

O. R. TAMBO DISTRICT MUNICIPALITY



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CONTRACT NO.: MIS 266 088 C

**NTSONYINI NGQONGWENI REGIONAL WATER SUPPLY SCHEME PHASE 2A:
CONSTRUCTION OF A 15ML/D WATER TREATMENT WORKS
(CIVIL ENGINEERING WORKS)**

CONTRACT 3

VOLUME 2: SCOPE OF WORK

JANUARY 2025

NAME OF TENDERER:

TENDER AMOUNT: ***** SEE VOLUME 1 *****

CSD SUPPLIER NUMBER:

CLOSING DATE & TIME: **14 MARCH 2025 AT 12H00**

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O. R. TAMBO DISTRICT MUNICIPALITY

BID NO: MIS 266 088 C

NTSONYINI NGQONGWENI REGIONAL WATER SUPPLY SCHEME PHASE 2A: CONSTRUCTION OF A 15ML/D WATER TREATMENT WORKS CONSTRUCTION OF A 15ML/DAY WATER TREATMENT WORKS (CIVIL WORKS)

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C3: Scope of Work

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Status

Should any requirement or provision in the parts of the Scope of Work conflict with any requirement of any Specification(s) forming part of this contract or any drawings, the order of precedence, unless otherwise specified, is:

- Drawings
- Project Specifications (including amendments to Standard and Particular Specifications)
- BoQ
- Particular Specifications
- Standard Specifications.

The above notwithstanding, any discrepancy shall be brought to the attention of the Engineer for clarification.

C3.1 Description of the Works

C3.1.1 Project Overview

The proposed Ntsonyini Water Treatment Works (WTW) forms part of Phase 2 of the Ntsonyini – Ngqongweni Regional Water Supply Scheme, which comprises of an abstraction works, a pumping station and rising main, off-channel storage dam and the gravity supply line to the WTW. The scheme is approved to abstract 5,493,590 m³ per annum or 15,050 m³/day from the uMzimvubu River.

The proposed Ntsonyini Water Treatment Works (WTW) is to be one contract that involves the construction of building platforms, roadworks, civil engineering services, sludge lagoon, building works, building electrical works, and fencing.

This contract excludes the process mechanical and process electrical scope of works. The process mechanical and electrical works will be delivered in a separate tender.

C3.1.2 Employer's Objectives

The employer's objective is to appoint a Contractor to construct the WTW serving the villages of in the Ntsonyini and Ngqonweni areas located in the OR Tambo District.

The Contractor shall make use of local resources as far as is possible. These resources include local labour, local suppliers, sub-contractors and plant hire.

The employer is desirous of awarding the contract as soon as possible. The award of contract will commence with the acceptance of the Notification of Award by the successful bidders. The signing of the selected formal contract will be finalized soonest after notification of award.

C3.1.3 Overview of the Works

Work to be carried out under this contract is shown on the drawings and described in the project specification. This work may be briefly described as comprising the following:

The works that will be included in Phase 2 of the project, namely provision of a 15M³/day WTW are as follow:

- Concrete work
- Building work
- Building Electrical work
- Interconnecting pipe work
- Bulk Earthworks
- Road works
- Stormwater drainage
- Water pump station
- Water rising main
- Water reticulation
- Fire water reticulation
- Sewer reticulation
- Dirty water reticulation
- Decanting system
- Chlorination system
- Sludge lagoons
- Fencing around the WTW

C3.1.4 Civil Works Project Description

The nature of the civil works for this project covers multiples civil, structural, earth and building works scope of services. The following construction elements are included in this project:

- Site clearance and preparation works
- Earthworks and platform creation
- Excavations and trenching
- Reinforced concrete construction including water retaining structural concrete.
- Cladded steel structures
- Brickwork construction
- Medium pressure pipeline construction for process pipework and other ancillary services
- Roadworks and stormwater
- Ducts and Culverts
- And administrative buildings.

The civil scope of works can be separated in the following separable buildings, structures and process units:

Process Specific:

- Flow control chamber
- Cascade aerator
- PAC contact channels
- Flow division structure
- Compact treatment unit (combined process unit):
 - Flocculator (4 Modules)
 - Clarifier (4 modules)
 - Rapid gravity sand filters (8 units / 4 pairs)
- Clear water reservoir with chlorine contact tank
- Sludge dams with overflows
- Supernatant recirculation pump station
- Process piping:
 - Inlet works piping (between the flow control chambers and the cascade aerator)
 - Flow division piping (between the flow division structure and the compact unit)
 - Clear water piping (from the filter block to the clear water reservoir)
 - Backwash, de-sludge and scour pipework (from all units to sludge dams)
 - Supernatant return piping (from supernatant pump station to PAC contact channel)
 - Service water piping (to and from domestic water tank)
- Service water tank

Ancillary buildings and structures:

- Chemical dosing building
- Chlorine gas dosing building
- Electrical Building and Blower room
- Emergency equipment building
- Administration building
- Staff accommodation with carports
- Electrical inverted portal culvert duct
- Services piping
 - Potable water / Fire fighting
 - Sewage
- Guard house
- Fencing

C3.1.5 Building Electrical Project Description

This section tries to describe the building electrical works required on the site in a moderate level of detail. For final quantities and requirements please refer to the drawings and the specifications sections.

The site contains process electrical equipment and building electrical equipment. For the sake of clear project boundaries and keeping work package battery limits complete all the building electrical construction was included with the civil construction scope of works. In general building electrical services are:

- Interior lighting
- Interior specialized lighting (Such as water quality inspection cavity)
- Exterior lighting
- Plug points
- Distribution Boards
- Conduits and cable management
- Cabling

The site consists of a collection of buildings typically found on a water treatment plant. An overview of these buildings are as follows:

- Guard House
- Administration Building
- Buildings associated with the process
 - Filter Gallery
 - Under roof walkways
 - Chemical Dosing Building
 - Pumps Stations
- Housing Units
- Undercover parking or other undercover shelters

Specific Exclusions are as follows:

- High Mast Lights
- Site reticulation
- Process related electrical services

C3.1.6 Architectural Building Project Description

ARCHITECTURAL

1. Accommodation Unit

Comprising two 53sqm mirror-imaged living units. Each comprising a 23sqm open plan living/kitchen area, one 5sqm bathroom and two 9sqm bedrooms. Each with its own drying yard and outdoor undercover patio area.

Building construction comprised as follows:

- Steel roof sheeting on timber trusses with a suspended ceiling.
- Load bearing brickwork with external Face brick. Internal plastered bricks painted.
- Solid timber front door with aluminium windows & patio doors. Hollow-core internal doors.

2. Parking Area with Carports

Located adjacent to the Accommodation Units. Comprising 256sqm paved area accommodating eight 3 x 6M undercover parking bays. Carport structure comprised as follows - Steel roof sheeting on an engineer designed steel hollows section structure and columns.

3. Ancillary/Administration Building

A 188sqm building comprising a 19sqm reception area, 27sqm boardroom, 35sqm open plan office area, 11sqm kitchen with a 49sqm cafeteria. An external toilet. Internal disabled toilet as well as two bathrooms. Along with an external walled staff area.

Building construction comprised as follows:

- Steel roof sheeting on timber trusses with a suspended ceiling.
- Load bearing brickwork with external Face brick. Internal plastered bricks painted.
- All external doors and windows are aluminium. Hollow-core internal doors.

4. Guardhouse

A 35sqm building comprising a 8sqm reception area with an attached 20sqm transformer room.

Building construction comprised as follows:

- Steel roof sheeting on a steel frame structure with a suspended ceiling in the reception area.
- Load bearing brickwork with external Face brick. Internal plastered bricks painted.
- Aluminium external door and windows to the reception area.
- Double steel door with louvre vents to the transformer room.

Description to be added

C3.1.7 Location of the Works

The proposed Ntsonyini Water Treatment Works (WTW) will be located approximately 90 km east of Mthatha, and 44km North-West of Port St Johns in the Eastern Cape. The proposed treatment works will be located on the banks of the uMzimvubu River, which has a catchment area of 19,852 km². The site is accessible from the R61 Provincial Road, with 32 kilometres being gravel road.

The proposed Water Treatment Works is located at the following co-ordinates:

Latitude - 31°26'43.62"S

Longitude - 29°17'21.44"E

C3.1.8 Description of Site and Access

The site is accessible from the R61 Provincial Road, with 32 kilometres being gravel road accessible to trucks and 2-wheel drive bakkies in dry weather, but 4x4 vehicles in wet weather.

The general climatic conditions for Mthatha are as follows:

Altitude above sea level	: ~832 to 1077 MASL
Maximum temperature	: 40 °C
Minimum temperature	: -2 °C
Annual Average Temperature	: 17,5°C
Annual Average Rainfall	: 693mm
Rainfall season	: Summer

C3.1.9 Geotechnical Conditions

All Geotechnical information is included in Annexure C4.1.

The Tenderer is at liberty to excavate extra trial holes on site provided that he has made prior arrangement with the Employer's Agent and the community, and provided that he accepts responsibility for any damage that may result there from.

C3.1.10 Health and Safety

OR Tambo District Municipality is a state-owned business enterprise and operates within the South African legislative parameters of the Occupational Health and Safety Act 85 of 1993. With the promulgation of the revised Construction Regulations, Regulation Gazette 10113, Government Notice 84, dated 7 February 2014, OR Tambo District Municipality seeks to fulfil its duties as espoused in clause 5.

Each year fatalities, serious injuries and poor attitudes of Contractors mar the reputation of the Construction Industry therefore OR Tambo District Municipality has a responsibility to limit its risk by ensuring a zero tolerance and better practice approach to Contractors and those affiliated to this project. Thus a high premium is placed on the health and safety (H&S) of OR Tambo District Municipality stakeholders, which include its employees, professional service providers, public and its physical assets.

The responsibilities that OR Tambo District Municipality and relevant stakeholders have toward its employees are captured in, but not limited to this document. The responsibilities stem from both moral, civil and a variety of legal obligations. The Principal Contractor is to take due cognisance of the above statement.

OR Tambo District Municipality, as the Client has appointed a H&S Agent which has developed this project specific Health & Safety Specification (PSHSS) for the project in order to provide the Principal Contractor making a bid or appointed to perform construction work for the project with all the relevant requirement pertaining to H&S.

C3.2 Engineering

C3.2.1 Design Services and Activity Matrix

Responsibilities for design and related documentation are as follow:

Concept, feasibility and overall process	Employer
Basic engineering and detail layouts to tender stage	Employer's Agent
Final design to construction stage	Employer's Agent
Temporary works	Contractor
Preparation of record drawings	Contractor

The extent of the Employer's Agent's design is shown on the layout plans.

C3.2.2 Contractor's Designs

The Contractor will be responsible for design of all temporary works and all construction methods, all shoring and lateral support that may be required. The Contractor will also be responsible for the preparation of method statements before commencing with construction.

C3.2.3 Blasting

No blasting will be permitted within 500m of any dwelling.

C3.2.4 Drawings

Drawings for the project are listed in C5 of Volume 3. The drawings issued to Tenderers as part of the Tender Document must be regarded as provisional and preliminary for the Tenderer's benefit to generally assess the scope of the work. The drawings are issued separately in a book of drawings.

The work shall be carried out in accordance with the latest available revision of the drawings to be issued by the Engineer for construction. At commencement of contract, the Engineer shall deliver to the Contractor two sets copies of the construction drawings and any instructions required for the commencement of the works.

From time to time thereafter during the progress of the works, the Engineer may issue further drawings or revisions for construction purposes as may be necessary for adequate construction and completion of the works and defects correction.

The Contractor will be required to mark up one complete set of prints of the construction drawings with as-built information and submit these to the Employer's Agent at the end of construction, prior to issue of the Certificate of Practical Completion.

C3.3 Procurement

C3.3.1 Subcontracting

C3.3.2.1 Scope of Mandatory Subcontract Works

In terms of the latest Preferential Procurement Regulations (2017), prequalification must be used in identified tenders to advance designated groups on the basis of B-BBEE Status Level of contributor, EME or QSE or on the basis of subcontracting with EMEs or QSEs which are 51% owned by either of the following: Blacks; Black Youth; Black Women; Black people with disabilities; Black people living in rural or underdeveloped areas or townships; cooperatives owned by Black people; Black people who are Military Veterans.

It is therefore a contractual requirement in this case that at least **30%** of the value of work to be sub-contracted to EME/s and / or QSE/s which are 51% owned by black people living in rural or underdeveloped areas or townships with ***as many as can practically be engaged from the immediate area (Ward)*** and, only if there aren't sufficient qualifying contractors, can subcontractors be sourced from outside the Ward (but within the O. R. TAMBO District Municipality). The local Community Leadership will propose prospective subcontractors to the preferred bidder and contractual arrangements finalised by negotiation before final award (***no negotiations with Tenderers at tender stage***). Approved local sub-contractors shall be invited to price a BoQ for a specific sections of work. The Employer and ISD Consultant will assist in the evaluation process.

C3.3.2.2 Proportion of work undertaken by non-target SME / QSE Subcontractors

The Contractor shall submit to the Employer's Agent documentary evidence (either an original valid B-BBEE status level verification certificate or an affidavit for Exempted Micro Enterprise or certificate issued by a registered auditor, accounting officer (as contemplated in section 60(4) of the Close Corporation Act, 69 of 1984) or an accredited verification agency in terms of the Construction Codes of Good Practice for Broad-Based Black Economic Empowerment, in terms of the Preferential Procurement Regulations, 2017) of the B-BBEE status level of every sub-contractor employed by the Contractor. Until such time as documentary evidence as described above has been submitted to the Employer's Agent, a sub-contractor shall be deemed to be a non-compliant contributor.

The Contractor shall furthermore, on the written request of the Employer's Agent, provide documentary evidence showing the value of work sub-contracted to any or all of the sub-contractors employed by the Contractor.

C3.3.2.3 Subcontractor Requirements

All subcontractors appointed under C3.3.2.1 and C3.3.2.2 above shall be:

- Registered with the CIDB.
- Allocated work within the category and value limits designated by their CIDB grading.
- Be in good standing with the Department of Labour.
- Registered on the Central Supplier Database.

Proof of the above is to be provided to the Employers Agent before appointment of the subcontractor.

