS 044, SANS 455, and applicable standards for stainless steel welding. All welding to be done prior to protection of steelwork.

PS H 5.3.5 Bolting

All erection bolts used to be manufactured to SANS 136. Bolt Grade 8.8 to be used. All bolts shall be Hot Dipped Galvanised for Mild Steel elements and 316L Stainless Steel for Stainless Steel elements.

PS H 8.3 MEASUREMENT AND PAYMENT

Notwithstanding the various payment clauses contained in Clause 8.3, payment shall be as stated in the Schedule of Quantities and shall include for supply, fabrication, corrosion protection, delivery to site, erection including all fixings and grouting of baseplates. No separate item shall be included for corrosion protection and it shall be deemed included in the supply and fabrication of steelwork rate.

As far as practically possible, connections are to be bolted so as to minimise the amount of site welding required. Bolted connections to receive a minimum of 2 M12 bolts, unless otherwise specified. Details of any splices to be submitted to the Engineer for approval prior to erection.

All costs for splice details are for the Contractors account.

PS H 8.3.1 Preparation of shop detail drawings

Add the unit 'number (no)' to method of measurement.

The following Steelwork for pipes/ valves is anticipated:

- Landing Valve Gasket Support
- Landing Valve Cover
- Landing Valve Support Clamp
- Pipe Hanger Clamp
- Clamp Support for Straight Pipes (In Services Tunnels)
- Clamp Supports at Valves (In Services Tunnels)
- Bridge Supports Type A
- Bridge Supports Type B

PS H 8.3.1.2 Supply and fabrication of steelwork

- a) Stainless steel items – Grade 2507:

The Contractor shall include in his rates for fabrication, supply all appurtenances, delivered to site.

- b) Galvanised Mild steel with Epoxy Coating items:

The Contractor shall include in his rates for fabrication, corrosion protection (in accordance with PSHC) supply all appurtenances, delivered to site.

- c) Stainless steel items – Grade 316L:

The Contractor shall include in his rates for fabrication, supply all appurtenances, delivered to site.

PS H 8.3.3 Erection on Site

Unit: t or No

The rate shall include for secure storage and erection on site. This shall be complete with all appurtenances.

PS H 8.3.3(a) Extra-over for concrete repair works

Unit: no

Where landing valve covers are being replaced and repairs is needed between the new frame and existing concrete substrate shall be repaired in accordance with PSG 5.20. The tendered rate shall include all installation repair work.

PS H 8.3.14 Allowance for the dismantling of any existing steel brackets and steel works

Unit: Prov. Sum

An allowance has been made for dismantling and removal of existing steel brackets.

SANS 1200 PSHC: CORROSION PROTECTION OF STRUCTURAL STEELWORK

PS HC 1 SCOPE

This specification also covers the corrosion protection of steel pipes, fittings, specials, and jointing materials, (i.e., pipework) in addition to the corrosion protection requirements of section PSL. Where reference is made to “steelwork” in this Specification it shall be deemed to include steel pipework.

PS HC 5.7 COATING SYSTEM

Unless otherwise specified or described on the drawings or Bills of Quantities, the following coating systems shall apply. Typical areas of application and some approved products are given.

SYSTEM	AREA OF APPLICATION	DESCRIPTION
A	Lining and coating of pipework and immersed steelwork and plant for water and treated sewage effluent.	<p>Remove all oil, grease, and soluble salts by washing with a water emulsifiable solvent degreaser and rinsing with potable water. Dry abrasive blast to white metal in accordance with Sa3 of ISO 8501-1:1988 to obtain a surface profile of 50 to 75 microns.</p> <p>Three coats of a low solvent, high solids, polyamine/amide epoxy to a dft of 350 µm (Plascon Plascoguard Copon KSIR88, Duram OptiGuard HB PW, Dulux Sigmaguard EHB, Carboline 891 or approved equivalent).</p> <p>Epoxy coating followed by one decorative topcoat twin pack polyurethane to a dft of 40 µm for pipework above ground and above water (Duram OptiThane 621, Dulux Sigmadur Gloss, Stoncor Carbothane 134 or approved equivalent) (total dft = 390 µm).</p>
B	Lining and coating of pipework and immersed steelwork and plant for raw and screened sewage, settled sewage and sewage sludges.	<p>Preparation and coating: As for System A</p> <p>Lining: Two coats of solvent free epoxy to a dft of 500 µm (Duram OptiGuard SF, Stoncor Carboguard 550 or approved equivalent).</p>
C	Fabricated steel items e.g. bridges, tanks, roofs, supports, etc.	<p>Remove all oil, grease and soluble salts by washing with a water emulsifiable solvent degreaser and rinsing with potable water. Dry abrasive blast to near white metal in accordance with Sa2½ of ISO 8501-1:1988 to obtain a surface profile of 40 to 60 microns.</p> <p>System C.1: More corrosive conditions</p> <p>1 Coat inorganic zinc silicate to dft 100 µm followed by 1 coat epoxy tie coat to dft 100 µm followed by 1 coat twin pack polyurethane to a dft 40 µm (total dft = 240 µm).</p> <p>System C.2: Lesser corrosive conditions</p> <p>2 Coats of high solids, polyamine/amide epoxy primer to dft 100 µm each (Carboline 893 or approved equivalent) followed by a topcoat twin pack polyurethane to a dft of 40 µm (total dft = 240 µm).</p>

SYSTEM	AREA OF APPLICATION	DESCRIPTION
D	Coating system for hot dip galvanised surfaces.	Sweep-blast-clean all surfaces and apply 1 coat polyamine/amide epoxy primer to a dft of 100 µm (Duram OptiGuard HB Mio Grey, Stoncor Carboguard 193) followed by a topcoat twin pack polyurethane (Duram OptiThane 621, Stoncor Carbothane 134) to a dft of 40µm (total dft = 140 µm). All edges, corners and welds shall be given a stripe coat of the epoxy primer before top coating. Caution: Normal blast cleaning will damage the galvanised layer and cannot be used. Sweep-blast-clean using unrecycled Blastrite Microblast (ultrafine non-metallic grit, not less than 0.2 mm and not greater than 0.8 mm) using nozzle pressure not greater than 300 kPa (43Psi), holding the nozzle at a 30 degrees – 60 degrees angle to the surface being cleaned and holding the nozzle at 450-600 mm away from the surface being blasted.
E	Fusion bonded epoxy (e.g. for valves, mechanical couplings, pumps, etc.).	Water resistant, non-toxic and non-tainting, fusion bonded epoxy pipe coating in accordance with SANS 1217 to a dft of 300 µm. Pre-heating is needed to achieve the required coating thickness. (Plascon epoxy/polyester powder: CEP series, Dulux Sigmaling FBE 27 or approved equivalent).
F	Hot applied thermoplastic (e.g. for valves, mechanical couplings, pumps, etc.).	Synthetic thermoplastic polyamide or equivalent to a dft of 300 µm. This coating shall be applied by dipping the object to be coated into a fluidised bed of the polymer after the object has been suitably heated. (Plascoat PPA 571 or approved equivalent.)
G	Gearboxes, motors (not immersed), etc.	1 Coat polyamine/amide epoxy (Duram OptiGuard HB PW, Stoncor Carboguard 891) to a dft of 125 µm followed by a topcoat of twin pack polyurethane (Duram OptiThane 621, Stoncor Carbothane 134) to a dft of 40µm (total dft = 165 µm).
H	Flanges, joints, jointing materials, etc. below ground and in unventilated conditions (e.g. valve chambers).	Treat surfaces, bolts, nuts, etc. with a compatible primer, packed with a bitumen-based or tar-based mastic and wrap with an approved plastics tape. (Denso systems or approved equivalent.)
I	Hot dip galvanising (standard or heavy duty)	Hot dip galvanizing shall be done in accordance with SANS ISO 1461. Where "heavy duty" is specified, the coating thickness shall exceed the standard thickness by 25%.

Note: For items supplied with factory applied system, the Contractor shall ensure that a system equal to or better than the above is applied to those items "bought in". All variations or alterations shall be subject to the Engineer's approval. Wherever practical or desirable allowance shall be made for a decorative final coat to be applied on site.

PS HC 5.10 REPAIR OF DAMAGED COATINGS

Repair to hot-dip galvanizing damaged by handling or transport shall be done by cleaning the area and applying 3 coats of a zinc rich primer giving a dry film thickness of at least 100 µm and containing at least 94 % zinc in the dried film. If the Engineer considers that damage is excessive, such items shall be replaced by the Contractor, at his expense.

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Repairs to epoxy and other painted coatings shall be in general compliance with Subclause 3.9.2.3 of SANS 1200 L and to the manufacturer's specifications.

SANS 1200 PSL: MEDIUM PRESSURE PIPELINES

PS L 3.4.2 Pipes of Nominal Bore up to 150mm

Change the words “up to 150 mm” in the heading and contents of this clause to “smaller than 100 mm”.

Replace Clause 3.4.3 and 3.4.4. with the following Clause 3.4.3:

PS L 3.4.3 Pipes of Nominal Bore 150mm and Larger

All pipes, fittings and specials of steel pipes of nominal bore 150 mm and larger shall conform to SANS 719; Grade C. The following standard codes shall also apply:

American Petroleum Institute

API 5L : Specification for line pipe
API 1104 : Standard for welding pipelines and related facilities

The minimum wall thickness of pipes, fittings and specials (mild steel and stainless steel) shall be as follows:

NOMINAL DIAMETER (mm)	MINIMUM WALL THICKNESS (mm)
151 to 450	4.5
451 to 750	6.0
751 to 950	8.0

Stainless Steel Pipework

Stainless steel pipework shall be to ASTM 312. Schedule 10 pipes and fittings shall be used except where otherwise specified.

PS L 3.7.1 uPVC Pipes

Replace the contents of this subclause with the following:

uPVC (PVC-U) pipes and fittings shall be fitted with spigot and socket rubber ring joints and shall comply with the relevant requirements of SANS 966-1:2000.

Add the following Clause PSL 3.7.3:

PS L 3.7.3 Polyethylene Pipes

Polyethylene pipes shall be of the Class indicated on the construction drawings complying with the provisions of SANS ISO 4427. Pipes shall be coupled by means of butt welding, electro-fusion couplings, or compression fittings.

PS L 3.8.2.1 Flexible Couplings

Flexible couplings and flanged dismantling couplings for steel pipes shall be suitable for the type of pipe. Where used between steel and flexible pipes of another material (e.g., uPVC or GRP), the flexible couplings shall be stepped to make up any difference in diameter (if required) and shall have long collars (min 220 mm).

Flexible couplings shall be coated to System A (refer to PSHC) and shall include decorative coating inside buildings like pump stations. In addition to this, flexible couplings of ferrous and stainless-steel material below ground or inside unventilated areas like valve chambers shall be treated in accordance with System H (refer to PSHC).

Stub studs (i.e. studs welded to the flanges of flange adaptors) and their washers and nuts shall be of grade 316 stainless steel.

PS L 3.8.3 Flanges and Accessories

All bolts and nuts shall be hexagonal head type complying with SANS 136 Gr 8.8 with threads of coarse pitch series. All bolts must be of equal length and the length of each bolt shall be such that, after the nut has been tightened, the end of the bolt shall project above the nut by not less than one full thread and not more than three full threads. Two washers shall be used with every bolt-and-nut set where used on coated surfaces that could be damaged. Before assembly, all bolts shall be coated with an approved nickel based anti-seizure/corrosion protection compound.

Bolts and nuts used with ferrous steel shall be hot dip galvanised to SANS ISO 1461 and bolts and nuts used with stainless steel shall be 316 stainless steel. Flanges and accessories of ferrous and stainless steel material below ground or inside unventilated areas like valve chambers shall be treated in accordance with System H (refer to PSHC).

Suitable isolation shall be provided between flanges, washers and bolts to prevent galvanic corrosion between dissimilar metals (e.g. between stainless steel and mild steel or cast iron).

Where services are relocated or connected to existing pipes, the dimensions of existing flanges and pipes shall be verified by the Contractor prior to ordering of materials.

Add the following Clause PSL 3.8.8:

PS L 3.8.8 Bolts, Nuts and Washers

SANS 136 Gr 8.8 mild steel bolts, nuts and washers shall be used with mild steel and cast iron pipework. Stainless steel bolts, nuts and washers shall be used with stainless steel pipework. The bolts and nuts shall be hexagonal head type with threads of coarse pitch series. Two washers shall be used with every bolt and nut. Before assembly, all bolts shall be coated with an approved nickel based anti-seizure/corrosion protection compound.

All bolts must be of equal length and the length of each bolt shall be such that, after the nut has been tightened, the end of the bolt shall project above the nut by not less than one full thread and not more than three full threads.

PS L 3.9 CORROSION PROTECTION

In addition to the requirements of SANS 1200 L, the requirements of SANS 1200 HC shall apply.

Where the supplier's corrosion protection system betters the system as specified in the standard or project specifications the opinion of the Engineer, the manufacturer's specifications shall apply.

No coating systems are required to stainless steel unless otherwise specified, scheduled or shown on the drawings, but pickling and passivating shall be done in accordance with SANS 064 to the complete pipe, fitting or special that shows any signs of corrosion and mild steel contamination.

PS L 3.9.2.1 Pipes of Nominal Bore up to 150mm

Change the words “up to 150 mm” in the heading of Clause 3.9.2.1 to “smaller than 100 mm” and replace the contents with the following:

Unless otherwise scheduled or shown on the drawings, steel pipes, fittings and specials smaller than 100 mm diameter shall be hot dip galvanised in accordance with System I (refer to PSHC).

PS L 3.9.2.2 Pipes of Nominal Bore 150mm and Larger

Change the words “over 150 mm” in the heading and contents of Clause 3.9.2.2 to “100 mm and larger” and add the following:

Steel pipes, fittings and flanges of nominal bore 100 mm and larger shall be lined with cement mortar (as per Clause 5.11) and coated in accordance with System J (refer to PSHC).

PS L 3.9.5 Bolts, Nuts and Washers

Where used with mild steel and cast iron all joints, bolts, nuts and washers shall be hot dip galvanised to SANS ISO 1461 and where used with stainless steel it shall be 316 stainless steel.

Suitable isolation shall be provided between flanges, bolts, nuts and washers to prevent galvanic corrosion between dissimilar metals (e.g. between stainless steel and mild steel or cast iron).

PS L 3.9.6 Corrosive Soil

All types of steel and cast iron flanges, joints, jointing materials, flexible couplings, etc. below ground and in damp and/or unventilated conditions (e.g. valve chambers) shall be treated and wrapped in accordance with System H (refer to PSHC).

PS L 3.10 VALVES

Add the following clauses:

PS L 3.10.1 Requirements for all Valves

All valves shall comply with the following:

- Valves shall be designed and constructed to ensure reliable operation after long periods of non-operation and their method of actuation shall be designed to operate under the full pressure rating of the valve.
- Valves shall be double-flanged unless otherwise specified.
- Fasteners shall be of grade 316 stainless steel. This applies to all fasteners on the body of the valve and its gearbox.

- Steel or cast iron valve components, including valve bodies, shall be protected with System E (Fusion Bonded Epoxy) or System F (Hot-Applied Thermoplastic). (Refer to PSHC.)
- Handwheels shall be of cast-iron. The direction of closing/opening shall be clarified with the responsible authorities before ordering and shall be indicated on the handwheels.
- All valve bodies shall give the following information: Manufacturer's name, pressure rating, size of valve, direction of flow arrow.
- Valves shall be rated for 16 bar operating pressure unless otherwise specified or scheduled.
- Isolating valves shall be capable of being operated manually with a maximum applied torque of 150 Nm for valves with a nominal diameter of more than 450 mm and 100 Nm for valves with a nominal diameter less than 450 mm. Suitable gearboxes shall be fitted to provide easy opening when necessary.

PS L 3.10.2 Cast Iron Gate (Isolating) Valves

- Resilient seal valves shall be used unless otherwise specified or scheduled and shall comply with SANS 664 or BS 5163.
- The spindle shall be of grade 316 stainless steel or better and the captop shall have a 316 stainless steel bolt.
- The valves shall have non-rising spindles unless otherwise specified or scheduled. Rising spindles shall have protection covers and shall be suitably supported to prevent buckling.

PS L 3.10.3 Butterfly Isolating Valves

Butterfly valves shall either utilise a resilient body liner with a stainless steel disc or a resilient-lined disc for sealing and shall comply with the following:

- Shafts and fittings shall be of stainless steel and bearing bushes shall be of Teflon or similar. Seals shall be selected to suit the application. No carbon steel components shall be permitted internally and externally such components shall be properly protected.
- Valves shall be double eccentric type.
- Valves shall be air, gas and water tight when closed, as applicable.
- Hand lever valve actuation with a locking system for incremental valve setting from fully shut to fully open shall be provided for valves up to and including DN 200. Valves larger than DN 200 shall be equipped with robust, weatherproof grease-filled gearboxes with an indicator to show the degree of valve opening.
- The valves shall be installed with their disc shafts in horizontal orientation.

PS L 3.10.4 Non-Return Valves

Non-return valves shall be double flanged and of the tilting disk (single door) type and shall be installed as required, suitable for the operating condition and where applicable conform to BS EN 12334: 2001. Long pattern valves shall generally be used.

Disks shall be of design and weight to suit the prevailing hydraulic conditions and shafts shall turn in close fitted low friction bearings. Valves shall be fast-acting with short travel and designed to minimise slamming.

Disks shall be fitted with renewable bronze or gun-metal sealing faces, which shall mate accurately with renewable bronze on gun-metal seating rings in the valve body. All seating/seals shall be positively located.

Covers shall be provided to allow ample access for inspection, cleaning and servicing and shall be supplied complete with tapped boss fitted with an air release cock.

Hinge pins/shafts and internal fixing devices shall be stainless steel. Hinge pins/shaft shall preferably be square in section to ensure positive location of flaps and provide for secure fixings. For valves with external levers and adjustable balance weight the hinge pins/shafts shall extend through a renewable sealing gland on the side of the body.

Each valve shall be tested in accordance with BS EN 12334:2001 or if outside the size of this standard to the form as set out in BS EN 12334:2001 and to the nominal pressure designation/test pressure relationship set out therein or 700 kN/sq. m for 30 minutes whichever is the greater.

PS L 3.10.5 Fire Hydrants

Fire hydrants shall be of the above ground type and shall be suitable for a working pressure of 1,6 MPa with an 80mm Male BSP inlet. The outlet shall be 65 mm Female Instantons Outlet with Double Lug with cap top and chain. It shall open clockwise with a square spindle nut of the same size that is specified for the gate valves.

The fire hydrant shall be bolted to the flanged branch of a cast iron hydrant tee.

- i) Fire hydrants shall be Woodlands or similar approved type and shall be installed in accordance with SANS 1200, and approved by the Project Fire Engineer.
- ii) All Fire Hydrants shall be 65 mm diameter (internal).
- iii) Outlets shall be 65mm Female Instantaneous Outlet with Double Lug with loose cap and securing chain.
- iv) Hydrant spindles shall be in accordance with SANS 1128 and provided with caps, secured with retaining bolts.
- v) Hydrants shall be clockwise opening / left hand closing.
- vi) Hydrant body and bonnet shall be stainless steel.
- vii) The seat shall be nitrile rubber.
- viii) Hydrant covers shall be ductile iron conforming to EN 124 and shall be painted with red oil paint. The covers are to be secured to the frame with a galvanised chain or cable.
- ix) Hydrants shall be supplied and installed complete with a flanged CI extension piece complete with stainless steel nuts and bolts to ensure depth not greater than 400 mm.
- x) Hydrant chambers to be constructed in accordance with Drawing XDNE-028-1-000-C-DE-003-01.
- xi) Hydrants shall be installed at the end of dead "runs" for charging and bleeding the lines.

PS L 3.10.6 Flow meters

Replacement of Measuring Assemblies

There is the 'in line' type where the main and bypass meter as well as the changeover valve are contained in a single assembly that is common to combination meters of different nominal bore.

Then there is the classical by pass line type. Both makes can use of both types. Therefore pre-calibrated complete measuring inserts to fit Sensus Meistream combination type water meters as well as Elster Kent precalibrated inserts for combination meters will be required.

Spare Measuring Assemblies For Woltmann Type Meters

The measuring assemblies must comply with the requirements of the applicable standards (as applicable to the individual meters) some of which clauses are mentioned elsewhere. The measuring assembly must have been pre-verified in a meter body which is of the same make, type, shape and form as the intended recipient meter body. Spare Measuring Assemblies for Combination Meters

Metrological Class

The metrological class shall be at least class B.

Metal Bodies and Components

Copper alloy components intended to be in contact with the water being measured shall have a dezincification resistance quality that complies with the standard. Metallic coatings on copper alloy components may be used to enhance mechanical operation and accuracy of the meter but shall not be used for the purpose of corrosion protection.

Stainless steel components intended to be in contact with the water being measured shall be of a grade not susceptible to crevice corrosion.

Ferrous metal components intended to be in contact with the water being measured shall be coated to prevent corrosion. Refer to SANS 1217 for type 2 coatings Cast iron that complies with at least the requirements of SANS 936 for grade SG 42 iron Nuts and bolts must be of the hexagon-head type and must conform to SANS 135, except fittings covered by SANS 815.

Unless otherwise required, a meter shall be designed to operate under a nominal working pressure of 1 600 kPa.

PS L 3.10.7 Landing Valves

Landing valves shall be 80mm diameter flanged upward oblique valve suitable for 16 bar pressure rating.

The hydrant valve shall be in accordance with IS 5290 and singled headed stainless steel valve.

Test pressures:

Seat 1 x rated pressure

Body 1.5 x rated pressure

PSL 4 PLANT

PSL 4.3 TESTING

The Contractor must ensure that the test equipment is in good order and that it is calibrated.

PS L 5.1 LAYING

For steel pipes of 150 mm diameter and larger, the Contractor shall:

- 1) Unload pipes delivered to the site. The pipes shall be delivered as near as possible to the site of the Works. The Contractor shall unload the pipes from the road vehicles and store them until required. Storage areas shall be protected from fire and shall be protected by suitable fencing or other security measures.
- 2) Install the pipes and make the necessary joints.
- 3) Fabricate and install bends where shown on the drawings.
- 4) Supply and install special pipe sections where shown on the drawings.
- 5) Provide equipment and material and carry out radiographic examination of welded joints.
- 6) Install all air valves, isolating valves and scour valves.
- 7) Make good the lining and the external coatings at joints and clean out and sterilise the pipelines.
- 8) Provide equipment, make connections and carry out water tightness tests of the pipeline.
- 9) Rectify defects in the pipeline during construction and for a period of 12 months after the final date of acceptance of the contract.
- 10) The Contractor must ensure that the test equipment is in good order and that it is calibrated.

Add the following to sub-Clauses for PSL 5.1.2:

PS L 5.1.2.1 Preparation

- a) Before a pipe or special pipe section is placed the internal and external protective coatings shall be examined visually and by means of a Holiday detector of the correct type and rating for the particular coating system. No pipe shall be laid without the permission of the Engineer's Representative. The Contractor shall provide details of the equipment that will be provided to carry out Holiday detection on the site, including data on instrument settings at specified test volts/kilovolts.
- b) Any manufacturing defects located in the coatings shall be reported immediately to the Engineer who will give instructions for the repair of the defects.
- c) Any damage to the lining or coating during unloading or while the pipes are stored on the site shall be made good by the Contractor to the approval of the Engineer.
- d) When making joints or doing any other work inside the pipe every care shall be taken to avoid damage to protective coatings. The invert surfaces of the pipe shall be protected by rubber matting or by timber duck-boards at least 400mm wide, and the coating shall be protected during welding from weld spatter, hot slag, etc., using rubber matting.

PS L 5.1.2.2 Cleaning of Joints

Just prior to the installation of any section of pipe, all foreign matter of every nature and all protective material shall be removed from the surfaces that are to be in contact at welded joints where applicable, so as to leave thoroughly clean surfaces for metal-to-metal contact in the field joints.

PS L 5.1.2.3 Laying Pipes

- a) Each pipe shall be accurately laid to the required line and grade. In placing pipe in the trench or in chambers, the pipe shall be held by an approved broad sling, and the pipe shall not be dragged on the bottom of the trench or along concrete supports but shall be supported by the sling while being the adjacent pipe section. The pipe shall be securely supported in position between joints in such a manner as not to interfere with the required work at joints.
- b) Any dents which appear in the wall of the pipe shall be removed by the Contractor after the cause or the object causing the dent has been located and removed. The cost of removing the dent and making good the lining or wrapping shall be borne by the Contractor.
- c) Any damage to a pipe during or after laying shall be made good and for this purpose the Engineer may require the pipe to be removed from the trench and replaced with pipe which is free from defects.

PS L 5.1.2.4 Prevention of Uplift

There is a danger of the pipeline lifting if the trench becomes water logged while the pipe is empty. Before the end of each day's work the Contractor shall arrange to place and compact sufficient of the fill to prevent uplift by water.

Where connections to existing pipelines are required, the Contractor shall excavate well in advance of pipework being ordered to expose the connection point to verify that the assumed fittings can be used and that the connection as proposed can be made. It should be noted that it may be necessary to expose a full pipe length to verify the size and class of pipe in the ground or to locate an existing fitting.

Add the following Clause PSL 5.1.5:

PS L 5.1.5 Connection to Existing Pipelines

Where connections to existing pipelines are required, the Contractor shall excavate well in advance of pipework being ordered to expose the connection point to verify that the assumed fittings can be used and that the connection as proposed can be made. It should be noted that it may be necessary to expose a full pipe length to verify the size and class of pipe in the ground or to locate an existing fitting.

Add the following to sub-Clauses for PSL 5.2.3:

PS L 5.2.3.1 Welding

- a) Jointing shall be by butt welding laid down in accordance with the details shown on the drawings.
- b) Welded joints shall be made in accordance with approved welding techniques and to the standard specified in PSL 5.2.3.2. All welding shall be electric fusion welding and be acceptable to the Engineer.

PS L 5.2.3.2 Butt Welding

- a) Set up the welding equipment
- b) If necessary, erect a welding tent to protect against wind and dust.

- c) Mount the facing plane (trimmer).
- d) Align the parts to be welded (with the aid of roller mountings or other supports).
- e) Remove shavings - do not touch pipe ends by hand.
- f) Check parallelity of joint faces by bringing them together (maximum gap 0.5mm).
- g) Check pipe alignment (maximum 0.15 = 10% of wall thickness).
- h) Clean the heating area of the heating plate and jointing faces with non-fluff paper and acetone.
- i) Check the welding temperature ($210^{\circ} + 10^{\circ}\text{C}$). With a wall thickness > 15mm, aim at lower temperature range.
- j) Press the pipe faces against the heating plate until a bead is formed all-round the pipe circumference in accordance with the table of guide values indicated below or refer to the welding unit manufacturers guidelines.
- k) Reduce the pressure setting for heating up (soak period).
- l) After sufficient heating up, release the joint faces from the heating plate.
- m) Remove the heating plate and immediately join the parts to be welded. Do not exceed the maximum changeover time specified in the table of guide values (below).
- n) Steadily increase the jointing pressure or force from 0 to the final value; follow the jointing time specified in the table of guide values.
- o) Allow the weld to cool with the jointing pressure maintained; follow the table of guide values.
- p) When the cooling time has elapsed, the welded joint can be removed from the clamps.
- q) De-bead material (if deemed necessary) from area of weld in bore of pipe.