C3.4 Construction

C3.4.1 Works Specifications

C3.4.1.1 Applicable National and International Standards

C3.4.1.1.1 Applicable SANS 1200 Standardised Specifications

The following SANS 1200 Standardised Specifications for Civil Engineering Construction are applicable:

- SANS 1200 A - 1986 General
- SANS 1200 AB - 1986 Engineer's Office
- SANS 1200 C - 1980 Site Clearance (As Amended 1982)
- SANS 1200 D - 1988 Earthworks (As Amended 1990)
- SANS 1200 DB - 1989 Earthworks (Pipe Trenches)
- SANS 1200 DK - 1996 Gabions And Pitching
- SANS 1200 DM - 1981 Earthworks (Roads, Subgrade)
- SANS 1200 G - 1982 Concrete (Structural)
- SANS 1200 H - 1990 Structural Steelwork
- SANS 1200 HB - 1985 Cladding and Sheeting
- SANS 1200 HC - 1988 Corrosion Protection of Structural Steelwork
- SANS 1200 L - 1983 Medium-Pressure Pipelines
- SANS 1200 LB - 1983 Bedding (Pipes)
- SANS 1200 LC - 1981 Cable Ducts
- SANS 1200 LD - 1982 Sewers
- SANS 1200 LE - 1982 Stormwater Drainage
- SANS 1200 M - 1996 Roads (General)
- SANS 1200 ME - 1981 Subbase
- SANS 1200 ME - 1981 Base
- SANS 1200 MJ - 1984 Segmented Paving
- SANS 1200 MK - 1983 Kerbing and Channelling

C3.4.1.1.2 Other Applicable SANS Specifications

- SANS 462 Welded Wire Fabric Gabions and Gabion Mattresses (metallic-coated or polyvinyl chloride (PVC) coated).
- SANS 974-1 Rubber Joint Rings (non-cellular) Part 1 : Joint Rings for Use in Water, Sewer and Drainage Systems.
- SANS 1083 Aggregates from Natural Sources – Aggregates for Concrete.

C3.4.1.2 Particular Specifications

Refer to the *Variations and Additions to the Standard SANS 1200 Specifications: General, Civil and Structural Works* in Annex C3.6.

PA	SUB-LETTING OF THE WORKS
PB	BUILDING WORK SPECIFICATION
PC	FENCING SPECIFICATION
PD	NO FINES CONCRETE SPECIFICATION
G	SUPPLEMENTARY SPECIFICATIONS

C3.4.2 Plant and Materials

C3.4.2.1 Materials, Samples and Shop Drawings

The Contractor is required to provide proof of compliance with the materials specification, as well as to provide samples of materials and finishes.

Unless otherwise instructed in writing by the Employer's Agent, all proprietary materials are to be used, mixed, applied, fixed etc strictly in accordance with the manufacturer's recommendations.

Materials are to be ordered timeously to meet the construction programme. Extension of time for non-availability of materials will only be considered subject to the Contractor satisfying the Employer's Agent of timeous ordering thereof.

C3.4.3 Construction Equipment

C3.4.3.1 Requirements for Equipment

All equipment must comply with the requirements as stipulated in the Environmental regulations and specifications and contained in the OHS Act.

All construction plant and equipment used on this contract shall be in good working order, well maintained, of adequate size and fit for purpose. No plant or equipment that leaks oil, fuel or hydraulic fluids may be used on site.

Any plant or equipment that, in the opinion of the Employer's Agent, is not of adequate size or fit for use shall be removed from the site and replaced with acceptable plant and equipment, all at the Contractor's cost.

C3.4.3.2 Equipment Provided by the Employer

No equipment shall be provided to the Contractor by the Employer.

C3.4.4 Existing Services

C3.4.4.1 Known Services

The positions of all known existing services will be pointed out to the Contractor on site.

The Contractor shall take all necessary steps to ascertain the location of existing services before commencing any section of the works. Prior to the commencement of work in any area the Contractor shall carefully excavate to locate and mark the positions of all existing underground services affected by the works. He shall take all necessary precautions to protect any existing works whatsoever against damage which may arise and shall bear the full cost of the repairs to any damage caused as a result of his operations on site. Any damage to a service shall immediately be reported to the responsible authority and to the Engineer. The Contractor must liaise with all relevant authorities to satisfy himself that all existing services have been located.

C3.4.4.2 Treatment of Existing Services

The Contractor shall ensure that none of the existing services are damaged during the implementation of this Contract.

C3.4.4.3 Use of Detection Equipment for the Location of Underground Services

The Contractor may use detection equipment to locate underground services prior to exposing such by hand.

C3.4.4.4 Damage To Services

The Contractor shall exercise care in the vicinity of existing services and shall take all necessary measures to protect such services. Repairs to existing services damaged by the Contractor shall be for his own account.

C3.4.4.5 Reinstatement of Services and Structures Damaged During Construction

In the event of a service being damaged, the Contractor shall immediately notify the authority concerned, as well as the Employer's Agent. Where the authority concerned elects the repair, the Contractor shall co-operate with and allow such authority reasonable access and sufficient space and time to effect the repair.

C3.4.5 Site Establishment

C3.4.5.1 Services and Facilities Provided by the Employer

The O. R. TAMBO District Municipality is the Water Supply Authority.

No services or facilities will be provided by the Employer. The Contractor is to provide his own services and facilities, and to make allowance for the cost thereof in Section 1 of the Schedule of Quantities.

The Contractor will need to make his own arrangements with the local community for any space for a Site Camp.

C3.4.5.2 Facilities Provided by the Contractor

The Contractor is to provide the facilities indicated in the Schedule of Quantities.

The Contractor shall provide, for the exclusive use of the Engineer and his staff, one office and a toilet (refer to section PSAB). Survey equipment according to clause PSAB6 shall be supplied and maintained for the Engineer's use.

The Contractor shall provide, for the exclusive use of the Labour Desk Committee, one office and a toilet (refer to section PSAB).

The construction camp location is to be determined in consultation with the Employer, the Employer's Agent and the local community.

The construction camp is to be removed upon completion of the work, and the site returned to the condition in which it was found, to the satisfaction of the Environmental Control Officer.

C3.4.5.3 Storage And Laboratory Facilities

The Contractor is to provide the facilities indicated in the Schedule of Quantities.

Storage areas are to be contained within the Contractor's designated, fenced off construction camp(s).

C3.4.5.4 Other Facilities and Services

The Contractor is responsible for the provision of all necessary temporary facilities which are not provided by the Employer, including power, water, telecommunications, security services, medical, fire protection, sanitation and toilets and solid waste disposal.

The Contractor shall make his own provisions for the collection, storage and disposal of all construction waste (i.e. whether it be in the camp or on the construction site); all in conformance with the Environmental Management Plan and with approval of the Employer's Agent, the Local Authority and the Environmental Officer. Payment for the clearing, loading, transport, dumping fees and any other requirement or costs incurred shall be included in the scheduled rates.

The Contractor shall provide suitable and adequate portable chemical latrines for his employees and his sub-contractors. Latrines shall be maintained by the Contractor in a clean and sanitary condition to the Employer's Agent's satisfaction. The use of latrines shall be enforced and fouling of the site will not be tolerated.

The Contractor shall be permitted to house Key Personnel only within the construction camp site(s). At the commencement of the Contract, the Contractor shall inform the Employer's Agent of his intentions regarding the housing of Key Personnel on site, and he shall thereafter ensure that such accommodation is kept neat, hygienic, and properly controlled at all times. At any stage of the Contract, should the Employer's Agent be of the opinion that the housing of Key Personnel within the construction camp(s) is causing disturbance, or inconvenience to the landowner or nearby residents, the authority granted in this clause for the housing of Key Personnel within the construction camp(s) may be withdrawn, either partially or entirely.

The Contractor is to comply with all requirements contained in law or local bylaws, as well as any other requirements set by the local authority.

C3.4.5.5 Vehicles and Equipment

The Contractor is to provide the facilities indicated in the Schedule of Quantities.

C3.4.5.6 Notice Boards

The Contractor is to provide notice boards as indicated in the Schedule of Quantities, the layout of which is to match the template issued in the Tender Document.

The boards are to be erected at locations approved by the Employer's Agent. The Employer's Agent reserves the right (at no cost to the Employer) to have any sign, notice or advertisement moved to another location, or to have such removed from the site entirely, should such signs, notices or advertisements prove in any way unsatisfactory, or an inconvenience or danger to the general public.

These boards are to be maintained for the duration of the Contract. Any damage to the boards shall be repaired within fourteen (14) days of a written instruction issued by the Employer's Agent.

The notice boards and supporting structures are to be removed fourteen (14) days prior to the issue of the Final Approval Certificate.

C3.4.6 Site Usage

Access to site shall be limited to the Contractor and his personnel. The Contractor shall be responsible for the control of unauthorized entry to the site and shall inform the Employer's Agent of any breach of such rules. The site shall be managed and used for its intended purpose. The Contractor is required to keep a visitors log and ensure full compliance with site safety standards.

C3.4.7 Permits and Way Leaves

While the Engineer is responsible for obtaining all the necessary wayleaves, permissions and permits applicable to working near any existing services or other infrastructure on Site, the Contractor is responsible for abiding by the safety and other conditions imposed by such wayleaves, permissions and permits.

The Contractor shall ensure that all wayleaves, permissions and permits (furnished by the Engineer) are kept on site and are available for inspection by the relevant services authorities on demand.

C3.4.8 Alterations, Additions, Extensions and Modifications to Existing Works

The Contractor is to satisfy himself as to the dimensional accuracy, alignment, levels and setting out of existing structures or components thereof to ensure compatibility with the proposed works. Any concerns are to be raised timeously with the Employer's Agent.

C3.4.9 Inspection of Adjoining Properties

Where local residents' properties are likely to be affected by any construction activities, inspections of such potentially affected properties (such as boundary fences) are to be conducted with the owners of such properties, along with representatives of the local authority. This is to be completed before commencing with any construction activities in the vicinity.

The Contractor shall record the condition as well as photograph all adjoining structures before commencing with construction activities in the vicinity.

C3.4.10 Water for Construction Purposes

The Contractor is responsible for procuring, transporting, storing, distributing and applying the water needed for construction purposes. Consultation with the local community or the local authority may be required, depending on the proposed source of such water. See Amendments to SANS1200 Specifications regarding water for pressure-testing.

C3.4.11 Survey Control and Setting Out of the Works

Control points in the form of benchmarks and pegs have been established at critical points.

C3.4.12 Dealing with Water

The Contractor shall manage and dispose of water, whatever its origin, on the site so that the works are kept sufficiently dry for their proper execution and to ensure that no local person can drown in any excavation undertaken under this Contract.

The Contractor shall ensure that:

- Where it is not practically possible to make deep excavations free-draining, diversion berms are constructed to divert stormwater runoff from entering the excavations and all standing water will be removed as soon as possible after each rain event.
- Keep all completed works properly drained.
- Not inhibit surface drainage
- Protect all parts of the Works against damage and erosion caused by rain and surface water.

C3.4.13 Workmanship and Quality Control

The onus to produce work that conforms in quality and accuracy of detail to the requirements of the Specifications and Drawings rests with the Contractor, and the Contractor shall, at his own expense, institute a quality control system and provide suitably qualified and experienced Employer's Agents, foremen, surveyors, materials technicians, other technicians and technical staff, together with all transport, instruments and equipment to ensure adequate supervision and positive control of the Works at all times.

The cost of supervision and process control, including testing and mix designs carried out by the Contractor, will be deemed to be included in the rates tendered for the related items of work.

The Contractor's attention is drawn to the provisions of the various Standardized Specifications regarding the minimum frequency of testing required. The Contractor shall, at his own discretion, increase this frequency where necessary to ensure adequate control.

On completion and submission of every part of the work to the Employer's Agent for examination and measurement, the Contractor shall furnish the Employer's Agent with the results of the relevant tests, mix designs, measurements and levels to demonstrate the achievement of compliance with the Specifications.

C3.4.14 Features Requiring Special Attention

C3.4.14.1 Local Sub Contractors (Contract Participation Goal)

Although this Contract requires a 1km length of the pipeline to be 'ring-fenced' for local CPG subcontractors, the Contractor and subcontractors may mutually agree to 'swop' sections of the particular trenching, laying, backfilling, testing process.

C3.4.14.2 'Free-Issue' Supply of Ductile Iron pipes

The Ductile Iron pipes were procured by the previous Contractor, and they are stored in an open field at the Langeni forest. The Contractor shall be responsible for collecting pipes and transporting them to where they are required. The individual lengths of pipes shall be inspected for damage or defects together with the Employer's Agent and signed-off once loaded. From this point on, the care and protection of the pipes shall be the Contractors'

responsibility and the Contractor's insurance shall cover the cost of replacing any pipes that are subsequently damaged or stolen. The Contractor will also be responsible for securing the pipes at the pipe yard for the duration of the construction.

C3.4.14.3 Cleanliness of pipes just before laying

The 'Free Issue' pipes, when collected, will have dust and/or dried mud inside. It is a specific requirement that the pipes, sealing rubbers and sealing grove are cleaned internally immediately before laying to the Employer's Agent's approval and sign-off and, once laid, protected from further dirt and stormwater ingress. Failure to comply will result in the affected length of laid pipe being excluded for payment until the Employer's Agent is satisfied that it has been properly re-cleaned. The Contractor will be responsible for inspecting all rubbers and couplings for damage/defects soon after Contract award and any damaged rubbers must be replaced by the Contractor.

C3.4.14.4 Trench excavation in hard rock for pipelines

Much of the trenching will be in soft to intermediate material. The Contractor needs to critically examine the conditions on Site and allow for particularly heavy duty (minimum 30 tonne) excavators fitted with rock-buckets (for the more weathered areas) and heavy-duty hydraulic breakers (where in weathered sandstone). Blasting will only be allowed in strict accordance to an approved Blasting specialist recommendations and in strict accordance to the OHS requirements.

C3.4.14.5 Pipe Alignment in the road

There are many sections where there is insufficient road verge space to construct a new pipeline. The pipeline has been aligned to run close to or in the road to avoid these site restrictions. The pipeline deviates to the side of the road where there is need for an air valve or isolating or non-return valve chamber. Scour valve chamber upper structures can be offset from the pipeline.

Given the above situation, special attention shall be given to managing traffic (both vehicular and pedestrian) with an emphasis on safety.

C3.4.14.6 Water for filling and pressure-testing the Pipelines.

Water is available from the WTW for filling and pressure testing the pipelines, the Contractor may be responsible for tinking water from WTW to the nearest suitable air valve tee. The cost of abstracting, transporting, and discharging tankered water into the pipelines will therefore be measured separately. Being a time-consuming process, the Contractor needs to allow for the time taken to fill the pipelines in his / her program. Being an expensive process, the Contractor needs to take into account the extra time and cost (to his / her own account) if any re-filling following a failed pressure test is necessary.

C3.4.14.7 Supporting Documents

The Contractor will be required to provide a detailed labour forecast of the numbers of each category of worker which he intends to employ or utilise in the execution of the Works, together with the definition of the particular tasks on which it is intended that they will be engaged and the periods during which they will be so engaged.

C3.4.14.8 Monthly Reporting

It is a specific requirement of this Contract that the Contractor shall collect and record all relevant information for the completion of monthly and bi-annual labour, progress and cashflow reports (using Employer-issued templates) and submit these by due date every month to the Engineer without fail. The labour template follows the standard Expanded Public Works reporting. The reporting includes (but is not necessarily limited to):

Monthly Reports: -

- EPWP DWA Labour Schedule
- Monthly Progress Report
- MIG/RBIG – Monthly Progress Report
- Decent & Temporary Jobs Schedule

C3.4.14.9 Prevention of accidents to local residents; especially children

Particular care must be taken to proactively eliminate (as far as realistically possible) the risk of local individuals of all ages gaining access to construction areas during and outside working hours and coming to harm (In particular, drowning in flooded excavations and falling into open excavations). As part of this risk mitigation / elimination, the Contractor shall employ and post a guard at potentially dangerous excavations after-hours or where there no active presence of the construction team and shall hold regular meetings with the social facilitator and local community leadership to discuss and refine measures to mitigate risks to local residents.