Note: This must be completed before the welded material has fully cooled to prevent the possibility of cracking.

- r) Remove obstructions from the bore of the pipe in the area adjacent to the weld. Polish out using pencil grinder and sand paper "flap" wheels.

Note: It is good practice to record all pressure, temperature and time values for each welder.

PS L 5.2.3.3 Repairs Welding

- a) Repairs of welded joints shall be permitted. Where repairs are required the defective weld metal shall be cut out, and the parent metal prepared by grinding and re-welded to the satisfaction of the Engineer.
- b) The repair procedure and performance, and welders employed on repairs shall be qualified in accordance with Appendix B of American Petroleum Institute Standard 5L. Each repair weld shall be marked with the welder's identifying stamp.
- c) On discovery of reject welds the Engineer may, at his discretion, call for additional radiographic examination of the Contractor's cost until it is shown that the necessary standard is being maintained.

Add the following Clause PSL 5.11:

PS L 5.11 CEMENT MORTAR LINING

PS L 5.11.1 General

All pipes, fittings and specials shall be protected by means of a cement mortar lining. These shall extend over the full effective length of each pipe, fitting or special except for those with plain or spigot ends where the sheathing shall cease 300 mm from the plain or spigot end.

PS L 5.11.2 Preparation

All pipes, fittings and specials shall be cleaned both inside and outside of all rust, loose mill scale, paint, grease, oil or other foreign matter, including solidified welding material outside of the weld proper.

Cleaning shall be carried out immediately before coating. No cleaned surface shall be left exposed to the atmosphere for a period of more than two hours before coating is carried out.

Every precaution shall be taken to prevent cleaned surfaces from becoming moist or wet. Should this occur, such surfaces shall be thoroughly dried and re-cleaned.

PS L 5.11.3 Cement Mortar

The cement mortar shall be composed of Portland cement in accordance with SANS 4719 (as amended), and in accordance with SANS 1090: 2002 (as amended) and water well mixed and of proper consistency to obtain a dense homogeneous lining that will adhere firmly to the pipe surface. The aggregate to cement ratio shall not exceed 1.5:1 and the water content shall be the minimum consistent with workability and the process used.

PS L 5.11.4 Thickness

All pipes, fittings and specials shall have a cement mortar lining which shall have a thickness in accordance with the following table:

NOMINAL DIAMETER OF PIPE FITTING OR SPECIAL (mm)	LINING THICKNESS (mm)	TOLERANCE (mm)
100	5	+3 -0
150	5	+3 -0
200	6	+3 -0
300	7	+3 -0
301 to 600	10	+4 -0
601 to 1200	15	+5 -0

Pipes up to 300 mm nominal diameter shall allow a sphere (with the minimum bore diameter) to roll through under gravity and without hindrance to ensure the minimum bore for the pipe.

PS L 5.11.5 Method of Application

The lining shall be applied to pipes, straight fittings and specials by spinning or other approved method, and to fittings and specials whose shapes preclude this method by hand-plastering or other approved process. All water and laitance expelled during the lining operation shall be removed in such a manner that the surface of the lining shall be smooth, straight and true.

At a suitable time after completion of the lining operation, as determined by experiment, the spun lining shall be given a steel trowelled or smoothing bar finish by skilled workers. A second trowelling may be necessary should the first fail to remove all laitance and produce a smooth hard surface.

The finished lining shall be dense, firm and adhere rigidly to the surface. The lining shall be tested by lightly tapping the surface with a light hammer. Any pipe, fitting or special where there is no bond between the lining and the steel shall be rejected. Defective lining shall be repaired to the satisfaction of the Engineer.

PS L 5.11.6 Reinforcement

The lining of all fittings, specials, make-up pieces (where their length is less than their diameter) and at welded joints of nominal diameter 610 mm and greater shall be reinforced by means of a 50 mm x 50 mm x 2.5 mm diameter wire fabric. All reinforcement shall be tack-welded to the fitting or special in such a manner as to lie within the middle third of the lining.

PS L 5.11.7 Curing

PS L 5.11.7.1 General

After the initial set has taken place, the mortar lining shall be cured by water or steam as hereinafter specified.

PS L 5.11.7.2 Water Curing

Where water curing is to be used it shall be commenced not longer than twelve hours after completion of the lining. The lining shall be continually sprayed with water by means of approved atomising sprinkler heads, placed inside the pipes, fittings and specials. They shall be so spaced and be of such capacity as to keep the entire surface of the lining continually wet for a period of not less than 96 hours.

Where exterior sheathing is to be applied after lining, its application shall be commenced not less than 72 hours after completion of the lining and, in this case, water spraying may be interrupted for a Maximum of 3 hours for any particular sheathing operation.

When water spraying is recommenced after sheathing, precautions shall be taken so as to ensure that the sheathing is not damaged by the escaping water. Except for the sheathing operation no pipe, fitting or special shall be disturbed or moved during the curing period.

PS L 5.11.7.3 Steam Curing

When steaming curing is to be used it shall be commenced not longer than 8 hours after completion of the lining. The steam shall be introduced slowly and total surface of the lining kept in contact with moist steam at a temperature of not less than 50° C and not more than 63° C for a period of not less than 14 hours.

When exterior sheathing is to be applied after lining its application shall not be commenced until after completion of the steam curing.

Where connections to existing pipelines are required, the Contractor shall excavate well in advance of pipework being ordered to expose the connection point to verify that the assumed fittings can be used and that the connection as proposed can be made. It should be noted that it may be necessary to expose a full pipe length to verify the size and class of pipe in the ground or to locate an existing fitting.

PS L 7 TEST

The frequency and level of inspection and testing on steel pipework (i.e. pipes, fittings and specials) including corrosion protection shall be adequate to prove compliance with the specifications.

The following tests shall be done on steel pipework:

- Hydrostatic testing in accordance with Clause PSL 7.5.
- Radiographic examination of all factory welded joints at the place of manufacture in accordance with Clause PSL 7.2.2.
- Radiographic examination of field welded joints on Site in accordance with Clause PSL 7.2.2.
- Dye penetration tests in accordance with Clause PSL 7.2.1 on all field welded joints not subject to radiographic examination.
- Hydraulic field tests in accordance with Clause 7.3.

The Contractor shall adopt an acceptable quality control procedure that includes the records and results of inspections and tests for at least at the following stages:

- After fit up but before welding
- After welding but before surface preparation
- After surface preparation
- After application of the primer or first coat (as applicable)
- After the final coat
- At each of the above-mentioned hydraulic and radiographic tests
- At each of the relevant stages of checking in accordance with Clause PSA 7.1.1

A copy of the final report of the inspections and tests shall be forwarded to the Engineer before delivery of the equipment to site.

If requested by the Engineer, inspections and tests shall be conducted or witnessed (as the case may be) on his behalf by an independent competent inspector (3rd party inspector) appointed by the Contractor. The 3rd party inspector shall have adequate experience and hold an appropriate qualification from either the CISA, the SAIW or the SAQCC and his credentials shall be presented to the Engineer for approval.

The Contractor shall notify the Engineer timeously of all inspections and tests. Although each one may not be conducted or witnessed by the Engineer (or the 3rd party inspector or any other representative) it shall not relieve the Contractor of any obligations under the Contract.

This clause must be read in conjunction with clause 5.10 of SABS 1200L. Before trenches are filled in over joints, all pipelines are to be hydraulically tested by the Contractor to a pressure fixed by the Engineer, but not exceeding 75% of the pipe test pressure at the factory. All such tests are to be carried out in the presence of the Engineer at such times and in such sections as the Engineer may direct. The Engineer shall be given not less than three days' notice of readiness to test.

The Contractor shall provide the force pumps, pressure gauge, all necessary tools and fittings and the labour required for testing. He shall ensure that all valves in the section under the test are properly secured and closed and that no pipe or fitting will move.

The section to be tested shall be filled with water, care being taken that all air is expelled. The test pressure shall then be applied slowly by means of the force pump and shall be maintained by continuous pumping for at least 30 minutes or such longer period as may be necessary to permit thorough examination of all joints and fittings. There shall be no perceptible leak throughout the whole length under test and the amount of water pumped into the pipeline to maintain the test pressure shall not exceed one litre per hour per 10mm diameter of pipe per kilometre of length being tested. Any defect revealed by the test shall be made good and the section shall be re-tested until a satisfactory test is obtained.

The length of pipe laid but not satisfactorily tested shall not exceed 600 metres, except with the permission of the Engineer.

Should the Engineer not be satisfied with the care taken by the Contractor in cleaning out the pipework before laying and excluding foreign material, the Contractor shall, after completion of testing, scour out the pipelines to remove foreign matter to the satisfaction of the Engineer and thereafter disinfect the pipelines by filling them with heavily chlorinated water containing not less than 10 p.p.m. (parts per million by weight) of available chlorine, which shall be kept in the pipe for 24 hours. The Contractor shall provide the necessary chlorine (Chlorine gas, chlorinated lime, calcium hypochlorite or other approved compound), all plant equipment and labour required to introduce the chlorine into the pipelines and do everything necessary for disinfecting the pipelines and refilling them with potable water. On completion of disinfecting the pipelines shall be scoured out, using at least twice the volume of water contained in the pipework.

On completion the pipelines shall be left full.

Only potable water obtained from an approved source shall be used for filling, testing, disinfecting and scouring the pipelines.

PS L 7.2.1 Dye-Penetration Test

All bends, other fittings and specials whose shape precludes their being tested in terms of Clause PSL 7.5 shall be tested by the application of an approved penetrant dye to all welds. No trace of the dye shall appear on the other side of the weld.

Defective welds shall be repaired in accordance with the fabrication requirements.

Fittings and specials which have passed the penetrant dye test shall be stamped with the Contractor's stamp.

Where fittings and specials tested in terms of this Clause have been manufactured from straight pipe, such pipe, before being cut, shall be hydrostatically tested in accordance with this Specification.

PS L 7.2.2 Radiographic Examination

For each section of pipeline of the same nominal diameter, the Contractor shall make provision for a total of 25 % of the field welded joints to be tested by the use of approved X-ray equipment. In the initial stages of pipe laying for a particular diameter, all field welds shall be X-rayed. Thereafter, the Engineer shall, at his own discretion, select welds to be tested. The percentage of joints to be tested may be varied at the sole discretion of the Engineer.

All welds shall also be visually inspected by the Engineer or his representative.

All welded joints found to be defective in the opinion of the Engineer shall be repaired and re-X-rayed to the approval of the Engineer at no extra cost to the Employer. Such repaired joints shall not form part of the required test sample.

The Contractor shall submit details of the apparatus and method he proposes to use to carry out these X-ray tests and these shall be to the approval of the Engineer.

The fact that a joint passes the X-ray test does not relieve the Contractor of his obligations under Clause 7.3.

PS L 7.3.1 Test Pressure and Time of Test

Pipes shall not be tested against isolating valves. Special blank flanges or end caps, fully anchored, shall be provided for testing.

The contents of Clause 7.3.1.1 is applicable for PVC, polyethylene and steel (150 mm diameter and smaller) pipelines, for steel pipelines, add the following:

For steel pipelines 150 mm and larger:

After filling the section to be tested the section shall be allowed to stand for a minimum 24-hours. The Contractor shall then place the pipeline under a test pressure corresponding to the design head for the pipeline determined by interpolation from the design elevation of above mean sea level. Water shall be fed into the system through a calibrated meter and the pressure in the system measured by a calibrated gauge. The Contractor shall provide the necessary pumping system, connections, meter, gauges and labour. Each test shall continue for at least three days. Any decrease in pressure shall be made up every hour and the quantity of makeup water measured.

Replace the contents of subclause 7.3.1.2 with the following:

The test pressure for field testing shall be 1.5 times the rated maximum working pressure of the pipe e.g. class 10 pipe (1 MPa rated working pressure) shall be tested to 1.5 MPa and class 12 pipe (1.2 MPa rated working pressure) to 1.8 MPa.

Replace the contents of subclause 7.3.1.3 with the following:

The test pressure applied according to PSL 7.3.1.2, must with allowance for any level difference along the pipe line, be such that the pressure at any point in the pipe will be at least 1.25 times and not more than 1.5 times the rated working pressure of the pipe.

The contents of Clause 7.3.3 is applicable for PVC, polyethylene and steel (150 mm diameter and smaller), for steel pipelines 150 mm and larger, add the following:

The pipeline will not be considered satisfactory until the average leakage is less than 0.1 litres/mm diameter/kilometre/24-hours/30m head.

If the average leakage per 24-hours from the tested section of the pipeline is greater than that specified, the Contractor shall take immediate steps to reduce the leakage and shall at this own expense do any excavating necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed and shall make all repairs necessary to secure the necessary water tightness. He shall thereupon replace such excavated materials after which the test shall be repeated until the pipe under test is found satisfactory.

PS L 7.3.3 Permissible Leakage Rates

The contents of Clause 7.3.3 is applicable for PVC, polyethylene and steel pipelines, add the following:

The pipeline will not be considered satisfactory until the average leakage is less than 0.1 litres/mm diameter/kilometre/24-hours/30m head.

If the average leakage per 24-hours from the tested section of the pipeline is greater than that specified, the Contractor shall take immediate steps to reduce the leakage and shall at this own expense do any excavating necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed and shall make all repairs necessary to secure the necessary water tightness. He shall thereupon replace such excavated materials after which the test shall be repeated until the pipe under test is found satisfactory.