C3.4.14.10 Accommodation of Traffic

The Contractor will be required to make provision for the accommodation of traffic along all public roads for the full duration of construction. The site itself is not in a public area.

C3.5 Management

C3.5.1 Management of the Works

C3.5.1.1 Applicable SANS 1921 Standards

- SANS 1921-1:2004 Part 1 General Engineering and Construction Works
- SANS 1921-2:2004 Part 2 Accommodation of Traffic on Public Roads Occupied by the Contractor
- SANS 1921-3:2004 Part 3 Structural Steelwork
- SANS 1921-5:2004 Part 5 Earthworks Activities which are to be Performed by Hand
- SANS 1921-6:2004 Part 6 HIV/AIDS Awareness

C3.5.1.2 Particular Specifications (refer to C3.8)

Refer to C3.8 for particular (purpose written) specifications.

C3.5.1.3 Planning and Programming

The Contractor shall submit an initial programme in accordance with Sub-Clause 8.3 of the FIDIC Red Book for the execution of the Works within twenty-eight (28) days after receiving Notice under Sub-Clause 8.1 (Commencement of the Works) as stipulated in the Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer, Second Edition 2017.

The Contract period shall include all Saturdays, Sundays, non-working days (public holidays), special non-working days, as well as an allowance for anticipated inclement weather (as per Clause C3.5.1.13 below) during normal working hours. The programme shall be agreed between the Employer and the Contractor prior to the implementation of the construction works.

The programme shall be updated monthly, for discussion at the monthly progress (site) meeting, to indicate planned versus actual progress.

The Contractor shall review his progress each month and should progress lag behind the latest accepted programme, by more than 2 weeks, he shall submit a revised programme and method statement of how he proposes to make up the lost time. If, in the opinion of the Employer's Agent, such revised programme will not make up the lost time, the Employer's Agent shall have the right to request the Contractor to reorganize his work in a manner which will ensure an acceptable programme. Claims for additional payment to meet any costs incurred due to such reorganisation will not be accepted.

Should the Contractor wish to work outside normal working hours (as defined in the Contract Data) for any reason, he shall first seek permission to do so from the Employer's Agent. Attending to emergency situations or making-safe the Works are exempt from requiring prior approval, but notification shall still be sent to the Employer's Agent.

Site handover and commencement of execution of the Contract will only take place once all the necessary documentation (details given in Contract Data) has been submitted and approved. Before any site work is undertaken, an introductory meeting with the local community has to be held. The latter is arranged by the Employer's Agent.

C3.5.1.4 Programme Format and Content

Programmes shall be submitted in Microsoft Project format in hardcopy and softcopy. The Contractor is to provide the detailed programme such that it is legible.

The programme of construction shall be submitted to the Engineer within the time period stipulated in these documents. The programme shall clearly show all activities related to the works and shall indicate which activities are on the critical path.

In compiling the programme the Contractor shall take into account the following:

- The requirements and effects of employing labour intensive construction methods.
- The lead-time for training of local labour.
- The accommodation and safeguarding of public access and traffic
- Accommodation of and notification for temporary water shut down
- Establishment and de-establishment times.
- Time to obtain all permits and way-leaves.
- Appointment of Community Liaison Officer (CLO).
- All public and Contractor close down periods.
- All other activities required in terms of this document.

The Contractor's programme shall show:

- a) The various activities, related to a time scale, for each element of the Works, including those of Subcontractors, in sufficient detail to be able to assess construction progress.
- b) Water testing
- c) Critical path activities and their dependencies,
- d) Key dates in respect of information to be provided by the Employer's Agent and/or others.

C3.5.1.5 Methods And Procedures

Where requested in writing by the Employer's Agent, the Contractor shall submit Method Statements for constructing specific aspects of the Works. Such work shall not be started until the Contractor receives approval of the Method Statement in writing from the Employer's Agent.

C3.5.1.6 Quality Plans and Control

The Contractor is required to have in place, and follow, an approved Quality Assurance System for the execution of this Contract. To this end, the Contractor shall submit his proposed Quality Management Plan (QMP) to the Employer's Agent for approval along with his up-front documentation required before the commencement of the Works. The QMP shall include the Contractor's proposed Quality Control Plan (QCP) which shows how conformance to the QMP is to be documented.

In addition to this, the Contractor is required to follow the Employer's Agent's Site Quality Control procedures which entails the following:

- Contractor's submission of Request for Inspection of Work;
- Employer's Agent's signing-off of 'hold points' at each stage of the work (thereby authorising the

Contractor to proceed with the next stage of the work). This may take several iterations should the Employer's Agent require further work before signing-off. Work may not proceed on the next stage until the previous stage has been signed-off.

Claims for particular items of completed work for each interim Payment Certificate will not be certified for payment where the required sign-offs have not been obtained.

No claims for extension of time, nor any other form of compensation, will be entertained for delays in receiving the Employer's Agent sign-offs on 'hold points' where, in the opinion of the Employer's Agent, insufficient notice has been given to inspect and approve the Works. The default notice required is 48 hours.

The Contractor shall submit copies of all his conformance documentation to the Employer's Agent on a monthly basis and proof of recent calibration of all measuring devices that are to be used.

C3.5.1.7 Environment

The Contractor shall comply with the Construction Environmental Management Plan (attached in Annexures). The Environmental Control Officer shall liaise directly with the Contractor on general environmental matters. Where such matters affect construction works, the Environmental Control Officer will be required to address such concerns with the Employer's Agent.

The Contractor shall plan the work in such manner that wind-blown dust is kept to a minimum. Earthworks shall commence immediately after a section is cleared and approved. The Contractor will have a water truck or other means of dust suppression on standby for spraying the cleared areas. The cost of this process will be deemed to have been included in the clearing and excavation rates entered in the Schedule of Quantities.

Burning of any materials on site will not be allowed.

The Contractor is required to progressively and systematically finish and tidy the work as it proceeds. This will be monitored against the latest approved programme. The Employer's Agent shall have the right to not certify full payment of particular scheduled items where such items are largely complete, but finishing and tidying is deemed still outstanding.

Under no circumstances shall spoil, rubble, materials or equipment be allowed to unnecessarily accumulate on Site. If, in the opinion of the Employer's Agent, this is occurring, the Employer's Agent shall have the right to make an allowance for the estimated cost of rectifying the above by reducing particular measured quantities from claims being processed for payment.

C3.5.1.8 Accommodation of Traffic on Public Roads Occupied by the Contractor

All work within the road reserve is to be conducted strictly in accordance with the wayleaves issued for such work.

C3.5.1.9 Other Contractors On Site

There will be other Contractors constructing electrical and mechanical works on the site.

C3.5.1.10 Recording of Weather

The Contractor is to provide and correctly install a rain gauge and maximum/minimum thermometer at the construction camp. The Contractor shall record and keep a record of the daily rainfall and maximum/minimum temperatures, and supply the data to the Employer's Agent on a daily basis. Readings are to be recorded daily at 08:00 unless otherwise agreed to by the Employer's Agent.

The Contractor shall take all necessary precautions to ensure that the rain gauge cannot be interfered with by unauthorised persons.

C3.5.1.11 Format of Communications

All requests for information or requests for inspections are to be recorded in writing.

All instructions are to be issued in writing as a Site Instruction.

C3.5.1.12 Extension of Time Resulting from Abnormal Weather

Extension of time will not be considered for normal adverse weather conditions. For abnormal rainfall or saturated conditions will be calculated as follows:

- The Contractor shall, in his programme, allow for the expected number of working days on which work on critical path activities could be delayed – as given in the Schedule below.
- Extension of time will be calculated for each calendar month or part thereof over the full period for the completion of the Work, plus any approved extension thereof, as follows:
 - A delay caused by abnormal weather conditions will only be accepted for extension of time if, in the opinion of the Employer's Agent, it delays an item or items which lie on the critical path determined by the Contractor's approved programme (irrespective of actual rainfall).
 - An extension of time will be granted for the number of days, as approved, on which adverse weather conditions delay critical path activities, less the anticipated number of days given in the Schedule below.
 - The net extension of time determined for each month, which may be negative, shall accumulate algebraically to determine the net number days for extension of time due to abnormal weather conditions, but a negative total at the end of the Completion Period will not be taken into account.
 - Where a portion of a month is involved, a pro rata number of days shall be calculated.

The anticipated number of working days on which work on critical path activities will be delayed as a result of adverse weather conditions are as follows:

Month	Days	Month	Days
January	3	July	0
February	3	August	1
March	4	September	2
April	2	October	2
May	1	November	3
June	0	December	3

C3.5.1.13 Key Personnel

The Contractor is to compile and submit to the Employer's Agent a schedule of Key Personnel, including titles, names, designations and contact numbers of such personnel. This document is to be updated immediately in the event of any changes.

C3.5.1.14 Management Meetings

Formal project meetings will be held on site in the Employer's Agent's office (or similar suitable office). Representatives of the Employer, Employer's Agent and Contractor will be required to attend. The representatives are to have the necessary authority in respect of aspects such as planning and health and safety. The Contracts Manager and Construction Manager (Site Agent) are required to attend all such meetings.

The Contractor shall attend the following meetings during the Contract:

- a) An inaugural site meeting at the O. R. Tambo District Municipality's offices or as called by the Employer's Agent.
- b) Monthly site meetings on Site or as called by the Employer's Agent, from the commencement of the Works until the issue of the Taking Over Certificate (or where necessary as determined by the Employer's Agent).
- c) Monthly technical meetings called by the Employer's Agent (or where necessary as determined by the Employer's Agent).
- d) Meetings during the Defects Notification Period called by the Employer's Agent (only if warranted)
- e) The following reports shall be submitted by the Contractor before the monthly Site Meetings:

- Progress Report
- Plant & Labour returns
- Updated Programme vs Baseline Programme
- Updated cashflow projection.

The cost of these requirements shall be included in the rates tendered for Time Related Items.

C3.5.1.15 Forms for Contract Administration

The Employer's Agent's Representative will have a full set of contract administration forms for use on site. This includes forms for recording test results, claims, inspections and the like. The Contractor may use such as a basis for his documentation should he not have adequate similar templates.

C3.5.1.16 Electronic Payments

The Employer will make payments by electronic means only.

C3.5.1.17 Daily Records

The Contractor is required to keep daily records of resources (people and construction equipment) as well as of work performed on the site. A signed copy of the previous day's record must be provided to the Employer's Agent on a daily basis.

Information relating to construction equipment shall be recorded in the Daily Site Diary. In addition, the Contractor shall deliver to the Employer's Agent, on a monthly basis, a detailed schedule of construction equipment present on the site for that month. Full particulars are to be recorded, identifying each piece of equipment, including whether the equipment is in working order or out-of-order. This schedule is to be submitted by the first day of the month following the month to be reported.

C3.5.1.18 Bonds And Guarantees

Bonds and guarantees are to be submitted to the Employer from whom they can be collected once they are released, in accordance with the contract.

C3.5.1.19 Payment Certificates

Measurements for interim and final certificates must be agreed with the Employer's Agent prior to the issuing of a Tax Invoice by the Contractor.

The Contractor is to provide all invoices, vouchers and receipts in respect of payments made by him in connection with provisional or prime cost items when he requires payment for such.

The Contractor is to provide all invoices or receipts in respect of materials purchased and delivered to the site when he requires payment for such. Invoices or receipts are to clearly identify the material, the unit rate thereof, and the quantity/number purchased.

It is a specific requirement of this Contract that the Contractor shall collect and record all relevant information for the completion of end-of-month documentation to be submitted with each payment claim. The Payment Certificate (prepared by the Employer's Agent) will not be accepted by the Employer unless accompanied by the following:

- Local Labour Schedule (in EPWP format; ie giving employee names, IDs, gender, age group and disability status if applicable)
- Contract Participation Goal expenditure to date vs target (details of labour wages and salaries paid and payments to Targeted Enterprises vs value of work certified to date)
- Monthly Progress Report (from Site Meeting).

C3.5.1.20 Proof of Compliance with the Law

The Contractor shall insure his employees against accident in terms of the Compensation for Occupational Injuries and Diseases Act (Act 130 of 1993), as amended. A Letter of Good Standing with the Compensation Fund, as issued by the Department of Labour, must be submitted as part of the Tender.

Where the Letter of Good Standing expires during the contract period, the Contractor will be required to submit new, valid documentation. Failing to do so will result in work being stopped.

C3.5.1.21 Insurance Provided by the Employer

The Employer will effect and maintain the following insurances:

- The Works
- Public Liability

The contractor will be responsible for payment of excess amounts on insurance claims for: a) The Works and b) Public Liability above.

C3.5.2 Health and Safety

C3.5.2.1 Health and Safety Requirements and Procedures

The Contractor is to comply in all respects with the Occupational Health and Safety Act (Act 85 of 1993), as amended, as well as with the Construction Regulations 2014 and the Electrical Machinery Regulations.

The Health and Safety Officer appointed by the Employer shall liaise directly with the Contractor on safety matters but shall be required to channel safety matters affecting construction work through the Employer's Agent.

The Contractor shall take special care of the following during construction :

- Flooding of trenches or excavations
- Possibility of collapse of excavations in sandy soils
- Protection of deep excavations and adjacent structures
- Protection of existing services
- Accommodation of traffic and pedestrians
- Proper storage and stacking of materials
- Good housekeeping and site tidiness
- Provision of welfare facilities
- Dust control.

The Contractor's Health and Safety plan is to be approved and the Contractor's Safety Officer is to be appointed prior to the commencement of any construction activities. It is specifically noted that the person officially appointed as the Contractor's Safety Officer shall be properly qualified and experienced and be based full-time at the site while activities are taking place.

Time lost due to delayed commencement or suspension of the work as a result of the Contractor's failure to submit the safety plan timeously, shall not be used as a reason to claim for extension of time or standing time and related costs.

C3.5.2.2 Protection of the Public

Any excavations left open during the builder's holiday or other non-working days shall be adequately safeguarded at all times. Safe trench-crossings shall be provided where necessary. The length of trench left open at any one time may be restricted by the Employer's Agent, should he consider such restriction to be in the interest of public safety.

C3.5.2.3 Barricades and Lighting

The Contractor is responsible for the safety of the site and shall provide all necessary watching, barricading and lighting. This is especially significant at excavations.

C3.5.2.4 Community Participation

Although there is very limited scope for the employment of unskilled workers from the surrounding communities, there will be a strong expectation among the community that at least some people are employed while on-site activities are taking place (eg. providing 24h security, assisting with lifting / carrying / holding in position during assembly etc).

Such persons are to be selected and employed via a Community Liaison Officer.

A Provisional Sum allowance has been made for the short-term employment of CLOs in accordance with the following Terms of Reference (ToR):

- a) Candidates for the CLO will be selected by the local leadership.
- b) The accepted CLO will be responsible for liaising with a Project Steering Committee (PSC) for each area.
- c) The CLO is to be appointed for the period of on-site activity, plus a period of 14 days prior to this period.
- d) Remuneration for the CLO will be R 8 000 wages plus R500 cell phone allowance per month for the period of employment.

The CLO will liaise with the Contractor in performing the following activities:

- a) Organise and assist the contractor in explaining to all workers the labour-based construction model
- b) Ensure labourers understand their task and the principles behind task work
- c) Ensure labourers are informed of their conditions of temporary employment
- d) Attend all site meetings and briefing for work procedures
- e) Keep written record of interviews and community liaison which should be summarised and included in the monthly progress reports
- f) Collect monthly welfare reports and submit to social facilitators
- g) Ensure that contractor's workers are paid what is due to them and in time

- h) Assist in the recruitment of labour
- i) Promote and maintain sound relations with community stakeholders and other role players
- j) Screen the supplied labour by the community through Project Steering Committees to ensure compliance with the agreed upon recruitment policy and the government's labour employment targets

- k) Inform local labour about their conditions of temporary employment, to ensure their timeous availability and inform them timeously when they would be relieved, where the rotation of labour is applicable
- l) Keep the labour register of labour and manage records of project local labourers and be able to provide reports on employment statistics
- m) Consult on all decisions regarding local problems and any matters of importance that, in any way will be of relevance to the Contract.
- n) To be on site on a daily basis
- o) To register concerns / perceptions and raise them in the PSC meetings
- p) Attend site and PSC meetings to present monthly report on the local community labour involvement and site matters
- q) Identify possible labour dispute and any disciplinary matter and advise the site agent / foreman and assist in the resolution, where necessary must call for the assistance of the Social Consultant for the resolution of the conflicts
- r) Assist the contractor in preparing records of project employees. Assist the contractor in making task measurements and the records thereof
- s) Monitor the production of individual task workers and arrange replacement of those workers who fail to produce a reasonable task output
- t) Attend disciplinary proceedings to ensure that hearings are fair and reasonable
- u) Communicate daily with the contractor to determine additional labour requirements with regard to numbers and skills and pass this to the PSC
- v) Attend weekly meetings with the contractor and make a weekly written report which shall be a prerequisite to being paid.

The community is represented by a PSC. All liaisons with the community and the committees are the responsibility of the Social Facilitator in conjunction with the O. R. TAMBO District Municipality, the Employer and the Project Steering Committee. The Contractor will be required to liaise through them for any matters pertaining to the community.

C3.5.2.5 Employment of the Local Community

The Contractor is to limit the import of labour to skilled personnel only. Semi-skilled and unskilled labour is to be sourced from the local community.

It is a requirement that, at least, all unskilled labour taken-on by the Main Contractor and his sub-Contractors are sourced from the local community and that such employment is arranged through the CLO and PSC.

Employment of all temporary labour, whether employed directly or through a Subcontractor, shall comply in all respects with the National Government Department of Labour's regulations; including the minimum wage applicable to construction work in the Eastern Cape.

C3.5.2.6 Certificate of Service

An employee shall, upon termination of his services, be entitled to a Certificate of Service showing the full names of his employer (i.e. the Contractor) and the employee, the type of work done by the employee, the date of commencement, a record of training received and the date of termination of his services.

C3.6 Standard Specification

The following relevant standardized specifications, as listed below, shall form the Standard Specifications and apply to this contract:

The South African National Standards (SANS) 1200 Standardised Specification for Civil Engineering Construction, which the tenderer shall obtain / purchase from the South African Bureau of Standards, Private Bag X191, Pretoria 0001, Tel: (012) 428 7911, Fax: (012) 344 1568, e-mail: info@sabs.co.za <info@sabs.co.za>;

This Standard Specification may also be inspected, by appointment, at the offices of the Employer and the Employer's Agent during normal office hours.

C3.7 Variations and Additions to the Standard SANS 1200 Specifications: General, Civil and Structural Works

NOTE : Numbering in the Project Specifications corresponds with the numbering of clauses in the Standard Specifications (SANS 1200).

Tenderers must make provision for all the relevant Project Specification requirements to be included when calculating the prices of the various items in the schedule of quantities.

In addition, the sum tendered shall cover all initial costs incurred in complying with the requirements of C1.2 Contract Specific Data.

In certain clauses, the SANS 1200 standard specifications allow a choice to be specified in the project specifications between alternative materials and / or methods of construction and /or for additional requirements to be specified to suit a particular contract. Details of such alternative or additional requirements applicable to this contract are contained in this section. It may also contain additional specifications required for this particular Contract.

The number of each clause and each payment item in this part of the project specifications consists of the prefix PS followed by a number corresponding to the number of the relevant clause or payment item in the standard specifications.

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PSA GENERAL (SANS 1200 A)

PSA 1 SCOPE

Replace the first paragraph of sub-clause 1.1 with the following:-

"This specification covers requirements, principles and responsibilities of a general nature which are normally applicable to all civil engineering contracts as well as the requirements for the Contractor's establishment on Site"

PSA 2 INTERPRETATIONS

PSA 2.3 Definitions

Add the following definitions :-

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

'Specified' : As specified in the Standardised Specifications, the Drawings or the Project Specifications."

The term "Engineer" shall be replaced by "Employer's Agent".

The Employer's Agent shall be SMEC South Africa (Pty) Ltd.

The terms "ESCOM", "ESC" and "Electricity Supply Commission" shall mean "Eskom".

CCC: Conditions of Contract for Construction for Building and Engineering Works, Second Edition 2017.

PSA 2.4b Abbreviations

Add to Sub-clause 2.4(b):

"MAMDD: Modified AASHTO maximum dry density".

PSA 2.8.1 Principle

In the fourth line of Sub-clause 2.8.1, after the word "specification", add: "or in the measurement and payment clause of the standard specification, particular specification or project specification".

Add the following to this clause:

Items which are designated as provisional quantities or provisional sums in the Schedule of Quantities are intended to provide for works, the need or extent of which shall be established by the Employer's Agent during construction. Work scheduled as such shall only be undertaken on the written instruction of the Employer's Agent and, where applicable, shall be paid for at the tendered rate or in the absence of rates shall be valued in accordance with Clause 6.4 of the General Conditions of Contract.

The Schedule of Quantities shall not be used for ordering purposes and no liability or responsibility shall be admitted by the Employer's Agent in respect of materials ordered or procured by the Contractor on the basis of the Schedule of Quantities.

PSA 3 MATERIALS

PSA 3.1 Quality

Add to the Sub-Clause:

"No used or recycled material may be used in the Works unless expressly authorized by the Employer's Agent.

Materials specified as being to the approval of a Standards Bureau shall bear the official mark of the appropriate standard.

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

Where a material to be used in this Contract is specified to comply with the requirements of a SANS Standard Specification, and such material is available with the official SABS mark, the material used shall bear the official mark.

The Contractor shall submit in good time, before any construction commences, to the Employer's Agent on site, samples of all materials intended to be incorporated into the works. The samples shall be accompanied by results of tests

undertaken by an approved independent laboratory on the samples in question on behalf of the Contractor and at his cost, before consideration by the Employer's Agent

The Employer's Agent, during construction, will take independent samples from stockpiles of proposed construction materials on site and from the completed works. Approval will not be granted for samples delivered by the Contractor directly to the Employer's Agent's office. The Contractor shall be responsible for the cost of all failures on test samples and control testing.

All pipes, fittings and materials used in the Works, must bear the official standardisation mark of Standards South Africa where applicable. The mark on a pipe shall be visible from above after the pipe is laid.

Rubber articles, including pipe insertion or joint rings shall be stored in a suitable shed and kept away from sunlight, oil or grease. Contractor to inspect the existing rubbers for damage or defects soon after commencements and any unsuitable or missing quantities to be replaced.

Large items not normally stored in a building shall be neatly stacked or laid out on suitable cleared areas on the Site. Grass or vegetation shall not be allowed to grow long in the storage areas and the material shall be kept free of dust and mud and shall be protected from stormwater. Pipes shall be handled and stacked in accordance with the manufacturer's recommendations, special care being taken to avoid stacking to excessive heights and placing over hard objects. Any PVC pipes/material and rubbers shall be protected from direct sunlight by suitable covers.

Every precaution shall be taken to keep cement dry and prevent access of moisture to it from the time it leaves the place of manufacture until it is required for use on the Site. Cement is to be used on a first in/first out basis. Bags of cement which show any degree of hydration and setting shall be removed from the site of the Works and replaced at the Contractor's own expense. Any cement older than six weeks is to be removed from site.

Materials shall be handled with proper care at all times. Under no circumstances may materials be dropped from vehicles. Large pipes or large plant shall be lifted or lowered only by means of suitable hoisting equipment.

Where propriety materials are specified it is to indicate the quality or type of materials or articles required, and where the terms "or other approved" or "or approved equivalent" are used in connection with proprietary materials or articles, the Contractor is to supply with their tender the name of the manufacturer and supporting documentation that show that the materials or articles comply with the relevant specifications. It is understood that the approval shall be at the sole discretion of the Employer and the Employer's Agent.

Irrespective of any approval granted by the Employer's Agent or the Employer, the Contractor shall be deemed responsible for quality of all materials used for construction and their specified performance."

Add new Sub-Clause:

"PSA 3.3 : Ordering of Materials

The quantities set out in the Schedule of Quantities have been carefully determined from calculations based on data available at the time and should therefore be considered to be only approximate quantities. The liability shall rest entirely and solely with the Contractor to determine before ordering, the required types and quantities of the various materials required for completion of the Works in accordance with the Specifications and the Drawings issued to the Contractor for construction purposes.

The Contractor shall ensure that the work is not delayed due to the lack of materials on Site, by placing orders for material required under this Contract as soon as possible. No extension of time will be allowed for any delay due to the supply of materials.

Any reliance placed by the Contractor on the estimated quantities stated in the Schedule of Quantities issued for tendering purposes, or measurements made by the Contractor from the drawing issued for tendering purposes, shall be entirely at the Contractor's risk, and the Employer accepts no liability whatever in respect of materials ordered by the Contractor on the basis of Tender Documents.

Before ordering materials of any kind the Contractor shall check with the Engineer whether or not the scope of the work for which the materials are required is likely to change substantially. No liability or responsibility whatsoever shall be attached to the Employer for materials ordered by the Contractor except when ordered in accordance with written confirmation issued by the Engineer.

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

PSA 4 PLANT

PSA 4.2 Contractor's Office and Stores (Refer SANS 1921-1 Clause 4.14)

Add to the Sub-Clause:

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

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

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

Add the following new clauses:

PSA 4.3 Site Establishment

The extent of office accommodation, assistants and equipment required by the Employer and his Agents is described in SANS1200AB as amended.

The Contractor is responsible to locate and provide a suitable area for his office accommodation, which may be on the Site if space permits. The Contractor shall conform to all local authority, environmental and industrial regulations in relation to his office accommodation. The Contractor is required to ensure that his site is established above the 1:100 year floodline.

The Contractor is responsible to locate and provide separate residential accommodation for all his employees. No residential accommodation for employees will be allowed on the Project Site. The Contractor shall be responsible for transport of his employees to, from and within the Site.

The Contractor shall provide security watchmen for the Contract as he deems fit at no extra cost for the Employer. The Contractor must ensure that all his employees as well as the employees of his subcontractors are able to identify themselves as members of the construction team.

Temporary water connections, Contractor's offices, storage sheds, ablution facilities, barricading of Works shall be located in an approved position and subject to the approval of all authorities concerned.

The Contractor is required to provide adequate lightning protection.

The Contractor shall make his own arrangements to accommodate his employees but not within the camp site area. Chemical toilets only will be allowed where temporary facilities have to be provided

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

During progress of the work and upon completion thereof, the Site of the Works shall be kept and left in a clean and orderly condition. The Contractor shall store materials and equipment for which he is responsible in an orderly manner, and shall keep the Site free from debris and obstructions.

PSA 4.4 Temporary Power Supply

The Contractor shall make his own arrangements directly with the local service provider concerning the supply of and payment for temporary electrical power to the Contractor's site establishment and work areas. No direct payment shall be made by the Employer to the Contractor or service provider for the provision or use of temporary electrical services. Electrical power cannot be guaranteed by the local service provider. The Contractor shall make his own arrangements for back-up power in the event of power failures and shortages – there shall be no entitlement to additional payment or extension of time in this regard.

The rates tendered for the relevant items in the Preliminary and General parts of the Bill of Quantities shall include all costs for the establishment and maintenance of a temporary power supply to the works for the full duration of construction, testing, commissioning and trial operation as necessary to execute the scope of works.

PSA 4.5 Ablution facilities

The Contractor shall erect and maintain proper ablution facilities. The Contractor shall service and maintain the facilities in a clean and hygienic state for the duration of the contract period and on Completion of the works for the removal from the Site.

PSA 4.6 Temporary Water Supply and Sewerage

The Contractor shall make his own arrangements concerning the supply of water and sewer collection and disposal. No direct payment shall be made for the provision of water or sewer collection or disposal.

Prior arrangements must be made with Kouga Local Municipality for the use of water for Construction Purposes. The contractor may be billed for this water and the necessary metering and billing arrangement must be discussed and agreed with Kouga Local Municipality prior to any construction of the works.

The rates tendered for the relevant items in the Preliminary and General Section of the schedule shall include all costs for the establishment and maintenance of water supply to the works and the Contractor shall make his own arrangements for the possible conveyance and storage of water if necessary. The Contractor will be held responsible for any wastage of water due to negligence.

The Contractor shall, at his own expense, be responsible for safely and hygienically dealing with and disposing of all human excrement and similar matter generated on the Site during the course of the Contract, to the satisfaction of the Engineer and the responsible health authorities in the area of the Site.

The Contractor shall further comply with any other requirements in this regard as may be stated in the Contract.

No separate payment will be made to the Contractor in respect of discharging his obligations in terms of this sub clause and the costs thereof shall be deemed to be included within the Contractor's bided Preliminary and General Items.

PSA 4.7 Security Clearances

Tenderers should note that the Employer may require that Security Clearance investigations be conducted on any number of the Contractor's personnel. If so required by the Employer, the Contractor must remove personnel as indicated immediately and ensure that they have no access to the works or documentation or any other information pertaining the site. The Employer shall not be liable for any cost concerning the removal of personnel or the effect thereof on the execution of the work."

PSA4.8 Equipment condition

All equipment on site shall be in a good working order, and is to be in such a condition that it can achieve production rates which are typical of the industry standards.