PS L 7.4 TEST OF EPOXY COATINGS

Subclause 7.4 a) Tests for pinholes and holidays

Coatings and linings shall undergo pinhole and holiday detection over at least 20% of the coated and lined surfaces in accordance with SANS 1217 and shall be deemed to fail if pinholes or holidays are detected.

Subclause 7.4 b) Coating thickness tests

In addition to the requirements of Subclause 6.5 of SANS 1200 HC, the achieved dry film thickness (dft) shall be obtained by taking not less than 10 dft readings per coating and lining of each individual fitting, special, valve and structural element or if in continuous lengths, per each 2 m length of pipe or structural element.

Add the following Clause PSL 7.5:

PS L 7.5 HYDROSTATIC TESTING OF PIPES AND SPECIALS

PS L 7.5.1 All pipes shall be subject to and approved hydrostatic test to a test pressure determined as follows:

$$P = \underline{2\,000} \text{ tf}$$

D

Where

"P" is the test pressure in kPa.

"f" is 85 per cent of the guaranteed minimum yield strength in MPa for the steel plate.

"D" is the outside diameter of the pipe in mm.

"t" is wall thickness in mm.

- PS L 7.5.2 Hydrostatic testing shall not be carried out until all aspects of fabrication have been completed.
- PS L 7.5.3 The pressure shall be applied steadily by approved means and maintained without variation sufficiently long for proof and inspection. While under the test pressure the pipe shall be struck smartly and repeatedly along its length with a hammer of a mass of not less than 1 kg.
- PS L 7.5.4 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 Engineer may order its rejection.
- PS L 7.5.5 The fact that any pipe may have passed the hydraulic test at the Works shall not exempt the Contractor from his liability under Clause 4.1 of the General Conditions of Contract.
- PS L 7.5.6 If a pipe fails to pass any of the above tests it shall be rejected but the Engineer may permit repairs or alterations to be made to enable the pipe to pass the test.
- PS L 7.5.7 The Engineer may require one or more pipes to be tested to destruction. If practicable the Engineer 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.

Pipes shall not be tested against isolating valves. Special blank flanges or end caps, fully anchored, shall be provided for testing.

PS L 8.1 MEASUREMENT AND PAYMENT

Unless otherwise stated in the descriptions of the scheduled payment items for pipes, fittings, valves and specials, the tendered rates shall include the cost of corrosion protection, all factory and field testing, disinfection, jointing materials and isolation between dissimilar metals. The rates shall include a 3rd party inspector if an inspector is included in the payment item description.

The laying of pipes shall be deemed as labour intensive. The cost of labour based construction activity is covered by using the standard payment items with no additional extra-over payment item to cover the additional cost of using labour based construction methods.

PS L 8.2.1 Supply, lay and bed pipes complete with couplings

Unit: m

Replace the second sentence "No deductions will be made for specials and valves" with the following sentence: "Except for short pipe runs as scheduled under Clause 8.2.5, no deductions will be made for specials and valves".

**PS L 8.2.2 Extra-over 8.2.1 for the supplying laying and bedding
of specials complete with couplings Unit: No**

Add the following to Payment Item 8.2.2:

The contents of Clause 8.2.3 shall apply to this Clause. For steel pipes welded on site the rate shall cover the cost of cutting and jointing by welding to make the installation complete.

PS L 8.2.2 (n) Fire Hydrant Assembly

The Contractor shall cost this item as a hole, as per detail drawings. The rate shall include all items indicated for, together with concrete thrust block, valve box, excavation, backfill, testing and all appurtenances completed.

PS L 8.2.2 (o) Landing Valve Assemblies

- 1) The Contractor shall cost this item complete, including all appurtenances.
- 2) The Contractor shall cost these items complete, including all appurtenances, but must make provision for detail measuring and manufacturing of item 2 and 3. These two items are subject to detail on site measuring, cutting, bending and manufacturing.

The single section stainless steel landing valve support anchor bracket, is measured under item SANS 1200H, 8.3.1.2.1.3

PS L 8.2.5 Supply and Place Pipes, Valves and Specials

Change the unit of measurement of this item to: "Sum or No".

Where the unit is scheduled as a Sum, the scope and detail of the relevant pipes, valves and specials shall be shown on the drawings and/or described in the Bills of Quantities or specifications. In that case the sum shall cover the collective cost of all the relevant pipes, valves and specials.

Where "DESIGN" is added to the description of this payment item in the Bills of Quantities, the rate shall include the cost of design services as specified for this contract (refer to Clause 3.2.1). The detail of the pipework that is given on the drawings is deemed to be adequate for tendering and planning purposes. Any changes deemed necessary by the Contractor to provide a fully reliable and functional system in accordance with the specifications shall be included in the tendered rates. No variations in payment will be entertained during the construction stage.

Where additional supports or brackets are schematically shown on the drawings or deemed necessary by the Contractor, the rate shall include the design, manufacture and construction of required for the supports.

When an "extra-over" item is specified the installation, testing and commissioning shall be measured separately in the Bills of Quantities.

PS L 8.2.5 a) Supply and place pipes, valves and specials

- a) Water Meters

The Contractor shall cost each type of meter installation complete with all appurtenances, including supply, handling, fixing, bed, testing, cutting of pipes, turning, jointing and connecting into/onto existing building/structure supply mains. The different assemblies are as per the detail drawings for the following ranges:

- DN 25 (32mm pipeline)
- DN 25 (40mm pipeline)
- DN 50 (75mm pipeline)
- DN 80 (110mm pipeline)
- DN 100 (160mm pipeline)
- DN 150 (200mm pipeline)
- DN 200 (250mm pipeline)
- DN 250 (315mm pipeline)
- DN 250 (355mm pipeline)

NOTE: The minimum required flow rate for the DN25 meter is a 3 500 litres / hour.

Amend Clause 8.2.7 to the following:

PS L 8.2.7 Extra over items 8.2.1 (a) and (b) for encasing pipes and joints

The tendered rate shall be per cubic meter. The Contractor shall include in his rate for:

- 1) 25MPa concrete, for supply, handling and working of concrete.
- 2) Shuttering, for supply, cutting, fixing and for all appurtenances.

These items are conditional for if and when required, if the situation arrives for additional protection and securing of services crossings.

In each and every event, a detail measured sheet, including a drawing with dimension need to be supplied to the Engineer for approval.

PS L 8.2.10 Temporary Work

Temporary valves, water truck, etc.

- a) The Contractor shall make provision potable water trucks on standby to supply water for facilities, when connecting new water mains onto and into existing water infrastructure. The rate shall be for number of water tankers.

The rate shall include for:

- i) A water tanker with a capacity of 18000 l (each) with a pump that can deliver water at a rate of 3 500l/h to 15 000l/h minimum, at 3.5 bar maximum pressure.
 - ii) Each truck shall be fitted with a 25mm diameter supply hose of at least 20m in length, with attachment to connect to a water main of 25mm diameter.
 - iii) Provision must also be made for connections between 75mm diameter to 32mm diameter.
 - iv) Driver and plumber.
 - v) Temporary valves and connection for DN25 to DN80.
 - vi) This shall be available during the commissioning of the new network.
-
- b) The Contractor shall make provision for a temporary pipe deviation for tunnel shut down including water supply and 200m of 160mm HDPE pipes. This length of pipe can be moved within a zone as work progresses in sections of the tunnel. The rate in the Schedule of quantity shall be for no. of deviations.

Replace the payment clause with the following:

PS L 8.2.11	25MPa Anchor/ Thrust Blocks	Unit: m³
	Anchor and thrust blocks shall be measured per cubic metre concrete and the tendered rate shall include for all formwork and reinforcement (where specified) for the required dimensions.	
PS L 8.2.13	Valve and hydrant chambers	
	(a) Isolating Valve box	
	Type 1 for valves	Unit: No.
	(b) Landing valve box	
	Type 2 for landing valves	Unit: No.
	(c) Landing valve box repair	
	Existing Landing Valve Boxes	Unit: No.
	For repairing of existing valve boxes, the works specified PSG 5.20 shall apply.	
	<i>Add the following Payment Items PSL 8.2.16 to PSL 8.2.18:</i>	
PS L 8.2.16	Pipe Route Markers	Unit: No.
	Pipe route markers shall be provided in accordance with the drawing details.	
	The unit of measurement shall be the number of pipe route markers installed. The tendered rate shall include full compensation for manufacturing, installing, painting/coating and inscribing of the identification marks and submitting to the Engineer the records of all the pipe route markers.	
PS L 8.2.17	Cutting into Existing Pipes to Connect Extra Couplings and Fittings	Unit: No.
	The tendered rate shall include full compensation for any inconvenience suffered, for normal and exceptional risks and for unforeseen eventualities, for all arrangements and timeous liaison with the service providers, for verification of existing pipe diameters in accordance with PSL Clause 5.1.5, for cutting of the pipe and disposing of unused cut-offs and for construction of all necessary temporary measures like excavating, pumping, pipework, etc. to enable the works to be carried out in dry conditions. Separate items shall be scheduled for different types of connections.	
	The supply and installation of the couplings and fittings shall be measured separately.	
	The excavation for exposing the pipeline shall be measured separately.	
	The Municipality will provide guidance and assistance of a practical nature for the Contractor in matters related to the closing down and recharging of the existing water system when it is necessary for him to work on the system.	
	The Contractor shall give 24 hours written notice to the Engineer of his intention to operate on the live water system, stating fully the proposed plan for isolating, draining, cutting, connecting, recharging and opening up the mains.	

TRANSNET NATIONAL PORTS AUTHORITY
ENQUIRY / CONTRACT NUMBER DESCRIPTION OF THE WORKS:

The Contractor shall also provide each affected consumer with at least 24 hours written notice in advance of his intention to close the system down. The total period of shut down including drainage and re-charging may not exceed 4 hours. All such work must be carried out between the hours of 8 a.m. and 4 p.m. The extent and frequency of the shutdown must be to the satisfaction of the Engineer.

Included in the reasons for a shut-down as required by the Contractor will be the cutting out or installing of a valve or fitting, the cutting and plugging of a main, the installation of temporary mains or connections, and so on.

PS L 8.2.18 Extra-over 8.2.1 for Laying Pipes Inside Sleeve Unit: m

The rate shall cover the additional costs (if any) for installation of the various pipes inside sleeves to line and level, including, but not limited to: Installation guides and supports capable of moving the pipeline into the sleeve without damage to coatings, joints, etc. and permanently anchoring the pipe against hydrostatic uplift forces. The Bill of Quantities item shall describe the type and size of sleeve which the pipe will be installed in.

SANS 1200 PSLB: BEDDING (PIPES)

PS LB 1.1 SCOPE

This specification also covers the bedding required for electric cables and cable ducts.

PS LB 3.1 SELECTED GRANULAR MATERIAL

Replace the contents of Clause 3.1 with the following:

Selected granular material shall be an aggregate, sand or granular material, all of a non-cohesive nature and free from any organic material, of which the grading analysis shows 100 % passing a 13.2 mm sieve and not more than 5 % passing a 0.075 mm sieve.

In very wet conditions and if so ordered by the Engineer, a non-plastic crushed material with the specification as stated underneath should be used for bedding cradle.

a) Grading

SIEVE SIZE (MM)	% GOING THROUGH
19.0	100
13.2	84 – 100
9.5	70 – 84
4.75	45 – 65
2.36	29 – 47
1.18	19 – 33
0.600	13 – 25
0.300	10 – 18
0.150	6 – 13
0.075	4 – 10

b) Crusher value

The aggregate crushing value, calculated at minus 13.2 mm plus 0.5 mm fraction, may not exceed 29 mm.

PS LB 3.2 SELECTED FILL MATERIAL

Replace the contents of Clause 3.2 with the following:

The requirements of PSLB 3.1 shall apply mutatis mutandis.

PS LB 5.1.4 Compacting

The degree of compaction attained for bedding, for pipelines in road reserves, shall be 93% of modified AASHTO (100 % for sand).

PS LB 8.1 BASIC PRINCIPLES

The bedding of pipes shall be deemed as labour intensive. The cost of labour based construction activity is covered by using the standard payment items with no additional extra-over payment item to cover the additional cost of using labour based construction methods.

PS LB 8.1.5 Disposal of displaced material

Replace the contents of Payment Item 8.1.5 with the following:

The Contractor shall provide the necessary spoil site for disposal of surplus material and shall make the necessary arrangements with the owner of the site, and shall make provision in the scheduled rates in the Bills of Quantities for all charges in this regard and for all costs for transporting the material regardless of the distance involved.

PS LB 8.1.6 Freehaul

Replace the contents of Payment Item 8.1.6 with the following:

The Contractor shall select the sources of imported material and borrow pits. As a result all haul for transportation of the material shall be regarded as freehaul. No overhaul shall apply, regardless of the distance involved.

Add the following Clauses:

PS LB 8.2.6 Cement stabilised bedding

Unit: m³

Bedding shall be stabilised with 3% cement where directed by the Engineer in hardstands, trafficked areas and areas adjacent to railways.

The soil or gravel shall be mixed with 3% cement and shall be compacted in layers of 150mm thick to 97% of modified AASHTO density.

The rate shall be per cubic meter and include mixing, placing, compacting and all necessary activities to provide a sound finish.

PS LB 8.2.7 Dump rock

Unit: m³

The contents of Clause PSDB 8.2.8 shall apply.

SANS 1200 PSLC: CABLE DUCTS

PS LC 1 SCOPE

Add to this clause:

For the protection of exposing cables that are too shallow or within 150mm of a water main been installed.

PS LC 8.2.6(a) Extra-over for cement stabilised bedding and backfilling

Unit: m³

The Contractor shall, when excavating for the water main trenches, cross an electrical, telecommunication, fibre sleeve or open cable that is within 150mm from the bottom of the water pipe, must be exposed and backfilled with imported back fill material, modified with 3% cement, to create a stable cradle for the service and bed for the water pipe.