Should any equipment, in the opinion of the Engineer, be substandard or breaks down frequently to such an extent that it affects the progress on the project, the Engineer may instruct the Contractor to replace such equipment.

PSA 5 CONSTRUCTION

PSA 5.1.1 Setting out the Works

Add before the first sentence:

Delete this clause and replace with the following:

"The Contractor shall be fully responsible for the setting out of the works.

(Although the drawings may show the approximate positions of existing works and services, neither the Employer nor the Engineer accept any responsibility for the accuracy thereof. It shall be the duty of the Contractor to search for and make himself acquainted with the actual locations and ownership of existing works and services before any construction work is commenced.

Where, during the course of the contract, services have been located and exposed, they shall be securely shored and protected, and the Contractor shall take adequate measures to prevent any damage occurring to them.

Furthermore, any damage done to existing works and services shall be reported immediately to the authority concerned and the Engineer shall be notified accordingly in writing.

Before commencing any construction, the Contractor shall check the relative positions and levels of all reference pegs, bench marks and line pegs and inform the Engineer of any discrepancy. The Contractor shall advise the Engineer of any conflict between the position of any part of the Works and an existing feature."

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

Add to the Sub-Clause:

"Before the commencement of construction work in the vicinity of boundaries, the Contractor, under the direction of the Employer's Agent, shall search for plot pegs where boundaries have not been established by the erection of walls or fences and the Contractor shall compile a list of such pegs that are apparently in their correct positions. At the completion of the

contract, the Contractor shall expose the pegs that were listed at the commencement of the construction and the Employer's Agent will arrange for any such pegs that are missing to be replaced at the Contractor's expense.

All plot boundary pegs shall be marked with fencing droppers which shall be painted.

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

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

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

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

PSA 5.2 Watching, Barricading, Lighting and Traffic Crossings

Delete the clause and replace with the following.

"The Contractor shall comply in all aspects with the requirements of the Occupational Health and Safety Act (Act 85 of 1993), as amended, the Construction Regulations, 2014 as well of those of the relevant authorities and the South African Road Traffic Signs Manual.

Pursuant to the terms of Clause 31 of the General Conditions of Contract the Contractor must employ competent watchmen and must guard the works both day and night.

It must be borne in mind that the works are located in existing residential areas and the safety of both the general public and traffic using the public roads which abut the works is of paramount importance. The Contractor must therefore in this regard provide all necessary safety devices such as barricades, barriers, signs, lights, fencing, etc. to both warn the public of the dangers posed by the works and prevent the public from gaining access thereto. Plastic safety tape will not be accepted on its own as an adequate safety barrier.

Prior to any excavation work being undertaken, the Contractor shall submit his proposals for safeguarding the works to the Engineer for approval and shall amend such proposals as the Engineer deems necessary.

Should, at any time during the course of the contract, the agreed upon safety measures be found to have been ignored by the Contractor, a penalty of R2 000, 00 per occurrence will be levied upon the Contractor by the Engineer and such penalty, aggregated for more than one occurrence, shall be deducted from the amounts due to the Contractor in the payment certificate immediately following the occurrences.

The removal of barricades, barriers, signs, lights, fencing etc. which constitute the safety measures by persons unknown shall not relieve the Contractor of his responsibilities in terms of this clause and he shall replace them immediately their removal has been noted.

Furthermore, such removal by persons unknown will not be sufficient cause for the penalty to be levied by the Engineer. The Contractor shall provide guards at night to prevent the removal of safety devices should he deem it necessary. The presence of street lights in the vicinity of the works will not relieve the Contractor of erecting the safety devices agreed upon by the Engineer.

No separate item has been scheduled for the necessary measures, the cost of which shall be deemed to be included in the rates."

PSA 5.4 Location and protection of existing services

Add the following new clause:

Existing services

"Prior to commencing work, the Contractor shall confer with all Authorities and Departments concerned and obtain the necessary wayleaves for both overhead and underground services affected by the Works and shall satisfy himself that he has obtained all the relevant information required to complete the Contract. The Contractor shall carry out the works with the minimum interference to existing services. He shall co-operate with all Authorities and Departments concerned and he shall be solely responsible for carrying out the following operations and checks:

- (1) He shall inform all Authorities and Departments in good time before the correct stage of the construction is reached for the laying and/or relaying of any particular services.

- (2) He shall set out the lines and levels of pipes, culverts and any other necessary features of the Contract in order that Authorities and Departments are able to lay and/or relay services correctly.

It shall be clearly understood that obtaining the necessary wayleaves and any extra work, such as the removal of any portion of the Works already executed either by the Contractor or other Authority or Department and its subsequent re-execution, which is caused by the Contractor's failure to observe and carry out his responsibilities as specified, will be at his own cost.

If the Contractor considers that the progress of the works is being retarded by the failure of any Authority or Department to lay, remove or divert pipes, ducts, services, cables or poles within a reasonable time, he shall immediately notify the Employers Agent in writing, stating clearly the number of days of delay claimed. The Employers Agent will then decide whether such a claim is justifiable, and in the event of the claim being accepted he will hand to the Contractor a certificate stating clearly the number of days of delay sanctioned.

The cost of repairing any damage to services, due to miscalculations or negligence on the part of the Contractor or his failure to carry out the duties set out in this Clause, shall be borne by the Contractor.

(a) Protection of Overhead and Underground Services

Services and sub-surface obstructions are unlikely to be affected by the work, based on available records and surveys. Although every care has been exercised in the presentation of the available data, the Employer cannot and does not vouch for the accuracy or completeness of the information shown. Whenever the Contractor deems it necessary to determine the exact location of an existing service or obstruction, he shall, at his own expense, make any examination that he may consider desirable in advance of the work, and the Employer does not accept any liability for loss, damage or delay to the Contractor as a result of the non-location or inaccurate location of services or obstructions.

Where no underground services are shown on the drawings or scheduled, but the possibility of their presence can be reasonably inferred, the Contractor shall in collaboration with the Employers Agent, search for such services to establish their positions well in advance of the work. A full report shall then be submitted in good time to the Employers Agent, to enable the necessary arrangements for the protection, removal or diversion of the services before work is commenced in their vicinity.

In the event of damage to existing services, the Contractor shall take such immediate action as is necessary to prevent further damage or danger to life or property and shall immediately notify the Employers Agent who will issue instructions as to the necessary repairs or protective measures to be taken. The cost thereof shall be borne by the Contractor irrespective of whether the repairs or protective measures were carried out by him or by or on behalf of the service authority or department concerned.

As soon as an underground service not shown on the drawings is discovered, it shall be deemed to be a known service and the Contractor will be held responsible for any subsequent damage to it. If such service is damaged during the course of its discovery, the Contractor will be reimbursed for the cost of making good such damage, unless it is established by the Employers Agent that the Contractor did not exercise reasonable diligence and care and that the damage was avoidable."

(b) Existing Services

"Existing service" shall include any service which has been temporarily taken out of service to allow for the execution of the works or which has been taken out of service as a result of an event which necessitated the execution of the works.

(c) Condition of Existing Services

The Contractor acknowledges that he has inspected and examined all known existing services and all existing services subsequently discovered, as contemplated in (a) above and is satisfied that all such services were in an acceptable and serviceable state at the commencement of the works, alternatively, upon discovery thereof as contemplated in (a) above.

In the event of a dispute as to the acceptability and/or serviceability of an existing service at the commencement of the works or upon the discovery of such service, the Contractor shall bear the onus of proving that the service in question was not in an acceptable and/or serviceable state at the commencement of the works.

(d) Maintenance, Protection and Relocation of Existing Services

During the course of the works, all existing services including traffic signals, watermains, sewers and stormwater reticulation, electricity transmission and telephone lines, cables, poles and conduits whether in service or not shall be protected, supported and maintained to the satisfaction of the service authority or department concerned and the Employers Agent. The Contractor shall bear all costs in this regard.

Where a bank of underground ducts, cables etc. are crossed over a distance of less than 1.0m they shall be regarded as a single crossing. Hydrants under pressure, watermain valve covers and manholes shall be kept unobstructed and accessible at all times.

Where the existing stormwater system is affected by the roadworks, drainage pipes and structures will have to be upgraded, adapted or demolished and new drainage pipes and structures constructed.

The covers and frames of service manholes and catchpits will have to be adjusted where they are affected by the roadworks.

(e) Work in Close Proximity to Existing Services

The Contractor shall note that no mechanical excavators or vibratory type compactors may be used within three (3) meters of any telecommunications or electrical services. No pegs or stakes shall be driven into the ground in the vicinity of underground services unless their exact positions have been determined.

The Contractor's attention is drawn to the following with regard to work done in the proximity of ESKOM and other electrical services:

Machinery and Occupational Safety Act (Act No 6 Of 1983) with Regulations

D16 (7) Excavations

"The builder or excavator shall ascertain as far as practicable the location and nature of underground services likely to be affected by the excavation and take such steps as may be necessary to prevent danger to persons."

The Electricity Act (Act No 40 Of 1958)

Section 51(3) : Offences and Penalties

"Any person who without legal right (the proof of which shall be upon him) cuts or damages or interferes with any apparatus for generating, transmitting or distributing electricity, shall be guilty of an offence and liable on conviction to a fine not exceeding R1 000,00 or to imprisonment for a period not exceeding twelve months."

The Contractor shall take the above into account in the drawing up of his construction programme and in the calculation of his tendered rates, and shall note that no additional payment or compensation will be allowed for any additional costs or delays incurred as a result of compliance with these regulations, except as measured and paid under the Items listed in the Schedule of Quantities.

The Contractor shall allow all reasonable access to the representatives of any Authority or Department for the purpose of maintaining, laying and/or relaying any services, cables or mains during the period of the Contract.

Permanent alterations to existing services ordered in writing by the Employers Agent, and for which no separate provision has been made in the Bill of Quantities, will be paid for under dayworks if required.

PSA 5.7 Safety

Add the following to this clause:

"Compliance with

- 1) OHS Act and Regulations and
- 2) Environmental Management Plan (EMP or EMPr)

Lump sums are provided in the Bill of Quantities to cover the contractor's cost for compliance with the requirements of the Construction Environmental Management Plan and the Occupational Health and Safety Act, 1993, the Construction Regulations, 2014 and the Health and Safety Specification respectively.

In addition, Sums are included under Time Related Items in the Preliminary and General Section of the Schedule of Quantities. The lump sums shall include full compensation for the provision of the necessary site official, the training, PPE, plans, audits, assessments, administration, etc. and all other costs required for compliance. Fines issued for non-compliance will be deducted from these Sums but are not limited to the value of the Sums stated."

PSA 5.9 ACCOMMODATION OF TRAFFIC

Add the following:

Temporary traffic signs shall be erected at all open excavations and trench crossings. The **number and layout** of the traffic signs shall comply with the Site Manual entitled “**Safety at Roadworks in Urban Areas**”, as published by the Department of Transport. Traffic signs shall have a yellow background with either a red or black border.

PSA 5.10 SITE MEETINGS

Add the following new clause:

The contractor will be required to attend regular site meetings, normally held once a month to discuss general progress, quality of work, problems, claims, payments, etc, but not matters concerning the day-to-day running of the Contract.”

PSA 7 TESTING

PSA 7.2 Approved Laboratories

Delete the clause and replace with the following:

All checks/testing conducted by the contractor and additional acceptance control testing as required by the Employer’s Agent, will be done by a South African National Accreditation System (SANAS) accredited laboratory.

PSA 8 MEASUREMENT AND PAYMENT

PSA 8.1.2.1 Replace the last sentence of subclause 8.1.2.1 b) with the following:

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

PSA 8.2.1 Fixed-charge and value-related items

Replace the contents of subclause 8.2.1 with the following:

“The sum tendered for each fixed-charge and value-related item will be paid in one single payment in terms of the first progress certificate issued after the Contractor’s obligations in respect of that item have, in the opinion of the Engineer, been discharged.

The tendered lump sum amounts shall not be subject to any variation if the actual value of work done under the Contract exceeds, or falls short of, the Tender Amount, or as a result of an extension of time for completion in terms of the Conditions of Contract.”

PSA 8.3 Scheduled Fixed Charge and Value-related Items

PSA 8.3.1 Contractual Requirements

Add to sub-clause 8.3.1:

“In addition, the sum tendered shall cover all initial costs incurred in complying with the requirements of the Special Conditions of Contract.”

PSA 8.3.2 Facilities for the Contractor

Add to sub-clause 8.3.2:

The tendered rate shall include all costs as listed in SANS 1200 A 8.3.2.2 (a) to (i)

PSA 8.3.2.2 k) Rain gaugeUnit: Sum

The rate to include recording of rainfall to be verified by the Employer’s Agent’s Representative. All rainfall records must be documented and shall be submitted to the Employers Agent. These records will form the basis for claims for abnormal inclement weather in accordance with clause 8.5 (c) of the Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer, Second Edition 2017.

PSA 8.3.2.2 l) Eating facilities for workersUnit: Sum

Contractor to provide 6m x 6m 2.5m high shed for workers for use at lunch and tea breaks with sufficient seating. The shed shall consist of timber and galvanised iron sheeting and covered on at least three sides. The floor shall be levelled and compacted.

PSA 8.3.5 Occupational Health and Safety.....Unit: Sum
Add the following new clause:

The Contractor shall comply with the requirements of the Health and Safety Specification under Part F of the document. The tendered rates for the different initial H&S obligations shall include full compensation to the contractor for compliance with all the requirements of the OHS Act and Regulations (including the Construction Regulations 2014) at all times for the full duration of the Contract.

Payment of the rate tendered shall include full compensation for all costs resulting from the appointment of a staff member as an Construction Safety Officer, the control and management, the on-site hands-on and in-house training, and the materials and assistance rendered to personnel, staff and equipment engaged in construction and other tasks on the site of the works

PSA 8.3.6 Environmental Management Plan.....Unit: Sum

Add the following new clause:

The contractor shall comply with the requirements of the EMP under Part C of the document when relevant. The contractor shall tender the lump sums in the Bill of Quantities to cover his initial obligations in respect to the EMP.

Payment of the rate tendered shall include full compensation for all costs resulting from the appointment of a staff member as an Environmental Site Officer, the control and management, the on-site hands-on and in-house training, and the materials and assistance rendered to personnel, staff and equipment engaged in construction and other tasks on the site of the works.

PSA 8.3.7 HIV Aids Awareness..... Unit: sum

Add the following new clause:

The contractor shall comply with the requirements of the Department of Public Works HIV Aids Specification for Civil Contracts (dated April 2004). Contractor to obtain his own copy of this document. The sums will be paid to the contractor in equal monthly amounts subject to proper/substantial compliance. Compliance will be monitored by regular audits.”

PSA 8.4 Scheduled Time-Related Items

PSA 8.4.1 Contractual Requirements

Add the following:

The contractor shall tender a lump sum in the Schedule of Quantities to cover his time-related establishment costs. The amount tendered and paid shall be full compensation to the Contractor for:

- (i) The maintenance of his whole organisation as established for this Contract.
- (ii) The maintenance of all insurances, indemnities and guarantees required in terms of the Conditions of Contract or Tender where applicable.
- (iii) Compliance with all general conditions and requirements which are not specifically measured elsewhere for payment in these Contract Documents.