The Contractor must, when he encounters such a scenario, inform the Engineer to inspect. The Contractor shall provide a method statement and seek approval from the Engineer to commence. Each occurrence must be properly documented by the Contractor.

PS LC 8.2.10 Precast concrete cover slabs

Unit: no

The Contractor shall when excavating for the water main trenches cross a sensitive service that is at risk of getting damaged, the Contractor will be able to use precast concrete cover slabs, if agreed and evaluated by the Engineer.

Each occurrence must be properly documented by the Contractor.

SANS 1200 PS LE: STORMWATER DRAINAGE

Add the following Clauses PSLE 3.1(f):

PSLE 3.1 (f) SLOTTED PIPES FOR SUBDRAINS

Slotted Pipes for subdrains shall have an outer diameter of 110 mm unless indicated otherwise elsewhere. These slotted pipes shall be uPVC pipes with a wall thickness in accordance with Class 4 pressure pipes to SANS 966-1:2000.

The size of the perforations in perforated pipes shall be 8 mm \pm 1.5 mm diameter and the number of perforations per metre shall be approximately 26 for 110 mm pipe. Perforations shall be spaced in two rows for 110 mm pipes.

The arrangement of slots shall be to the Engineer's approval but the total slot area shall not be less than specified for the perforations.

Pipes without slots or perforations required for conveying ground water from the subdrains proper to the point of discharge, shall be un-perforated uPVC pipes as specified above.

PSLE 3.4 MANHOLES, CATCHPITS AND ACCESORIES

Manholes shall be constructed with brickwork unless otherwise detailed on the drawings or instructed by the Engineer on site.

PSLE 3.4.2 Prefabricated chambers and shafts

Cast-iron gulley grates shall be installed with an anti-theft chain, one end built into the brickwork and the other end welded to the grate for a single grate catchpit, and shall be looped through both grates and welded together for a double grate catchpit.

PSLE 3.6 CONCRETE

Concrete for sub-surface drainage shall be as indicated on the drawings and comply with the relevant requirements of SANS 1200 G. Slotted pipes for the sub-surface drain shall be cast in a porous no-fines concrete on top of the blinding layer unless indicated otherwise.

PSLE 3.7 SAND FILTER MATERIAL

Sand shall be used as filter material for the internal sub-surface drain and wall drainage as indicated on the drawings.

Physical properties of the sand shall be similar to that specified in PSLB 3.1.

Add the following Payment Items PSLE 8.2.14:

PSLE 8.2.14 Supply, handle, lay and Bed Slotted Pipes Unit: m

The unit of measurement shall be the linear metre of installed slotted pipes. The rates for slotted pipes shall include for 19 mm clean washed stone, U14 Bidum geofabric,

TRANSNET NATIONAL PORTS AUTHORITY
ENQUIRY / CONTRACT NUMBER DESCRIPTION OF THE WORKS:

couplings, end caps, short lengths of un-perforated pipes and any additional materials,
plant or labour required for installing the pipes.

SANS 1200 PS LF: BUILDING CONNECTIONS (WATER)

PS LF 8.2.9 Ancillary items

Unit: no

The Contractor shall when installing the water connection, metered or not, shall continue to expose to the point of connection. This will include for locating, excavating, cleaning of located pipes, fittings, backfill and reinstatement to its original condition and finish. Allowances have been made for these actions.

Proper record keeping must be done by the Contractor and presented to the Engineer at completion of each connection.

The rate tendered shall either be per number of building connections located, cleaned and reinstated.

SANS 1200 PS ME: SUBBASE

PS ME 3 MATERIALS

PS ME 3.2 PHYSICAL PROPERTIES

PS ME 3.2.1 Subbase material

Add the following:

The type of subbase layers shall be as shown in the drawings.

PS ME 3.3 SELECTION

PS ME 3.3.1 General Selection

During construction, should the physical properties of the material appear to differ appreciably from the properties of the material previously approved, the Contractor shall obtain the Engineers approval prior to processing the material. If the Engineer does not give his approval, the material shall be removed from site and replaced with suitable material at the Contractors cost.

PS ME 3.4 PLACING AND COMPACTION

PS ME 3.4.1 Placing

Before the construction of the sub-base, the Contractor shall ensure that the underlying subgrade and selected layer, if any, comply with the relevant requirements of SANS 1200 DM and to the specification required in this document.

The Contractor may use whatever technique he chooses to achieve the specified standards for sub-base and shoulder but in selecting his technique, should bear in mind the limited widths of trenches.

PS ME 3.4.2 Compaction

The sub-base shall be compacted to a density of at least 97% of MOD AASHTO density.

PS ME 4 STABILISATION

PS ME 4.1 RATE OF APPLICATION

The rate of application of stabilisation agent is specified in the bill, and if so required will be determined on site by the Engineer after testing the material stockpiled for use in the sub-base.

PS ME 5 CONSTRUCTION

PS ME 5.5.6 Curing

The stabilized layer shall be protected against rapid drying out for at least seven days following completion of the layer.

The stabilized layer shall be covered with a material conforming to the minimum of a G5 specifications for the duration of the curing process. The material forming the protective layer shall be watered at such intervals as may require keep the stabilized layer continuously damp, and in dry weather this shall be done at least once every 24 hours.

The layer shall be adequately maintained such that traffic can be accommodated for the duration of the curing process, after which it will be removed and stockpiled for reuse.

PS ME 6 TOLERANCES

PS ME 6.1 CROSS SECTIONS

The level of the surface of the shoulder adjacent to the road surfacing shall be within the following tolerances relative to the adjacent road surface : 5mm + 10mm.

PS ME 7 TESTING

PS ME 7.2.1 Process control

Amend Table 2 as follows:

Replace "1500m² and 1500m²" in column 2, opposite Density indicator test, "5000m²" in column 2 opposite CBR and UCS with "100m²".

Replace "-" in column 3 opposite CBR and UCS with "1".

PS ME 7.2.2 Routine inspection and testing

Substitute last sentence with the following:

No density shall be less than the specified minimum density for the relevant layer.

PS ME 8.3 MEASUREMENT AND PAYMENT

PS ME 8.3.3 Construct the subbase course/shoulders/gravel wearing course with material from commercial sources or designated borrow areas

The Contractor's attention is drawn to the fact that the subbase widths are restricted. Rates must include for all plant and supervision necessary to achieve the required specifications.

Add the following Payment Item:

PS ME 8.3.11 Curing

Unit: m³

The rate shall cover the cost of locating the source, complying with all the relevant precautions required in terms of 5.1, procuring the material. basic selection, transporting from source to point of deposition on the road, spreading, watering, compacting, and maintaining for the duration of the curing process, removing and stockpiling.

SANS PSMH: ASPHALT BASE AND SURFACING

PS MH 1 SCOPE

Add the following:

This section covers the furnishing of materials and the reinstatement of original asphalt paved areas.

PS MH 3 MATERIALS

PS MH 3.4 BITUMINOUS BINDERS

(i) Conventional binders

Add the following:

The binders to be used shall be as follows:

- (a) Continuously graded surfacing course: penetration grade bitumen PG58E-22 EMB as per SABITA Manual 35 (elastomer modified AE-2 binder)
- (b) Continuously graded base: 35/50-penetration grade bitumen.

(ii) Non-homogeneous (heterogeneous) modified binders"

The bitumen-rubber binder shall be manufactured according to the guidelines contained in "Technical Guideline: The use of Modified Bituminous Binders in Road Construction (TG 1-2007) Asphalt Academy.

(3) *Extended oil*

Add the following:

TABLE B4202/2: REQUIREMENTS FOR EXTENDER OIL

Property	Limits
Flash Point	180°C (min)
Percentage by mass of saturated hydrocarbons	25% (max)
Percentage by mass of aromatic unsaturated hydrocarbons	55% (min)

PS MH 4.0 Plant and equipment

PS MH 4.1 GENERAL

(b) Moisture

Moisture control must happen all the time.

PS MH 4.7 MISCELLANEOUS EQUIPMENT

Add the following paragraph:

Only Hand spraying shall be permitted on areas approved by the Engineer. The binder distributor shall be capable to apply the binder evenly over the full area. The equipment shall be fitted with a suitable cut-off spray-head and fishplate.

PS MH 5.0 CONSTRUCTION

PS MH 3.4.2 Composition of asphalt base and surfacing mixtures

"The design of the asphalt mixes shall be in accordance with "Interim Guidelines for The Design Of Hot-Mix Asphalt In South Africa (June 2001)", and appropriate research results. The mix properties and requirements shall be as specified in the project specifications.

PS MH 5.5 DESIGN OF ASPHALT

PS MH 5.5.2 Marshall criteria

The relevant asphalt mixes for the base and surfacing layers shall comply with the requirements in table B4203/2.

TABLE B4203/2: ASPHALT MIX REQUIREMENTS: BASE AND SURFACING

Property	Continuously graded base mixes	Continuously graded surfacing mixes	Stone mastic asphalt mixes	Semi-gap graded surfacing mixes
Marshall Stability (kN)	8 – 18	8 – 18	-	8-18
Marshall Flow (mm)	2 – 6	2 – 6	-	2-6
Stability /Flow (kN/mm)	>2,5	> 2,5	-	>2,5
VMA (%)	> 14	> 15	> 17	>15
VFB (%)	65 – 75	65 – 75		65-75
Air voids (%)	4 – 6	4 – 6	3 – 5	4-7
Indirect tensile strength @ 25°C (kPa)	> 1000	> 1000	> 400	>800
Dynamic Creep Modules @ 40°C (MPa)	> 20	> 20	-	>15
Modified Lottmann* (TSR)	> 0,7	> 0, 8	> 0,7	>0,8
Air permeability @ 7% voids (cm ²)	< 1 x 10 –8	< 1 x 10 –8	<1 x 10 –8	<1x10-8
Binder film thickness (microns)	5,5 – 8,0	5,5 – 8,0	-	5.5 – 8,0
Filler bitumen ratio	1 – 1,5	1 – 1,5	-	1-1,5
Immersion index (%)	-	-	-	>75

* At 7% voids

PS MH 5.6 PROPORTIONING, MIXING AND TRANSPORTATION OF THE ASPHALT

PS MH 5.6.5 Transporting the mixture

Add the following paragraph:

Special precautions shall be taken by the Contractor to ensure that the temperature of the total mass of asphalt does not decrease by more than 10°C from point of dispatch to the point where it is to be paved. The use of the thermal blankets is obligatory.

The Contractor shall ensure that trucks used to haul asphalt are not overloaded and the legal axle loads are not exceeded. Before any asphalt can be transported, the Contractor must provide the Engineer with the certified carrying capacity of each truck intended for the purpose of transporting the mix. The Contractor shall provide the Engineer with a weighbridge ticket before discharging into the paver hopper.

Any truck that is overloaded shall not be allowed to discharge its load and shall return to the depot/batching plant for adjustment of the load. In addition a penalty shall be applied for the overload.

Add the following sub-clause:

(i) Approval of asphalt mixture

Before any asphalt is placed on the road, the Engineer shall approve the mix design. The approval process shall be as follows:

The Contractor shall prepare and submit a laboratory design mix with test results at four different bitumen contents. The design mix shall be submitted on the prescribed form D3 of TMH 10: "Instruction for the Completion of As-Built Materials Data Sheets" with all the necessary test results completed. In addition, the proposed asphalt mixture shall be subjected to gyratory testing. All the expenses in preparing and submitting the laboratory design mix shall be to the Contractor's cost.

Samples of all aggregate and bitumen shall be submitted with the laboratory design mix to enable the Engineer to carry out check design testing as necessary. The above design and aggregate shall be submitted to the Engineer at least six weeks before it is intended to commence with any asphalt production.

PS MH 5.9 JOINTS

Add the following to this clause:

Where the difference in level between the new work and the existing road surface exceeds 25mm, joints shall be treated as follows:

Transverse steps at the end of a day's work shall be tapered off at a slope of 1 vertical to 20 horizontal (1:20) to tie in with the existing surface. The tapered section shall be removed before surfacing is recommenced and a joint formed in accordance with clause 4208 of the specification.

Longitudinal joints exposed to traffic shall be provided with a taper of compacted asphalt material over the full length of the exposed joint. The width of the taper shall be at least 5 times the difference in level between the old and new work.

All costs involved in the provision and removal of these temporary ramps shall be deemed to have been included in the rates tendered for the relevant asphalt pay item."

PS MH 7 TESTING

PS MH 7.1 Mix Design

Add the following:

The contractor shall supply the Engineer with a mix design 3 weeks prior to the programmed start date of production or delivery of materials.

PS MH 7.2.1 Coring testing by the Contractor

PS MH 7.2.1.1 General

Add the following:

A suitable coring machine shall be available on a daily basis when asphalt paving is taking place. Cores shall only be drilled, when the road temperature is 20°C or less. Core holes shall be filled with hot mix asphalt and compacted, all within 24 hours of the core being drilled. Coring shall be carried out within 48 hours after the paving has been completed and supplied to the Engineer. The test results of cores shall be submitted to the Engineer within 24 hours after coring.

1) Routine inspection and tests

Add the following paragraphs:

The Contractor shall keep accurate records of:

- (i) The position where every truckload of asphalt is paved (chainage, lane, time and date).
- (ii) The temperatures of the asphalt in the trucks both at the mixing plant and at the paving equipment immediately prior to discharging the load.
- (iii) The truck and load number from which control samples are taken. All samples taken shall be appropriately numbered.

SANS PSMJ: SEGMENTED PAVING

PS MJ 1 SCOPE

Add the following:

This section covers the furnishing of materials and the construction of any paving.