The Contractor shall tender a lump sum for the abovementioned items. Payment of the lump sum shall be made monthly in compliance with the method laid down in Sub-clause 8.2.2 of SANS 1200:A.

The contractor will not be paid Time-Related Preliminary and General charges for any Special Non-Working Days, which shall be deemed to have been allowed for in his rates.

PSA 8.4.5.1 Provision of Security Personnel.....Unit: Month

The tendered rate shall cover the cost of providing such security personnel the Contractor deems appropriate, taking cognizance of the location of the site and the historical record of incidents of crime in the area.

PSA 8.4.6 Compensation in terms of Clause 10.1.1 of the GCC-2015 & as stated in the Contract Data (Part 1) (New Clause)for delays incurred:

- (a) Plant Unit: Sum per working day
- (b) Labour Unit: Sum per working day
- (c) Supervision Unit: Sum per working day

(d) Other services, facilities etc. not covered by (a), (b) and (c) Unit: Sum per working day

The sum tendered for each item shall cover the full and final standing cost per day of delaying the specified resource or facility and no additional compensation shall apply, notwithstanding any provisions to the contrary in the contract documents, or in respect of any extension of time granted in relation to the circumstances described in 8.5 of the Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer, Second Edition 2017.

For the purposes of calculating the total delay, a working week shall be held to consist of five working days and a working day 9 hours.

Payment for partial standing of any of the scheduled resources for a day or part thereof, or the standing of a complete resource for a part day, will be made pro-rata in proportion to an appropriate factor assessed by the Employer's Agent.

The amount by which compensation for delays is adjusted shall be subject to the contract price adjustment formula.

The Contractor shall take note that no payment will be considered for any additional cost incurred in protecting his plant and site establishment, as well as for costs incurred in respect of damage to constructional plant and equipment.

PSA 8.5 Sums Stated Provisionally by Employer's Agent

Add the following:

PSA 8.5.1 Arrange for additional testing to be carried out, as required by the Engineer, by an accredited laboratory..... Unit: Provisional Sum

The provisional sum provided in the Bill of Quantities is to cover the payment of the SANAS registered soils laboratory to conduct any additional tests as directed by the Employer's Agent.

PSA 8.5.2 Overhead, charges, profit etc. on item PSA 8.5.1.....Unit: %

The percentage tendered shall be paid to the Contractor on the actual amount paid to the soils laboratory and shall cover the following:

- All costs involved in arranging the tests with the laboratory.
- Setting out the positions for the tests to be taken by the laboratory as indicated by the Employer's Agent.
- Making good all test holes.
- The cost of all overheads, charges and profits.

PSA 8.5.3 Community Liaison Officer (CLO) remuneration.....Unit: Provisional Sum

PSA 8.5.4 Overheads, charges, profit, etc. on PSA 8.5.3.....Unit: %

PSA 8.5.5 Conducting of skills audit, development of training plan, attending accredited training courses.....Unit: Provisional Sum

PSA 8.5.6 Overheads, charges, profit, etc. on PSA 8.5.5.....Unit: %

PSA 8.5.7 Transport of workers during training where it is not possible to undertake training in close proximity to the site.....Unit: Provisional Sum

PSA 8.5.8 Overheads, charges, profit, etc. on PSA 8.5.7.....Unit: %

PSA 8.5.9 Accommodation of workers during training where it is not possible to undertake training in close proximity to the site.....Unit: Provisional Sum

PSA 8.5.10 Overheads, charges, profit, etc. on PSA 8.5.7.....Unit: %

PSA 8.8 Temporary Works

Add the following:

PSA 8.8.1 Access road to the works

Provision of access road to the works..... Unit: Sum

The contractor to construct temporary access road to the site of the works and rehabilitate the area to its original stated and approval of the environmental practitioner dealing with environmental matters on the contractor.

The rate to include for lifting, carefully removing and stockpiling and reinstating affected grassed areas to its original state. The road shall be constructed with suitable temporary layerworks to accommodate construction vehicles and shall be maintained for the duration of the contract. Temporary pavement layers to be removed from site and grassed areas reinstated upon completion of the works.

PSA 8.8.2 Accommodation of traffic on adjacent roads at all times..... Unit: Sum

A specific item has been included in the Schedule of Quantities to allow the Contractor to cover the costs of accommodating traffic on the adjacent roads at all times. The sum shall cover the effect on the Contractor's programme, delay in the works, damage to or loss of a deviation, supply, erection and moving and re-erection of all necessary traffic signs, drums, barricades, the provision of flagmen and any other operation or equipment, plant or labour necessary.

Temporary traffic signs shall be erected at all diversions. The number and layout of the traffic signs shall comply with the Site Manual entitled "**Safety at Roadworks**", as published by the Department of Transport.

Traffic signs shall have a yellow background with either a red or black border.

Payment under this item will be made on a pro-rata basis to the duration of the contract.

PSA 8.8.6 Special Water Control

Add the following:

(a) Special water control.....Unit:
Sum

The sum shall cover the cost for the provision, operation, maintaining and removal of all plant and materials required to deal with any water anywhere on site as required in terms of Subclause 5.1.3 of SANS 1200 D and Subclause 5.1.2 of SANS 1200 DB. No additional payment will be made for "Special water hazards".

The sum shall cover the cost of providing the necessary plant or materials, or both, fully erected and operative on the Site, the cost of operating and maintaining pumps, well points, sheeting, close timbering, and other equipment, as applicable, for 24 hours a day, 7 days a week, throughout the period during which the facilities are required, and the cost of removing such goods and restoring the Site to its original condition on completion of that part of the project for which the temporary works were erected.

Two equal payments will be made, one with the first and the other with the last payment certificate.

Add the following:

PSA 8.9 Employment of local labour duration of construction.....Unit: Month

Add the following new clause:

The sum tendered shall cover the cost for drawing up temporary employment contracts, complying with all aspects of EPWP labour reporting and & management of local labour.

PSA 8.10 Provision for the development of a Quality Assurance Plan.....Unit: Sum

Add the following new clause:

The tendered rate shall cover the fixed full costs for the implementation and management of the Quality Assurance Plan for the duration of the contract.

PSAB ENGINEER'S OFFICE (SANAS 1200 AB)

PSAB 3.1 Nameboards

In the second sentence, after the words "...employer, engineer and contractor", add the words "and funder".
Replace the third sentence with:

"The Contract Nameboards shall be erected within fourteen days of the Commencement Date and shall be placed where ordered. Any damage to this board shall be repaired within seven days of a written instruction issued by the Engineer. Name boards and signs shall be fabricated from durable materials such as Chromadek G275 galvanised steel plate that will not distort due to weather conditions and shall be mounted on poles adequately braced and founded to prevent warping or damage from wind or other adverse weather conditions. The Contractor shall keep the contract name board in good state of repair for the duration of the Contract and shall remove them on completion of the Contract.

Further to the above the Contractor will not be allowed to erect more than two of his own nameboards in the area of the Works. The position of these shall be agreed to by the Engineer. No payment will be made for the supply, erection or maintenance of the Contractor's nameboards and the Engineer reserves the right to order the removal of the nameboards if not properly maintained.

All nameboards shall be removed within 7 days of the issue of the "Certificate of Completion."

PSAB 3.2 Office Building (s)

Replace the content of clause 3.2 with the following:

"The Contractor shall provide and furnish three (3) offices and a boardroom for the use of the Engineer, as detailed below. The offices shall be suitable for accommodation of the following Engineer's staff:

- One Engineer's Representative (Resident Engineer);
- Three Assistant Resident Engineers; and
- Two Clerks of Works.

Minimum dimensions of these offices and boardroom shall be as follow:

Dimensions	Boardroom	Each Office
Minimum floor area	28m ²	16m ²
Minimum window area per room	4.0m ²	3.0m ²
Minimum window area opening per room	2.4m ²	1.5m ²
Minimum clear height	2.5m	2.5m

The siting of all offices shall be to the Engineer's satisfaction and shall be decided upon in consultation with him and confirmed in writing before erection.

Requirements of each office and boardroom building are as follows:

- a) Shall be weatherproof.
- b) Shall have a wooden boarded floor that is at least 150 mm above the ground.
- c) Shall be provided with a ceiling and a lining to the walls.
- d) Shall be capable of being locked by way of three-lever locks with two keys supplied for each lock. In addition, 2 master keys that fit all locks shall be provided.
- e) Shall be well ventilated and shall be so insulated as to provide comfortable working conditions. The office units must be max 12 000 btu. The boardroom must be max 18 000 btu.
- f) Shall have at least two double 230 volt plug outlets.

The internal furnishings of each office shall include:

- g) one trestle table, 2 m long x 1 m wide x 0,9 m high, with a smooth top;
- h) one table or desk having a top of size at least 1,5 m x 0.9 m and at least one lockable drawer;
- i) one high stool;
- j) two chairs;
- k) a lockable upright steel cabinet with three shelves or a steel filing cabinet with four drawers;
- l) shelving of total length 3 m and of nominal width 300 nun;

- m) an acceptable blind on each window;
- n) 2 x Double 80-watt fluorescent light fittings complete with ballast and tubes;
- o) an air-conditioning unit for heating in winter and cooling in summer, capable of maintaining a temperature in the office of between 18 and 22 degrees Celsius.

In addition, one of the Engineer's offices shall be provided with the following:

- q) Refrigerator.
- r) Printer (as further specified below);

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

The Boardroom shall be equipped with the following:

- s) Conference table large enough to accommodate twelve people and have an area of at least 15m².
- t) Fifteen office chairs
- u) 2 x Double 80-watt fluorescent light fittings complete with ballast, tubes and a double wall plug.

All offices and the boardroom shall:

- v) Have uncapped internet access with at least 4Mbps speed. The use of LTE or similar modems is acceptable provided that it allows for enough concurrent users and allows speeds of higher than the specified minimums.
- w) Be provided with a WIFI network that enables all the Engineer's offices and boardroom to connect to it. The password for the WIFI network shall be made available to the Engineer's staff, but shall not be shared with the Contractor's staff.

The Contractor shall provide and maintain a computer printer and associated infrastructure and services that shall comply with the following minimum specifications:

- x) Printers shall, unless otherwise approved by the Engineer, be Samsung SCX-4600 Colour Laser Printer Series or equivalent compatible.

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

- a) All IT equipment provided shall be kept fully serviceable at all times by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 48 hours after notification by the Engineer's staff.
- b) The Contractor shall further provide at his own cost, all paper, ink cartridges, files and other consumables reasonably required by the Engineer.

The Contractor shall provide covered parking with spaces for 6 vehicles for the Engineer's use, with specifications as follow:

- c) The covered parking shall consist of corrugated or IBR roof sheeting on a timber or steel framework.
- d) Each parking space shall be at least 5m long x 2.5m wide.
- e) The minimum clear height between floor and the underside of the sheeting shall be 2.2m.
- f) The underside of the roof shall be free of protruding bars and ledges that may provide perches for birds.
- g) All spaces must be parallel.
- h) The carports shall be constructed so that the vehicles parked under them are always protected against the direct rays of the sun.
- i) The carport floor shall be covered with a layer of crushed stone to alleviate dusty and muddy conditions.
- j) The carports shall be positioned so as to provide easy and convenient access to the Engineer's offices.

The Contractor shall also supply a toilet with wash-basin for the exclusive use of the Engineer.

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

PSAB 4.1 Telephone

Replace subclause 4.1 with the following:

"The Contractor shall at his own cost, arrange for the provision of six (6) Samsung A20 or similar approved cellular phones, each with 150 minutes of airtime and 2 GB data bundles per month, for use by the Engineer's staff. No out-of-bundle usage shall be allowed.

Any additional purchase of airtime or data bundles shall be made by the Engineer. "

PSAB 4.2 Survey Equipment

Add new Clause 4.2

The Contractor shall provide and maintain survey equipment for the Engineer's use as follows:

- Calibrated Automatic Level with protective case
- Tripod
- 5m telescopic staff
- Measuring tape (100 m steel)
- 1m spirit level
- Paper, Clipboard and level book.
- Benchmark locations and levels
- One engineer's measuring wheel
- The Contractor shall keep the equipment insured throughout the Contract period against any loss, damage or breakage and shall indemnify the Engineer and the Employer against any claims in this regard.
- Upon completion of the Works, the ownership of the equipment shall revert back to the Contractor.
- All survey equipment provided by the Contractor shall be in good condition, properly calibrated and fit for the purpose."

PSAB 5 CONSTRUCTION

PSAB 5.4 Telephone

Replace subclause 4.1 with the following:

"The Contractor shall maintain, repair and/or replace all cellular phones if damaged through use on Site. The Contractor shall address any connectivity issues with the network operator within 24hrs of being made aware of such by the Engineer's staff."

PSAB 8 MEASUREMENT AND PAYMENT

Add the following:

PSAB 8.2.1.1 Contract Name boards.....Unit: No

The tendered rate shall cover all costs associated with the requirements of Clause PSAB 3.1.

PSC SITE CLEARANCE (SANS 1200 C)

PSC 3 MATERIALS

PSC 3.1 Disposal of material

Add the following:

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

PSC 5 CONSTRUCTION

PSC 5.1 Areas to be cleared and grubbed.

The Contractor shall ensure that the areas cleared and grubbed are kept to the minimum area necessary for the execution of the Works.

The Contractor shall clear and grub the area required for the Works, areas on which material will be stockpiled for later use and areas where material is to be dumped and spread, unless instructed otherwise by the Engineer.

PSC 5.2 Cutting of trees

The Contractor shall not remove trees with a trunk girth of more than 1m without the written permission of the Engineer.

PSC 5.6 Conservation of topsoil

Topsoil shall be removed from the cleared areas up to a depth of 150 mm (if available) and stockpiled.

8. MEASUREMENT AND PAYMENT

Add the following new Clause:

PSC 8.2.11 Take down and re-erect existing fences:

- (i) 1,2m high barbed wire stock fence and erect in new temporary position on the Site as instructed by the Engineer.....Unit: metre (m)
- (ii) 1,2m high x 4,2m wide farm gate complete with gate posts and erect in new temporary position on the Site as instructed by the Engineer.....Unit: metre (m)

The existing fence and gates shall be carefully removed to avoid damage and erected in a position on the Site as instructed by the Engineer. The rate to include transportation, excavation, footings and all other costs associated with re-erecting the fence in the temporary position and removing the fence at a later stage.

PSD EARTHWORKS (SANS 1200 D)

PSD 2 INTERPRETATIONS

PSD 2.3 Definitions

Amend the sentence headed "Restricted excavation" to read:

"Restricted excavation – All excavations for individual structures starting from the specified bulk excavation platform levels or, where no bulk excavation platform has been specified, from 150mm below natural ground level (ie excluding a nominal 150mm topsoil layer to be removed beforehand)."

Replace the definition "Borrow" with the following :-

"Borrow Material : Material, other than materials obtained from excavations required for the Works, obtained from sources such as borrow pits or the authorised widening of excavations. 'Borrow' shall have a corresponding meaning."

Replace the definition "Stockpile" with the following :-

"Stockpile (Verb) : The process of selecting and, as may be necessary, loading, transporting and off-loading material in a designated area for later use and a specific purpose."

Add the following definitions :-

"Fill : An embankment or terrace constructed from material obtained from excavations or borrow. In roads it includes the earthworks up to the underside of the Selected Sub-Grade level.

Fill (Material) : Material used for the construction of an embankment or terrace.

Roadbed : The natural in-situ material on which the fill, or in the absence of fill, any pavement layers, are to be constructed."

PSD 3 MATERIALS

PSD 3.1.2 Classes of excavation

Delete the contents of this clause and replace with the following:

"For this contract, the classes of excavation will be subdivided as follows:

(a) Soft excavation

All material which can still be efficiently excavated (in the opinion of the Engineer) by 30t excavator fitted with 'rock bucket' (excavator bucket typically fitted with not more than 3 tines designed to loosen layered weathered solid sedimentary residual material). This includes both soft soil material and weathered and fractured sandstone.

(b) Hard Excavation / Hard Rock

All partially weathered / unweathered sandstone material (in the opinion of the Engineer) which would normally be drilled and blasted if allowed:

- 1) Using Heavy Duty hydraulic breaker (albeit at a much slower rate of production than intermediate above);
- 2) Hard Rock excavation by drilling and pouring-in expanding grout: All material where Engineer agrees cannot reasonably be broken-out by 30t heavy duty hydraulic breaker alone due to access difficulties or extreme hardness.

Any unweathered boulders encountered shall be classified as 'Hard Rock: excavation by hydraulic breaker or expanding grout (as agreed with the Engineer)' where such boulders exceed 0,125m³ (approx. 500 x 500 x 500mm) in volume. Boulders smaller than this size shall not be classified.

PSD 3.3 Selection

PSD 3.3.1 General

Replace 3.3.1 with the following:

The Contractor is required to select, strip 150mm deep and conserve all topsoil from all work areas not already stripped of topsoil; including:

- Temporary stockpile areas (except topsoil stockpile areas)

- Any other otherwise undisturbed area used by Contractor for his own purposes.

The Contractor shall, for bulk, restricted and trench excavation, actively select-out and keep separate all materials into one of the following groups:

- Soft fully – weathered soil
- Weak mudstone / siltstone / sandstone (unsuitable for backfilling), but still falls into the 'soft material' classification as defined in PSD 3.1.2 a)
- Hard rock material (as defined in PSD 3.1.2 b).

Where the selected material is to be spoiled at the designated off-site spoil dump, the material shall be stockpiled separately at the spoil site in its respective group so that it can either be recovered later or selected by others. All material stockpiled on site for later use as backfilling or fill or landscaping shall also be stockpiled in their respective classification groups.

Add the following subclause:

"PSD 3.3.3 Selection in borrow pits and excavations

Approval of a borrow area for a certain purpose does not necessarily mean that all the material in that area is suitable for the specified purpose. What it does mean is that the borrow area contains some suitable material. The onus shall rest on the Contractor to ensure that only material that is indeed suitable is removed and used for the specified purpose.

When the Contractor has to select excavated material for a specific purpose, the above provisions relating to borrow areas shall apply *mutatis mutandis* to excavations.

The Contractor shall not waste or contaminate material that has been selected for a specific purpose."

Add the following sub clause :-

PSD 5 CONSTRUCTION

PSD 5.1.1.1 Barricading and Lighting (Refer SANS 1921-1 Clause 4.18.2 and 4.18.3)

Delete the Sub-Clause and substitute:

Without limiting any obligation which the Contractor may have in terms of any Act, Ordinance or other legislation, the Contractor shall ensure that all excavations which are accessible to the public or which are adjacent to a public road or thoroughfare, or by which the safety of persons may be endangered are protected as set out in Clause 13 of the General Safety Regulations of the Occupational Health and Safety Act, 1993 and that watchmen are employed to ensure that barricades, barriers and lights are effective at all times.

PSD 5.1.1.2 Safeguarding of excavations

Replace Clause 5.1.1.2 (b) with the following:

The Contractor must note that the excavations for most of the structures are deep. The Contractor is responsible for ensuring that all temporary excavation faces are stable and safe at all times and shall either:

- Provide a shoring system, designed by the Contractor and signed by a suitably qualified Professional Engineer, or
- Reduce the slope of excavations to the safe angle as determined by a suitably qualified Professional geotechnical engineer employed by the Contractor.

Where any part of the sides of the excavation for structures are steeper than 1 vertical : 2 horizontal and deeper than 1m below ground level, a 1m high perimeter barrier fence comprising at least 75mm diameter gum-poles or mild steel 'Y' fencing standard (at no more than 1,5m c/c) firmly anchored into the ground with at least 3 strands of high tensile fencing wire shall be erected no closer than 1m from the edge of the excavation (or further back if ground is unstable or disturbed). The barrier fence shall remain in place and be maintained until the relevant excavation is backfilled and/or profiled to shallower than 1:2 slope.

In addition, the Contractor shall provide stormwater diversion berms or ditches upstream of excavations for structures and, where reasonably possible, make all excavations free-draining. Where making excavations free-draining is not reasonably possible, the Contractor shall not allow water from any source to accumulate beyond 300mm deep anywhere in any excavations.

PSD 5.1.1.3 Blasting

The use of drilling and blasting methods to excavate hard rock will be limited to remote areas more than 500m from any structures or dwellings.

PSD 5.1.1.3a) Explosives (Refer SANS 1921-1 Clause 4.7)

Notwithstanding Sub Clause 5.1.1.3 the Engineer shall be notified at least 48 hours beforehand of the Contractor's intention to use explosives on site

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

PSD 5.1.1.3b) Use of Explosives (Refer SANS 1921-1 Clause 4.7)

Generally, the Contractor will be permitted to use explosives for breaking up rock and hard material during excavations, subject to the following conditions:

- Excavating using explosives will only be allowed during the early phases of the Contract before any of the reinforced concrete foundations of adjacent structures (closer than 25m) are cast. The Contractor shall therefore either:
 - Proceed with restricted excavations for the clariflocculators and filter buildings in parallel with each other; or
 - At least, drill and blast for all clariflocculators and filter buildings in close order, but defer the actual removal of the broken hard material to 'as and when' desired.
- (a) The Engineer or Inspector of Explosives shall have the power to prohibit the use of explosives in cases where in his opinion, the risk of injury or damage to persons, property or adjoining structures is too high.
- (b) Should blasting be necessary, the Contractor shall take every precaution to protect the Works and persons, animals and property in the vicinity of the site. The Contractor will be held responsible for any injury or damage caused by any blasting operations and shall make good such damage at his own expense.
- (c) The requirements of the Explosives Regulations Act (Act 26 of 1956) and the requirements of the Inspector of Explosives shall be complied with. In addition, where applicable, the requirements of Chapter 9 of the Regulations published in terms of the Mines and Works Act (Act 27 of 1956) and the requirements of the Government Mining Engineer shall be complied with.
- (d) A copy of each blasting permit issued to workmen, and of each permit issued to the Contractor to cover the purchase, storage and transport of explosives, shall be handed to the Engineer. The Contractor shall grant the Engineer access to all records maintained for the Inspector of Explosives or the Government Mining Engineer, as the case may be.
- (e) Before any blasting is undertaken, the Contractor, together with the Engineer and the ISD Consultant
- (f) and CLO shall examine and measure up any buildings, houses or structures in the vicinity of the proposed blasting and establish and record together with the owners thereof the extent of cracking or damage that may exist before commencement of blasting operations. It is advised that a photographic record will be required of neighbouring structures before blasting commences. These structures will be pointed out by the Engineer. It shall be the responsibility of the Contractor to make good at his own expense any further damage to such houses, buildings or structures which is a result of the blasting.
- (g) Where there is reasonable danger of damage to power and telephone lines or any other property, the Contractor shall suitably adapt his methods of blasting and the size of the charges and use adequate protective measures such as cover blasting in order to limit the risk of damage as far as possible.
- (h) When blasting to specified profiles, the Contractor shall so arrange the holes and charges such that the resulting exposed surfaces are as sound as the nature of the material permits. The Contractor shall make good at his own expense any additional excavation necessitated by the shattering of rock in excess of any over break allowance specified in the Specification Data or in any other specification or given on a drawing.

PSD 5.1.1.3c) Limitations for Blasting

- a) Approval of methods and keeping of records

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

Prior to starting any drilling for the first section of blasting, the Contractor shall submit for approval to the Engineer, details of the proposed overall methods of blasting that will be used on site, including spacing, depth and pattern of holes, charging levels (kg/m³), spacing and positioning of relays, method of blast initiation, precautions to prevent 'fly rock', maximum charge per relay, traffic arrangements during blasting, and any other details he may consider relevant. These details shall be submitted in writing and supported with sketches at least 7 days before the commencement of drilling and blasting.

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

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

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

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

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

b) Vibrations

Blasting vibrations are caused by the transmission of the shock wave from the explosion charge through the material being blasted. This shock wave could cause damage to structures in the vicinity of the blasting if the vibrations are not limited to acceptable levels. Damage to structures is closely associated with peak particle velocity of the ground vibrations in the vicinity of the structure. Advisable maximum levels for peak particle velocity are given in Table 2.

Table 2 - Maximum Particle Velocities (Vibration)

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

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

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

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

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

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

Table 3 - Maximum Charge Levels

Minimum distance from nearest blast hole Structure (m)	Maximum charge mass per relay (kg)
10	0,19
20	0,76
30	1,7
40	3,0
50	4,7
60	6,8
70	9,3
80	12,1
90	15,3
100	18,9

Only detonating relays of at least 20 milliseconds delay interval shall be used.

The above relationship can be used to calculate charge mass for other velocity limits. However, if higher charge levels have to be used for practical reasons, expert advice and possibly vibration measurements will be required.

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

PSD 5.1.1.3d) Negligence

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

PSD 5.1.3 Stormwater

Add the following to this Clause:

In that many of the excavations for structures cannot reasonably be made free-draining, it will be necessary to actively remove accumulated rain water from the excavations. The Contractor shall provide, operate and maintain sufficient pumping equipment, pipes and other equipment on site as may be necessary to keep all excavations largely free of standing water at all times.

The Contractor shall be responsible throughout the duration of the Contract, inclusive of the Defects Liability Period, for the provision of all soil erosion preventative measures necessary to protect the trenches, pipeline(s) and land utilised by the Contractor during the Contract from any adverse effects of soil erosion, settlement, scour, etc., resulting from the construction of the Works.

Cross embankments, generally extending across the full width of the working strip, consisting of low earth mounds shaped to rounded form and so oriented as to have a fall of 1% along their length, shall be constructed with compacted material having a minimum density of 90% modified AASHTO density and minimum dimensions and maximum spacing dependent on the slope of the ground along the length of the pipeline, as indicated in the following table:

Slope of Ground	Minimum Height	Minimum Width	Base	Maximum Spacing
0% - 5%	No cross-embankments required			
5% - 10%	300 mm	1,2 m		40 m
10% - 15%	375 mm	1,5 m		30 m
Greater than 15%	450 mm	1,7 m		20 m

The height of the cross-embankments for a distance of 1 metre on either side of the trench centreline shall be raised 150 mm above the remainder of the cross-embankment to allow for settlement. In order to form a satisfactory drainage channel upstream of each cross-embankment (at a slope of 1%) the crown over the backfilled trench shall be removed for a distance of 0.5 m upstream of the cross-embankment.

Cross-embankments shall be constructed to the same minimum standards and dimensions indicated above wherever artificial slopes have been formed on the working strip or other areas used during construction and, with the approval of the Engineer, are permitted to be so left.

No additional payment will be made for the construction of cross-embankments which will be deemed to be included in the excavation rates.

PSD 5.1.4.1 Dust nuisance

Add the following to this Clause:

Given the very fine texture of the soil, in dry, windy weather, extremely dusty conditions can be expected on Site unless suitable mitigation measures are taken. The Contractor shall be responsible for actively implementing effective dust control measures such that dust levels do not hamper workers' health and productivity.

The Contractor shall plan his execution of the Works accordingly and shall use sufficient water (with or without approved additives) or other methods to keep the level of dust to a reasonable minimum. Water for this purpose may be abstracted from the nearby river. This shall be done in consultation with the Engineer and to the Engineer's approval. The cost of all such mitigation measures shall be deemed to be included in the scheduled rates for excavation or Preliminary & General items.

PSD 5.1.6 Road Traffic Control

In the 4th line of Sub-Clause 5.1.6 amend "South African road traffic signs manual1)" to read: "Southern African Development Community: Road Traffic Signs Manual1) and Chapter 13: [Road works Signing] of the South African Road Traffic Signs Manual1) ", and amend the footnote to read:

"1) Published by the Department of Transport, Pretoria."

Where traffic signals are required, they shall be provided and operated in accordance with the applicable requirements of the South African Road Traffic Signs Manual.

Where work is to be carried out while half of the roadway is closed to traffic, flagmen shall be provided and temporary road signs shall be erected, maintained and operated."

PSD 5.2.2.1 Excavation for General Earthworks and for Structures (Refer SANS 1921-1 Clause 4.10)

Regarding over-excavation and overbreak, add the following to sub-clause (e):

Where the Contractor excavates in material classified as 'soft' (in terms of PSD3.1.2) to dimensions in excess of those shown on the drawings or ordered by the Engineer or if the material in the bottom of an excavation is loosened before concrete has been cast, or if there is any over-excavation, or any loose or disturbed soil, it shall be removed and the over-excavation under structures shall be replaced, at the Contractor's expense, by imported G2 crusher run material from commercial sources compacted to 100% mod AASHTO density or, alternatively, with 15MPa/20 mass concrete as ordered by the Engineer.

For restricted excavation in material classified as 'hard rock' (as defined in PSD3.1.2), an allowance for an average overbreak layer of 150mm below the required founding level (ie underside of blinding layer) for all structures will be automatically added to the quantity measured for payment for restricted excavation. Similarly, measurement for replacing overbreak with compacted G2 material (as per filling of over excavation mentioned above) will be automatically measured for payment. Over-break (and G2 filling) beyond the 150mm overbreak allowance shall be evaluated by the Engineer as 'avoidable' (and therefore deemed to be over-excavation and to the Contractor's account) or 'unavoidable' (excavation and backfilling measured for payment) .

Add the following new Sub-Clauses:

- (f) The Contractor shall inform the Engineer, in writing, at least 14 days before commencing any work which will result in a change in the topography of the site, whether such work is for the permanent works or for temporary works which the Contractor intends to execute for his own convenience. Thereupon, before commencing the work, the Contractor shall take cross-sections of the original ground profiles or another approved method to determine the ground profiles of the entire area to be worked. In addition all rock and/or foundation levels shall be recorded as the work proceeds.