PS MJ 3 MATERIALS

PS MJ 3.3 SAND FOR BEDDING AND JOINTING

Replace the contents of this item with the following:

Sand for bedding and jointing sand shall be free from substances that may be deleterious to blocks. In addition, the grading of the sand shall conform to that given in (a) or (b) below, no other grading of sand will be accepted.

a) Bedding Sand

<u>Nominal sieve size (mm)</u>	<u>% Passing</u>
9,52	100
4,75	95 – 100
2,36	80 – 100
1,18	50 – 85
0,60	25 – 60
0,30	10 – 30
0,15	5 – 15
0,075	0 – 10

b) Jointing Sand shall pass a 1,18 mm sieve and shall contain 10 – 50 % (m/m) of material that passes a 0,075 mm sieve.

PS MJ 5 CONSTRUCTION

PS MJ 5.7 JOINT FILLING

Add the following to the fourth line after “Sand that complies with 3.3(b):

“and mixed with 3% road lime measured by volume”

PS MJ 6 TOLERANCES

PS MJ 6.3 PERMISSIBLE DEVIATIONS

Add the following new items:

Item	Permissible deviations (mm)		
	Degree of Accuracy		
	III	II	I
5) Final anchor beam level to finished level	*	*	+0 , -5

PS MJ 7 TESTING

PS MJ 7.1.1 Checking

Replace the contents with the following:

The Contractor shall carry out sufficient checks to satisfy himself that the materials used, and the workmanship (construction, tolerance, and strength) attained comply consistently with the specified requirements. The Contractor will make available to the Engineer all the test results done. Checks will be carried out by the Engineer and the results made available to the Contractor.

PS MJ 8.2.6 Uplifting Existing Paving

Unit: m²

The rate shall include Uplifting existing paving, neatly stack for re-use and maintain, re-instate, supplying sand, placing the bedding layer, laying the units, compacted and plaster sand broomed into joints on completion for the following:

- 60mm Block Paving
- 80mm Block Paving
- 600x600 Pre-cast concrete slabs/blocks

The rate shall be per square meter and shall include all work required to reinstate the surface to a condition at least to its prior condition. Photographic records should be kept.

SANS 1200 PS MK: KERBING AND CHANNELLING

PS MK 3 MATERIALS

PS MK 3.9 BEDDING MATERIAL

Substitute MK 3.9 with the following:

The material on which concrete kerbs, channels and edging are bedded, shall be in accordance with the dimensions shown on the drawings and shall consist of a 30 MPa concrete mix with a 6.7 mm single size coarse aggregate.

PS MK 5 CONSTRUCTION

PS MK 5.2 PRECAST CONCRETE KERBING AND CHANNELLING

Substitute the first sentence of MK 5.2 with the following:

Precast concrete kerbing and channelling shall be laid and bedded on concrete bedding complying with the requirements of PS MK 3.9 and to the dimensions shown on the drawings.

PS MK 5.10 PROTECTION

Substitute the word "bad" in the second sentence with the following:

no chipped or patched kerbs will be accepted.

PS MK 5.14 EXPANSION JOINTS

These joints shall be provided at 10 m intervals. These joints shall be 12 mm wide, filled with a compound such as flexcell or similar product and sealed with a polysulphide sealant. Costs of furnishing the materials and construction of the joint are deemed to be included in the laying rate.

PS MK 7 TESTING

As per SANS specifications.

PS MK 7.2.2 Tests

The Contractor shall carry out a minimum of three cube crushing test per 100 m of kerbing placed. The cost of such tests shall be deemed included in the rates tendered for kerbing.

One cube crushing test shall consist of a set of six cubes made with concrete taken from the mixer, the kerbing machine or from any part of the work as ordered.

If, after three cubes of any set of six cubes have been tested after 28 days in an approved laboratory, the average crushing strength is found to be more than 3MPa below the specified strength, the kerbing represented by the cubes will be rejected.

The Contractor may apply for resubmission of the rejected section on the basis of cores drilled from this section and tested for the estimated actual crushing strength in accordance with SANS method 865 (excluding appendix A). The cost of the drilling and testing the cores is for the Contractor's account, regardless of the outcome of the tests on the cores. The number of cores required will be determined by the Engineer

and the criterion for rejection or acceptance of the section represented by the cores shall be as specified above for cubes."

SANS 1200 PS MM: ANCILLARY ROADWORKS

PS MM 3 MATERIALS

PS MM 3.3 ROAD MARKINGS MATERIAL

PS MM 3.3.1 Paint

All road markings shall be applied at the rate supplied in the bill. Any variation in application rate will be claimed under section 8.4.2.

This section and item is only applicable for road markings that was destroyed because of excavation and need to reinstate.

PARTICULAR SPECIFICATIONS

PS HDD

HORIZONTAL DIRECTIONAL DRILLING

For Horizontal Directional Drilling, the specification to adhere to is SASTT TECHNICAL STANDARD SASTT-TS-TT3:2017 Edition 1, published by the Southern African Society for Trenchless Technology (SASTT).

SASTT-TS-TT3: Edition 1		2017
Table A.2 — Specification data associated with this part of SASTT-TS-TT3		
Specification data associated with this part of SASTT-TS		Clause number
Essential Data		
Pipes shall be butt-welded high-density polyethylene (HDPE).		4.1.1
The pipe shall be a solid wall high density polyethylene (HDPE) PE100 PN16 with diameters as shown in the Schedule of Quantities.		4.1.1.1 a)
Welders shall be IFPA members and shall imprint each weld with their unique IFPA identification stamp displaying the IFPA company number, welder number and IFPA logo, issued in accordance with the Welder Identification System.		4.1.1.1 b) iii
Welded joints shall be tested in accordance with SANS 6269.		4.1.1.1 b) v
Before any production welding is commenced, the following shall be approved in accordance with SANS 10270 for heated-tool butt welding of pipes: 1. A Welding Procedure Specification (WPS) and 2. A qualification joint		4.1.1.1 b) vi
The internal and/or external welding beads shall be removed. The removed beads from each joint shall be retained in separate labelled transparent bags and handed to the Engineer		4.1.1.1 c)
Permission must be sought from TFR as well as Oil and Gas Operators when crossing their services. The requirements will be set by the 3rd parties and shall be adhered to by the Contractor.		4.3.1.2
Limited historical geotechnical data will be made available; however, HDD is required in many places across the Port and the data may not be close to the HDD site.		4.3.1.3
For measurement and payment purposes, the classification of rock is as described in SANS1200		4.3.1.3
Available existing services information has been made available, GPR will be required, and it remains the Contractors responsibility to identify services and liaise with the relevant authority/service provider.		4.3.1.5
Ground penetrating radar shall be used along the proposed drill path and drilling pits		4.3.1.5.2
Waypoint pits are compulsory for all Oil and Gas pipeline crossings as well as rail crossings.		4.3.1.5.3
The design criteria can be amended/supplemented by specific requirements by relevant service providers/authorities		4.3.1.6
The HDD Contractor should be specified in the Tender document by the Contractor		4.3.1.7
The drill plan for oil and gas pipelines shall be approved by the relevant authorities		4.3.1.7
Movements of the drilling shall be monitored and recorded on As-builts in .dwg format.		4.3.2.4.1
A breakaway link shall be used		4.3.4.3.5
A pullback gauge shall be used		4.3.4.3.5

SASTT-TS-TT3: Edition 1		2017
Table A.2 — Specification data associated with this part of SASTT-TS-TT3		
Specification data associated with this part of SASTT-TS		Clause number
Draw wires shall be inserted when the drilled pipe will be used as a sleeve.		4.3.5.3
Pipe end markers shall be installed at start and ends.		4.3.5.4
Surplus excavated material shall be removed, transported and disposed of at suitable disposal site. All haul is regarded as freehaul.		4.3.5.6
Pressure tests shall be performed on the pipeline		5.2.1
Pipe sleeves shall be proved when the service pipe/duct has been pulled through		5.2.2

1 MEASUREMENT AND PAYMENT

1.1 GENERAL

The basis of payment for a pipeline installed by horizontal directional drilling, takes cognizance of the fact that, although the Engineer may design and specify the pipeline, he cannot provide detailed drawings and dimensions for the horizontal directional drilling operations and any drilling pits, because these depend on equipment and methods that the HDD Contractor intends to use for carrying out the work.

In view of the considerations set out above and the nature of the operations, the provision and installation of horizontal directional drilled pipelines is scheduled with:

- a) an item for establishment on the contract site of works.
- b) an item for setting up at each installation;
- c) items for provision and installation of pipelines

1.2 SCHEDULED ITEMS

1.2.1 Horizontal directional drilling (HDD) establishment on site

HDD establishment on site..... **Unit: Sum**

The sum for the above shall cover the charges for providing and establishing on the contract site of works, the personnel, plant, equipment, setups in and around site between pits, and materials necessary for the installation of pipes, and the subsequent removal on completion of the HDD work.

A payment of 80 % of the sum will be made on the HDD establishment on site and the balance of 20 % on the HDD removal from site.

1.2.2 HDD installation setup

HDD installation setup **Unit: No**

A setup may be for drilling for a single pipeline, a bundle of pipes or a group of pipes that are parallel and not more than 1.5 m apart.

The rates for the above shall cover the cost of setting up for each HDD installation, for providing and establishing on site the personnel, plant, equipment and materials necessary for the HDD procedures to install the pipeline including obtaining wayleaves, protecting services, the verification of existing services, a ground penetrating survey if specified, preparing the drill plan, implementing safety control requirements, giving notice, site

inspection and photographic records, providing any watching and lighting and maintaining all temporary works until the installation is complete and the subsequent removal of temporary works, plant and equipment and making good.

Payment will be made on completion and approval of the installation.

1.2.3 Excavation of drilling pits

Excavation of drilling pits..... **Unit: No**

Drilling pits are normally located at the ends of the pipeline that is to be installed.

The rates for the above shall cover the cost of excavation, shoring, backfilling, and compaction in accordance with SANS 1200 DB Clause 8.3.2.

The construction of drilling pits should be measured and paid per number where the pits are simple and similar in accordance with a typical detail or where the pits are individually drawn and detailed. Where it is not possible to design the pit details, standard SANS 1200 pay items for excavation, backfilling, and compaction as well as hand excavation, shoring, dewatering and reinstatement should be quantified and scheduled for measurement and payment.

1.2.4 Hand excavation of pits

Hand excavation of pits..... **Unit: m³**

Excavation of pits by hand to locate existing services or provide waypoint pits to check on drilling progress.

The rates for the above shall cover the cost of excavation, shoring, backfilling and compaction in accordance with SANS 1200 DB Clause 8.3.2.

1.2.5 HDD installation of pipes

HDD installation of pipes **Unit: m**

The quantity measured and paid shall be the length in linear meters of the size, class, material and number of pipes installed.

Measurement shall be along the centreline of the pipe or pipe bundle installed as shown on the drawings. The start and end of the final pipeline to be measured as installed by HDD shall be clearly shown.

Payment for installed pipe shall be full compensation for the preparatory work, drilling of the pilot bore, pre-reaming, reaming and pullback of the pipe(s), including operation of the drilling fluid system and guidance system, and survey control, safety control, protection of existing services and structures, disposal of excavation spoil and drilling fluids and testing of the pipeline. The payment shall include for supply and assembly of the pipes into a continuous pipeline, whether by welding or mechanical joints as specified. Payment shall also include for the installation of any draw wires, end caps and markers specified.

1.2.6 HDD installation of pipes in rock

Extra over HDD installation of pipes in rock..... **Unit: m**

The quantity measured and paid shall be extra over Pay Item 1.2.5 per the length in linear meters of each size of pipe or pipe bundle installed requiring drill and reamer rock tooling.

1.2.7 CCTV inspection of installed pipes

CCTV inspection of installed pipe **Unit: m**

The quantity measured shall be the length of pipe installed.

Payment shall include all labour, plant, equipment, supervision necessary to inspect the installed pipes and provide a video recording and report.

PS PPR EMERGENCY REPAIR (INCLUDING APPURTENANT ITEMS) ON WATER NETWORK

PS PPR1 SCOPE

This portion refers to the repair work on existing water infrastructure components be it maintenance, repairs or replacement or working on such water services infrastructure within the ambit of the Contract. All rates or amounts tendered shall include for opening and closing the water network complete with all measures as per the specification in this document.

PS PPR2 REPAIR OF STEEL WATER MAIN BY BURST PIPE CLAMP

Repair of steel water main By Burst Pipe Clamp for DN pipe _____ **Unit: No.**

The scheduled rates must cover the excavation, cleaning of the pipe, fitting of the clamp(s), backfilling, reinstatement of the surface, return of scrap material, removing and disposal of surplus spoil, the clearing of site and any incidentals necessary for the completion for the work.

Payment will be made according to pipe diameter.

PS PPR3 CUT OUT SECTION OF STEEL PIPE & REPAIR

Cut out section of steel pipe and replace for DN pipe _____ **Unit: m**

The scheduled rates must include for the excavation, two pipe cuts, removing the section of pipe, replace the section with new pipe, weld the two joints 180 degrees on the top half, fit two couplings, backfilling, reinstating the surface, remove surplus soil, remove scrap material, the clearing of site and any incidentals, pipes and couplings necessary for the completion of the work.

Payment will be made on the measured distance between the two pipe cuts, related to the nominal diameter of the pipe.

PS PPR4 CUT OUT SECTION OF uPVC PIPE & REPAIR

Cut out section of uPVC pipe and replace with DN pipe class _____ **Unit: m**

The scheduled rates must include for the excavation, two pipe cuts, removing the section of pipe, replace the section with new pipe, couplings, backfilling, reinstating the surface, remove surplus soil, remove scrap material, the clearing of site and any incidentals, pipes, and couplings necessary for the completion of the work.

Payment will be made on the measured distance between the two pipe cuts, related to the nominal diameter of the pipe.

PS PPR5 CUT OUT SECTION OF FIBRE CEMENT PIPE & REPAIR

Cut out section of fibre cement pipe and replace with DN pipe class _____ **Unit: m**

The scheduled price for the replacement of a length of asbestos cement pipe shall include the excavation, removal of pipe, fitting of new pipe, fixing of couplings, backfilling, reinstatement of the surface, removal of scrap, removal and disposal of surplus spoil, clearing of site and any incidentals, pipes and couplings necessary for the completion of the work.

Payment will be on the measured length of pipe installed, related to the nominal pipe diameter of the pipe.

PS PPR6 CUT OUT SECTION OF HDPE PIPE & REPAIR

Cut out section of HDPE pipe and replace with DN pipe class _____ **Unit: m**
Complete with HDPE compressing fittings.

The scheduled price for the replacement of a length of HDPE pipe shall include the excavation, removal of pipe, fitting of new pipe, fixing of couplings, backfilling, reinstatement of the surface, removal of scrap, removal and disposal of surplus spoil, clearing of site and any incidentals, pipes and couplings necessary for the completion of the work.

Payment will be on the measured length of pipe installed, related to the nominal pipe diameter of the pipe.

PS PPR7 CUT OUT SECTION OF POLYPROPYLENE PIPE & REPAIR

Cut out section of polypropylene pipe and replace with _____ **Unit: m**
Complete with Cobra Connex brass fittings.

The scheduled price for the replacement of a length of polypropylene pipe shall include the excavation, removal of pipe, fitting of new pipe, fixing of couplings, backfilling, reinstatement of the surface, removal of scrap, removal, and disposal of surplus spoil, clearing of site and any incidentals, pipes and couplings necessary for the completion of the work.

Payment will be on the measured length of pipe installed, related to the nominal pipe diameter of the pipe.

PS PPR8 REPAIR / MAINTAIN FLANGED JOINT (LEAKING)

Repair or maintain flanged joint for DN pipe _____ **Unit: No.**

The rate shall cover all costs to repair a flanged joint: expose/uncover, clean as below, temporary measures, strip, quote, all transport, assemble after repairs (new seals, new fasteners if needed, new gaskets etc), install, test and commission, proof to the Engineer or his representative, etc, as specified herewith:

The flanges shall be bolted together using the following method:

- a) Flanged joints - a full face gasket or a ring gasket must be used. The joint faces must be cleaned with a wire brush, scraper or old hack saw blade. All traces of the old gasket must be removed as well as any gasket compound, if previously used.
- b) Examine the general condition of the joint facings. They should not show any evidence of deep scratches, severe corrosion or erosion, or warping, if any of these conditions are evident they must not be used.
- c) With the gasket in place on the one flange, bring up the mating flange. Every effort should be made to spring the mating flange parallel to the other with the edges in line. The use of bolts to spring faces parallel, must be avoided.
- d) The stud nuts should be snugged-up just enough to let the flange find its seat. When seated, with uniform clearance all around, the stud nuts are then snugged-up following the correct sequence. Insert the remaining bolts. They must then be heavily lubricated and the correct tightening sequences must be strictly adhered to.

- e) DO NOT snug-up the bolts on first go round. Using an impact wrench, set at approximately ½ the final torque for the first go round, including the hard-to-reach bolts.
- f) Paint all fasteners with two coats of approved bituminous corrosion resisting paint to manufacturers specification.
- g) Wrap flanged joints with Denso (Layflat) or similar approved (measured separately).

PS PPR 9 REPAIR LEAK AT HYDRANT

Repair leak at Hydrant regardless of type _____ **Unit : no**

Leaks from hydrants are generally derived from two sources, either from the stuffing box or from the outlet, and shall be repaired as follows:

- (a) Leak from the stuffing box, shall be repacked as discussed earlier in the specifications,
- (b) Where the leak emanates from the outlet, the bonnet must be removed, and the jumper and washer inspected for wear, distortion and deformity. If found to be defective, a new jumper with washer must be installed. If the jumper and seat is in order a new washer must be fitted and the stuffing box must be repacked.
- (d) The hydrant will only be replaced if the seat has been damaged which will allow water to leak past.

Payment will be made per hydrant repaired (each). The rate tendered shall include for all cost to repair hydrant regardless of type as above specified.

PS PPR10 EXCAVATION AND BACKFILL ONLY FOR CALL-OUT

Excavation and Backfill for call-out _____ **Unit: m³**

Distinction shall be made between excavation and backfill and shall be measured separately.

Excavation:

The rate shall cover all costs to excavate and expose infrastructure to be repaired be it hand excavation or machine excavation. Reference is made to clause PS10.4 regarding safety measures.

Backfilling:

The rate shall cover all costs to backfill and compact and reinstate surfaces to the approval of the Engineer. Reference is made to clause PS10.4 regarding safety measures.

To this end, reference is made to Particular Specification for Excavations (PE) and shall be deemed to include for this.

PS PPR11 LEAK REPAIR BY VIKING JOHNSON OR OTHER APPROVED COUPLING

Leak repair by Viking Johnson or other approved coupling _____ **Unit: No**

The rate shall cover all costs to repair a leak using a coupling complete with all appurtenances, fasteners, gaskets, seals etc. Paint all fasteners with two coats of approved bituminous corrosion resisting paint to manufacturers specification. Wrap flanged joints with Denso (Layflat) or similar approved (measured separately).

PS PPR12 STANDING TIME DURING REPAIR CALL-OUT

Standing time during repair call-out _____ **Unit: Hr**

All costs for standing time shall be deemed to be included in other rates tendered and no separate payment will be done for this.

PS PPR13 REMOVAL AND REPLACEMENT OF VALVES, HYDRANTS AND AIR VALVES

Removal and replacement of valves, hydrants and air valves for DN _____ **Unit: No**
(Distinction shall be made between removal and replacement)

The rate shall be per diameter of valve. The valve shall be exposed (excavate or uncover). The valve shall be removed.

The rate shall cover all costs to expose/uncover, remove valve, temporary measures, all transport, commission, proof to the Engineer or his representative, etc.

PS PPR14 REPAIR VALVE IN THE WORKSHOP REGARDLESS OF TYPE

Repair valve in the workshop regardless of type for DN _____ **Unit : No**

Materials and/or parts required for repair shall be quoted as the direct cost plus the percentage added for materials as quoted in section 1 of the bill of quantities.

The repair of valves which have been removed from service and are to be repaired in the Contractors workshop/camp site has been divide into separate activities and the Bidder must price for each activity separately:

- (i) Strip valve for inspection and there after reassemble loosely.
- (ii) Clean, replace defective parts, reassemble, hydraulic pressure test, and paint in accordance with the relevant sections in the specification.

Payment will be made per valve repaired, tested and passed by the Engineer, and for the spares used i.e., spindle, spindle nut, gate, packing, etc. No payment will be made for the cleaning and painting of the valve. Provision must be made in the Bidded price.

PS PPR15 MOVE EXISTING WATER METER INSIDE THE PROPERTY TO THE PAVEMENT

Move existing water meter inside the property to the pavement for DN range _ **Unit: No.**

The scheduled price must include for the breaking out and removal for the existing meter box situated on the property, the existing communication pipe to be cut 0.5 metres on either side of the meter (1.0 metre long) with a total cut-out length of 1 metre. Remove the existing pipe and install a new section of pipe with couplings. The site must be backfilled, reinstate the surface, removal of scrap material, removal and disposal of spoil, the clearing of site and any incidentals necessary for the completion of the work.

The installation of a new meter box with meter must be installed in the communication pipe 1 metre outside the stand boundary on the sidewalk. The rate must include for the excavation, cutting and removing of the existing pipe, installation of the meter box and

meter, connecting to the communication pipe, backfilling, reinstating of the surface, removal of scrap material, removing and disposal of surplus spoil, the clearing of site and any incidentals necessary for the completion of the work.

Payment will be made per meter size within range in the schedule of quantities.

PS PPR16 LEAK REPAIR AT DOMESTIC WATER METER

Leak repair at domestic water meter _____ **Unit: No**

The rate shall cover all costs to repair a water leak complete with all appurtenances save for tail pieces, water meters, stop valve, meter box which is available free of charge at the Employer's stores.

PS PPR17 MATERIAL AND STORAGE

PS PPR17.1 Storage

All materials issued to the Contractor shall be securely stored and the responsibility for the safe keeping of the material will rest solely with the Contractor. Storage areas, which shall be agreed to by the Engineer, shall be fenced with a 2.0m high chain link perimeter fencing and a lockable gate or other suitable storage, which must first be approved by the Engineer. All items shall be stored under cover in a approved store. The Engineers acceptance will in no way relieve the Contractor of his responsibility. Small items must be stored within a lockable shed i.e. sockets, meters, long screws etc.

PS PPR17.2 Stocktaking

Stock must be taken once a month by the Contractor and the returns, indicating the stock levels must be forwarded to the Engineer on or before the 10th working day of the next month. The Contractor must notify the Engineer of the time and date when the stocktaking will take place as his representative may elect to be present at the time of such stocktaking.

PS PPR17.3 Return of Materials

All items removed from the water network i.e., valves, hydrants, valve covers, hydrant covers, meter boxes, pavement slabs, blocks etc. shall be returned by the Contractor to the Water and Sanitation Department's Depot. The Contractor shall obtain the signature of the yard Superintendent acknowledging receipt. All the material must be itemised i.e., type, size, diameter, make number, meter number, meter reading, stand number etc. from which the meter has been removed.

PS EE ELECTRICAL AND ELECTRONIC WORKS

PS EE1 BILLING SOFTWARE AND LoRa COMMUNICATION DEVICES

This scope covers TNPA requirements for the Engineering, design, documentation of Automated Meter Readers (AMR) to be used in collecting water consumption and other data on the water reticulation network installed in Port of Durban (POD)

Solutions will only be accepted that does not store any billing information on cloud-based services.

AMR devices will collect and transmit the water metre data directly to Gateways and or will send data via repeaters to Gateway that will then route it further via the TNPA Engineering Local Area Network (LAN) to the billing servers in the port.

All devices must be covered by at least 2 –3 gateways that can read data from that device, the devices have a redundancy factor of 2 - 3.

Surveyed images as used in the final pipe alignment reticulation design will be used as a background / display for SCADA overview page to show Water meter data on the fire graphics page inside POD SCADA “Wonderware” and data will be displayed on the Dashboard software within Switch or equivalent software approved by the Engineer.

The existing PowerSmartWebBlack Software that is currently used for electricity and water billing will be used for electricity billing and to View Historical Water Data, the proposed Billing and dashboard software solution will be used for water billing once rolled out in this project.

Contractors project approach paper must clearly state the Software, communication devices and network topology they propose to utilize in executing this project, a detailed drawing / sketch showing all the AMR elements above must be submitted at time of tenderer this will be used to evaluate the AMR proposal.

PS EE2 BILLING SOFTWARE & COMMUNICATION

Proposals will be evaluated on the best probability of the Contractor meeting TNPA objectives as outlined in this document.

AMR systems that offer robust, secure ICASA approved open non-proprietary radio frequency protocols which optimize and enhance communication range and lengthen battery life of meters (built-in radio), meter interface units and repeaters/gateways shall be preferred.

The ability to communicate via ICASA approved open non-proprietary radio frequency with no connection surcharges and / or time-based surcharges.

Tenderers must provide a brief overview on their company with particular emphasis on service capabilities and their track record in South Africa. Preference will be given to tenderers, who can offer ex-stock deliveries of meters, as the project is conducted against a tight time schedule.

Full details and an undertaking from the tenderer to deliver within his stated delivery period must be provided.

Software must be instantaneous data reading storage into billing server software as used to collect data. Data will then be stored into billing servers’ application using a LAN Ethernet connection and a GSM backup connection to the billing server.

No annual software licence fee, the software must be purchased upfront, only when Supply utility's (Eskom or Umgeni Water) make changes to National Grid code or Water supply new levies / changes will an upgrade fee be required, as the software configuration must be changed to accommodate changes.

Proprietary cloud or 3rd party data bases used for storing data and manipulation of DATA will not be considered.

Personal information must be loaded and configured on the billing software and must not be published to the cloud, however raw billing data can be routed via Cloud and or GSM software.

Billing software must store the monthly bills generated in an PDF format and sequential order based on date.

Billing software must also be capable of retrieving data and storing in correct client profile allowing for analytical analyses of the client's water consumption.

Billing software must be South African based and or fully supported in SA and have office or support functionality in at least the major centres in SA i.e., Durban, Cape Town, Johannesburg, Pretoria, Bloemfontein, or Port Elizabeth.

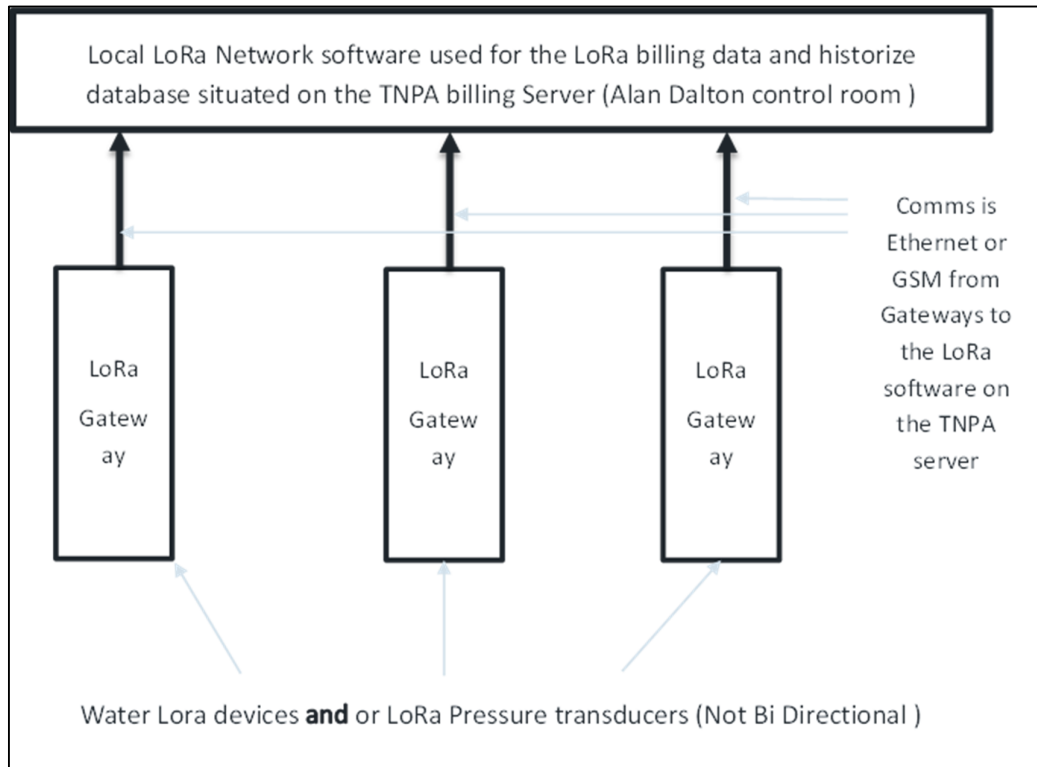
TNPA to continue using PowerSmartWebBlack Billing software for electrical metering until electrical metering is include or changed into the proposed billing software that will be selected at tender stage.

Billing software company must have at least personnel that will perform the following Staff sales (or customer service), technical support and a development team. companies that do not have all this functionality will not be considered.

Billing software must have the following features:

- Various access levels allowing different users different rights for working on software i.e., administrator, standard user, Data capture, external clients.
- Alarm conditions must also be historized for analyses by TNPA management on operational downtime.
- Billing software must also have an active dashboard functionality that will allow users to view different pages that will be created for viewing of instantaneous and historical data information I.E.
 - Actual scan time of data,
 - Billing accumulator's k/L line pressure
 - Engineering registers and preconfigured alarms and or action items
 - Meter status
 - Meter clock
 - Meter alarms

Picture below indicates typical equipment configuration on data flow into the Gateway and the gateway can then transmit data into the ethernet connecting to the Billing server, this configuration is required per zone.



All pulse outputs are required to be inductive and or reed switch type counters.

PS EE3 **AMR MODULE METER INTERFACE**

The unit must conform to the following minimum requirements:

- Accept inductive digital input pulse from water meter.
- Be configurable via a proprietary secure RF protocol or optical eye.
- Operate on the ISM license free radio band.
- Transmission of consumption values
- Data Logging logger facility
- Active alarm status (cable cut or removal where applicable, leakage, broken pipe, reverse flow, low battery)

PS EE4 **AMR GATEWAY DATA COLLECTORS**

The gateway data collectors shall be an ac and/or solar powered unit, which communicates in the unlicensed but managed 868mhz range with all the AMR modules in its assigned area and must be capable to transfer data from at least 250 meters per zone.

The gateway data collectors shall collect data from the devices and send the data to the billing server. The transmission interval should be adjustable between 30 minutes and 24 hours.

The gateway data collectors shall use an open-source secure encrypted Radio Frequency (RF) protocol from the meters and repeaters to obtain readings from the water meter.

The gateway data collector shall allow remote firmware and software upgrades once authorized or instructed by TNPA Engineering staff.

Gateway shall be of a compact and robust design to receive meter data in periodic intervals and transfer this data via ethernet into the Billing software or other TNPA approved platform.

Data storage will only be done on the existing TNPA billing servers, alternate offers that transmits data into a cloud-based environment and then transfer the data back into the TNPA billing servers will not be considered for this project.

PS EE5 THE AMR SYSTEM AND GATEWAYS

The system and gateways shall conform to the following requirements:

- Support GSM/GPRS quad band but be fully functional on ethernet VLAN
- IP 65 housing mounted externally.
- Powered by external power supply 65-285 VAC
- UV resistant on all externally mounted equipment.
- Configurable via fixed IP addresses for each Zone on the internal LAN ethernet for TNPA POD application.

PS EE6 AMR GATEWAY AND NETWORK

The contract calls for a RF network that can be used to collect data from edge devices such as water meters but that can be extended in the future for data collection from other sources such as but not limited to pressure transducers, electricity meters and other sensors.

The gateway(s) and network proposed should conform to regulatory requirements. As a minimum the system must conform to the following requirements:

- Open source and secure RF protocol
- Operate on the ICASA Free license radio band that is regulated by duty cycle limitations.
- Each gateway must be able to support at least 250 devices.
- Housed in an IP68 enclosure suitable for outdoor installation i.e., pole/wall mounting.
- The housing should include mounting brackets to ensure easy installation and mounting of the gateway.
- AMR system must be configurable via ethernet The User Interface shall permit the sending of alert outages, tampering, out-of-bounds system operating parameters to appropriate utility personnel via e-mail.
- The AMR system should allow for the monitoring of gateway health & statistics.
- Communication and data retrieval from meters must have at least two different retrieval methods should one coms method fail water consumption for customers can still be retrieved. AMR device battery life must be very good and or have external power input into Units and repeaters.
- Must have over 100,000+ meters deployed in SA in the Water, Gas & Electricity Metering utility.
- Must have an In-house software development team (offer custom features & reporting), Hardware Engineers Marketing team.

- Software product must be fully interrogatable using various comms modules GSM, Sigfox, LoRaWAN, WIFI & wireless M-bus comms.
- Software team must be SA based and have a proven track record of more than 10 years combined experience in the field of billing / dashboard software.
- AMR system should allow for adding additional gateways and configuring them via ethernet / web.
- Compatible with open-source data collection software

PS EE7

SERVERS, SOFTWARE AND USER INTERFACE

The 2 x TNPA billing servers are configured to do all the data collection at one central collection point for all data within the existing Utility billing systems (Electricity and Water) system.

The server collects data from all the existing gateway collectors and electrical water meters, it stores the gathered data in a secure database.

All raw metering and edge device data should be always available on the server.

The stored data is analysed on the server, the data is then available for display via an easy-to-use billing software must be enhanced so that TNPA will be able to create user defined dashboards for management and client displays this function will be WEB Based.

The approved billing software shall be used to generate reports; view demand graphs, determine usage patterns and enforce watering restrictions and send SMS and Email alarm /Notifications to Port Users

Using information from alarms and alerts transmitted from the AMR and uploaded into the Software, the Software shall have the ability to generate specific e-mail alerts for each Alarm and send the email, this must be configured by the User Interface the following is typical alarms to be transmitted:

- Low pressure alerts from pressure transducers
- Slow leak alerts on water meters
- Fast-leak or burst alerts on water meters.
- Night flow analysis (this is only used in buildings or where operations is not functional at night k/l consumption is supposed to be Zero or minimal)
- Leak detection or high flow alarm (the line pressure and water flow is verified against preset values as calculated to be max values per intake point, if the values are exceeded then the billing software must send a SMS and Email to individuals that will have to act on the alarm.

Billing software / AMR systems that uses open architecture communication design and be compatible for use with existing 29 X 150 mm dia. Meistream Water meters.

Software must be modified to allow Zero readings to be captured for water billing as various months when capturing estimated data from Metro bills the readings are Zero, but the surcharges are still applied for the account.

Create a report that will show consumption for a customer, and it must include the actual Rands amount charged for the same period.

eThekwini manual monthly bills create a spreadsheet that TNPA can just populate the current months consumption data for electricity and water, once this file is saved then

it must upload the consumption data into correct accounts, the system must also warn operators if the current months reading is less than the previous months reading. Billing software must also allow addition of manual data by TNPA staff into billing database to be configured to do billing and reporting on Web page or inside billing statements generated.


Create a statement report shown below with all changes listed in blue ink on the bill and remove the strikeout red data.

PowerSmartWebBlack

Bill To: 800A-African Marine Solutions Group

Address: Property Accounts TNPA Meters
Customer No. 4822
Debit_DLSIM3216_81723
Contract No. 70010568

Account No:



TRANSNET
national ports
authority

Tariff Level:	Meter	Supply from	Meter Size 25-40 mm
Bill Start Date:	01 April 2019	Meter number	C-DJA0577
Bill End Date:	30 April 2019	AMR Serial number	TBA

African Marine Solutions Group

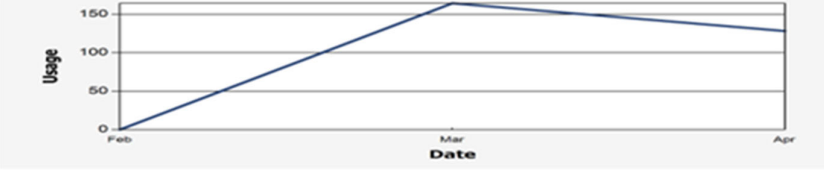
Meter Number C-DJA0577

Current Reading:	9651.000	Last Reading:	9523.000
Reading Date:	05 April 2019	Reading Date:	05 March 2019

~~Meter Number: C-DJA0577~~

Charge Label	Charge Description	Charge Detail	Charge Value
Customer Consumption	R29.12 / kl	128.00 kl	R 3 727.36
Sewerage @ 90% Usage	R8.21 /kl	128.00 kl	R 945.79
Connection Charge <i>Per / Day</i>	R 22.62 kl	29	R 655.98
Sewerage cost <i>Per / Day</i>	R 19.46 kl	29	R 564.34
Meter Total:			R 5 893.47

3 Month Ave K/L consumption displayed on Graph:



Last 12 months actual K/L consumption per month:

January	XXXXX.XX K/L	February	XXXXX.XX K/L	March	XXXXX.XX K/L
April	XXXXX.XX K/L	May	XXXXX.XX K/L	June	XXXXX.XX K/L
July	XXXXX.XX K/L	August	XXXXX.XX K/L	September	XXXXX.XX K/L
October	XXXXX.XX K/L	November	XXXXX.XX K/L	December	XXXXX.XX K/L

Statement Generated: 04/09/2019 13:41

PS EE8

BILLING SOFTWARE AND LORA COMMUNICATION DEVICES (INSERTS ONTO WATER METERS)

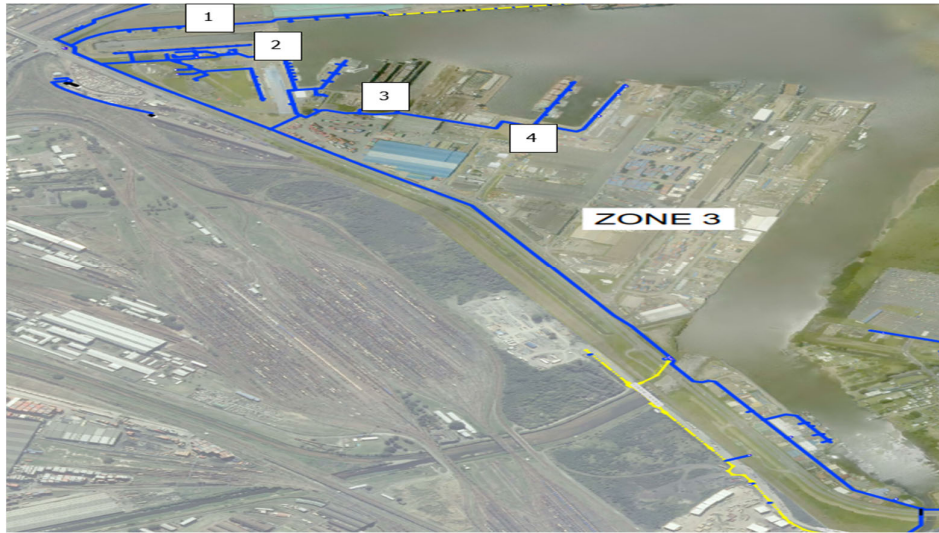
Port of Billing view pages "SCADA" of the 5 zones must be displayed one per dashboard indication Normal day to day information k/l used in the zone, line pressure the zone that will allow the client, operations, maintenance personnel to view data as per the sample rate of the metres and pressure transmitters. Typical Zone layouts shown below:



Zone 1 pipe work shown with possible positions of pressure transmitters.



Zone 2 pipe work shown with possible positions of pressure transmitters.



Zone 3 pipe work shown with possible positions of pressure transmitters.



Zone 4 pipe work shown with possible positions of pressure transmitters.



Zone 5 pipe work shown with possible positions of pressure transmitters.

PS EE9

GEOGRAPHICAL INFORMATION SYSTEMS (GIS) SOFTWARE.

Port of Durban has standardised on AUTODESK Map3D software, and the data collected must be shared in Shape files.

The shape files will consist of spatial data that is linked to GIS software and other geolocation or positioning services. Spatial data will consist of:

- Surveyed points
- Position where water pipes are installed.
- Depth of the water pipe installed.
- Diameter of pipelines installed Date installed
- Supplier manufacture QC docs reference number
- Any services that are crossed by the pipe lines.
- Water Meter position.
- Meter size.
- Serial number
- Test certificate.
- AMR Interphase Class / Type.
- AMR repeater or collector number.
- Billing software data unique billing number.
- All object other services un-covered will be recorded and include in Data pack issued to TNPA. shape files
- TNPA civil / electrical Engineer will supply the data capturing criteria per object or services found.

PS EE10

MEASUREMENT AND PAYMENT

There shall be no separate specified payment items for the works. The Bill of Quantities shall describe the necessary work required in this section.