The information so obtained shall be permanently recorded on a drawing or drawings which shall each be signed by both the Contractor and the Engineer. The Contractor shall then provide the Engineer with a reproducible copy of each drawing to serve as a permanent record both for the purpose of determining the quantities of excavation and earthworks carried out in the construction of the permanent works and the extent to which temporary works shall be removed or temporary excavations shall be refilled upon completion of the Works.

- (g) Excavations to final level, ready to receive a blinding layer or concrete footing, shall be completed not less than 24 hours before such layer or footing is cast. The Contractor shall arrange for the inspection by the Engineer or his Representative of all surfaces immediately before backfilling of any kind or casting blinding.

- (h) Where permanent concrete is to be placed against an excavated face, the excavation shall be trimmed to ensure that there is no projection greater than 20 mm protruding into the excavation profile.
- (i) The Contractor shall not spoil, waste or stockpile excavated material without approval.

PSD 5.2 Methods and Procedures

PSD 5.2.2 Excavation

PSD 5.2.2.2 Borrow Pits

Add the following:

"A commercial source shall, for the purposes of this Specification, mean a source of material provided by the Contractor, not the Employer.

Where it is specified that material shall be obtained from commercial sources, the Contractor shall be responsible and include in his price for fill from commercial sources, for finding a source of suitable material, for making all arrangements for procuring the material with the owner of the source, for the payment of any royalties, charges or damages and for transporting the material to the site regardless of the distance involved.

Commercial sources shall not be used for any materials without the written approval of the Engineer."

PSD 5.2.2.3 Disposal

REPLACE THE SECOND SENTENCE WITH THE FOLLOWING:

"The Contractor shall provide all necessary spoil sites for the spoiling of all surplus and unsuitable materials and shall make the necessary arrangements with the owner of the site where the material is disposed of, and pay all charges and levies as may be applicable for the use of such spoil sites.

Every spoil site provided by the Contractor shall be approved by the local authority in whose area it is located, and the spoiling shall comply with the applicable statutory and municipal regulations as well as the requirements of the owner of the spoil site.

Payment to the Contractor in respect of locating and making arrangements for suitable spoil sites and spoiling material at the such sites will be made in accordance with the provisions of subclause PSD 8.3.15."

ADD THE FOLLOWING SUBCLAUSE IN SUBCLAUSE 5.2.2:

"PSD 5.2.2.4 Selection and stockpiling

Approval or designation of the material in a particular borrow pit or excavation for a particular purpose does not imply that all the material in the borrow pit or excavation is suitable for the particular purpose to which the said approval or designation relates, nor that all material in the borrow pit or source should be used for the particular purpose. The Contractor shall select suitable material from that borrow pit or source, discard unsuitable material and reserve material for other purposes as necessary.

The Contractor shall organise and carry out his operations in such a manner as will prevent the contamination of suitable embankment and backfill material with unsuitable materials. Any excavated material which becomes, in the Engineer's opinion, unsuitable for use in embankments or backfill as a result of contamination, shall be disposed of in a manner acceptable to the Engineer and shall be replaced by the Contractor with materials acceptable to the Engineer, all at the Contractor's cost.

When required, or when ordered by the Engineer, material shall be stockpiled for later use. The additional costs for stockpiling material shall be paid to the Contractor in accordance with the provisions of subclause PSD 8.3.14."

PSD 5.2.5 Transport for earthworks

Replace the contents of subclause 5.2.5 with the following:

"The transport of all excavated materials, irrespective of the distance and source, shall be deemed to be free-haul, the cost of which is included in the Contractor's tendered rates and prices for the excavation of the materials. No separate compensation shall apply for the transportation of excavated materials."

PSD 7 TESTING

PSD 7.2 Taking and testing of samples

Replace the contents of the sub-clause with the following:

The Contractor shall carry out sufficient process control checks on the compaction of all fill and backfill layers in the presence of the Engineer's Representative to be able to demonstrate that the specified compaction is being achieved. The frequency of testing shall be such that tests shall be carried out for every lift of backfill material starting from 300 mm. The costs of testing shall be deemed to be included in the rates for backfilling of the platform.

PSD 8 MEASUREMENT AND PAYMENT

PSD 8.1 BASIC PRINCIPALS

Add the following Sub-clauses:

PSD 8.1.4 Recording of original ground profiles

The tendered rate for excavation shall cover the cost of recording the original ground profiles, rock and/or foundation levels, as applicable prior to commencement of any excavation, including stripping of topsoil. This is required to allow the Engineer to check the Contractor's survey and adjust his design levels if necessary.

PSD 8.1.5 Backfilling of over excavation

Backfilling over-excavation with compacted G2 material or mass concrete as specified in PSD 5.2.2.1(e) will not be measured for payment unless the over-excavation is ordered by the Engineer to remove unsuitable material, in which case the additional excavation will be measured and paid as restricted excavation in 'soft' material and the G2 or mass concrete will be measured by volume, all to the additional dimensions ordered by the Engineer.

PSD 8.1.6 Overbreak

For restricted excavation in material classified as 'hard rock' (as defined in PSD3.1.2), an allowance for an average overbreak layer of 150mm below the required founding level (ie underside of blinding layer) for all structures will be automatically added to the quantity measured for payment for restricted excavation. Similarly, measurement for replacing overbreak with compacted G2 material (as per filling of over excavation mentioned above) will be automatically measured for payment. Over-break (and G2 filling) beyond the 150mm overbreak allowance shall be evaluated by the Engineer as 'avoidable' (and therefore deemed to be over-excavation and to the Contractor's account) or 'unavoidable' (excavation and backfilling measured for payment) .

PSD 8.2.1 Computation of quantities

Add the following to Clause 8.2.1:

The volume of excavated material will be measured from the net outline of the structures and the average depth of excavation unless otherwise approved by the Engineer.

As noted in PSD 5.2.2.1, for restricted excavation in material classified as 'hard rock' (as defined in PSD3.1.2), an allowance for an average overbreak layer of 150mm below the required founding level (i.e. underside of blinding layer) for all structures will be automatically added to the quantity measured for payment for restricted excavation; as will the volume of G2 backfill.

PSD 8.3 SCHEDULED ITEMS

PSD 8.3.2 Bulk Excavation

Replace the contents of this clause with the following:

"(a) Excavate in all materials and use for embankment or backfill as ordered, from:

- (1) Necessary excavations Unit: m³
- (2) Designated borrow pits Unit: m³

(3) Commercial sources Unit: m³

The unit of measurement shall be the cubic metre measured in place in accordance with subclause 8.2 of SABS 1200 D.

Separate items will be scheduled for embankments and backfills for different parts of the works.

The tendered rates shall cover the cost of complying with all the precautions required in terms of subclause 5.1 of SABS 1200 D (as amended), in addition to the cost of excavating in all materials, basic selecting, loading, transporting, off-loading, spreading or backfilling, watering, compacting, final grading, complying with the requirements for tolerances, providing for testing, finishing and tidying, all in accordance with the specifications.

In addition to the foregoing, the tendered rate for subitem (b) shall further include for the costs of royalties (if applicable), whilst the tendered rate for subitem (c) shall also include for the costs of finding a source of suitable material, for making arrangements with the owner of the source, for procuring the material, for the payment of all requisite royalties, charges or damages, and for transporting the material to the site regardless of the distance involved. No payment will be made for the removal of overburden or stockpiling at the commercial source and no extra over payment shall apply for excavating in intermediate, hard or boulder material."

(b) Excavate in all materials and dispose Unit: m³

(Separate subitems may be scheduled by the compiler for excavations for different parts of the works).

The unit of measurement shall be the cubic metre of material excavated, measured in place in accordance with subclause 8.2 of SABS 1200 D.

The tendered rates shall cover the cost of complying with all the precautions required in terms of subclause 5.1 of SABS 1200 D (as amended), in addition to the cost of excavating, basic selecting, loading, transporting, off-loading at the spoil site, maintaining and finishing the spoil site, all in accordance with the specifications.

PSD 8.3.3 Restricted Excavation

Replace the contents of this clause with the following:

Separate scheduled items will be provided for each type of excavation material (in accordance with the selection criteria specified in PSD 3.3.1), together with its method of excavation and intended destination / use as per PSD 8.3.2 Bulk Excavation. Separate scheduled items will be provided for each type of structure.

Notwithstanding the requirements of Clause 8.3.3, no additional payment will be made for restricted excavation of roads in its entirety irrespective of road width or length. The cost of which will be deemed to be included in the tendered rates for excavation.

PSD 8.3.3 (b) Extra-over 8.3.3 a)

Add the following:

) Hard rock excavation without using explosives Unit: m³

The use of explosives to remove hard rock in restricted areas will not be permitted. The contractor's rate to include employing other methods of excavation such as wedging and splitting, or hydraulic hammers.

PSD 8.3.3 Extra-over 8.3.3 a)

Add the following:

c) Hand Excavation Unit: m³

The rate to make provision for hand excavation which shall be employed where possible as instructed by the Engineer.

PSD 8.3.4 Importing of materials

Delete subitem (a) of 8.3.4 and replace with the following:

- a) Extra over items 8.3.2 and 8.3.3 for importation of materials from commercial sources or contractor's off site sources
 - i) Commercial sources..... Unit: m³
 - ii) Contractor's off-site sources..... Unit: m³
- d) Extra over items 8.3.2 and 8.3.3 for importation of material from other necessary excavations on site..... Unit: m³
- e) Extra-over item 8.3.2 for importation of impervious clayey lining material to Sludge Lagoon base and embankments:
 - i) 300mm thick compacted in 150mm thick layers compacted to 95 % mod. AASHTO maximum density..... Unit: m³

PSD 8.3.6 Overhaul

Delete subclause 8.3.6.

PSD 8.3.5 Extra excavation to provide working space around structures

In addition to the provisions of clause 8.3.5, the tendered rates for 'extra excavation in all materials for working space' shall also include for:

- 1) Any lateral support (if necessary for stability) and any other measures required to render and maintain the excavation sides in a safe, stable state at all times as specified in clause 5.1.1.2 and PSD 5.1.1.2 b);
- 2) The cost of temporarily stockpiling working-space material (on or off-site), spoiling any unsuitable and excess material, processing to OMC and backfilling and compacting to 95% Mod AASHTO density in layers not exceeding 150mm.
- 3) Provision of access ramps into the excavation (or other means of providing safe access for personnel and plant to enter and exit the excavations).
- 4) Provision and maintenance of a 1m high barrier fence around all excavations deeper than 1,0m and where the sides of the excavation are steeper than 1 vertical : 2 horizontal.
- 5) Provision of stormwater diversion berms or ditches upstream of the excavation and maintaining a minimum of accumulated rain water in the excavations.

PSD 8.3.8.1 Existing Services Unit: m³

Add the following to Subclause 8.3.8.1(c):

The rate tendered for (c) shall further cover the cost of backfilling the excavation with excavated material compacted to 90% Modified AASHTO density, loading, transporting within a free haul distance of 0,5 km and disposing surplus material as directed, keeping the excavation safe, dealing with water, taking special care that the exposed services are not damaged in any way and any other operation necessary to complete the work.

The tendered rates shall also include for keeping excavations safe, for dealing with surface and subsurface water, for removing surplus excavated material from the Site, for transporting all material within the free-haul distance, and for supplying adequate supervision during both excavation and backfilling operations.

No distinction will be made to the depths or the lengths to which excavations are taken. Excavation in excess of that authorised will not be measured for payment."

PSD 8.3.10 Top soiling

Delete the contents of this clause and replace with the following:

"The rate shall cover the cost of supplying topsoil from commercial, stockpile or other sources on site within a free haul distance of 1.5km (as applicable), preparing the area to be top-soiled in accordance with PSDB 5.2.4.2 including removal and spoiling of rocks, stones and debris; applying 2:3:4(30)zn fertilizer at a rate of 40gm/m² and raking the topsoil surface ready for installation of vegetation cover."

Add the following new Clause

Add the following items in subclause 8.3:

"PSD 8.3.14 Extra over items PSD 8.3.2.(a)(1) and PSD 8.3.3 for temporary stockpiling Unit: m³

The unit of measurement shall be the cubic metre of material from necessary excavations, temporarily stockpiled by the Contractor on the instructions of the Engineer, before being used in embankments or backfill. Measurements shall be taken in place in compacted embankment or backfill as the case may be.

The tendered rate shall include for the costs, additional to those provided for in PSD 8.3.2(a)(1) and PSD 8.3.3, of off-loading, forming and maintaining the stockpile for as long as is required, reloading and transporting within the applicable free-haul distance from the stockpile.

Payments to the Contractor under this item will only be made in respect of that material stockpiled on the instructions of the Engineer (which instruction shall state specifically that payments for such stockpiling will be paid for under this item) and no payments will be made to the Contractor under this item in respect of materials stockpiled by the Contractor on his own volition, nor for materials necessarily stockpiled by the Contractor in consequence of the sequence of operations adopted by him the course of executing the works, whether such stockpiling was avoidable or otherwise."

"PSD 8.3.15 Extra over items PSD 8.3.2(b) and PSD 8.3.3 for disposing of spoil material on a site provided by the ContractorUnit: m³

The unit of measurement shall be the cubic metre measured in accordance with subclause 8.2 of SABS 1200 D of surplus and/or unsuitable material disposed of, on the instruction of the Engineer, at a spoil site or spoil sites provided by the Contractor.

The tendered rate shall include full compensation for the additional cost of providing a spoil site or other means of disposing of surplus spoil material, for transporting the material regardless of the distance involved, for acceptance charges for such material and for all other incidental costs to dispose of the spoil material."

"PSD 8.3.16 Importing of Materials for Fill Under Floors and Foundations

Separate items will be scheduled for each different class and type of fill material. The tendered rate shall cover the cost for importing from commercial sources, transporting, placing and compacting material.

- i. Clean Sand compacted to 100% Modified AASHTO (unless otherwise stated) in 150mm thick layers (unless otherwise stated) Unit: m³
- ii. G5 compacted to 97% Modified AASHTO (unless otherwise stated) in 150 mm thick layers (unless otherwise stated) Unit: m³
- iii. G6 compacted to 95% Modified AASHTO (unless otherwise stated) in 150 mm thick layers (unless otherwise stated)Unit: m³
- iv. G7 compacted to 95% Modified AASHTO (unless otherwise stated) in 150 mm thick layers (unless otherwise stated)Unit: m³
- v. Clay material from commercial sources or borrow pits (Classified in Particular Specification PDP 03, Section 3.2) Unit: m³
- vi. Backfill (class of material stated) stabilised with 5% cement where directed by the Engineer.....Unit: m³

The unit of measurement shall be the cubic metre of backfill material, measured in place after compaction according to the authorised dimensions, which was stabilised on the Engineer's instructions in accordance with Subclause PSDB 3.5(c).

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing, backfilling and compacting the stabilised material to 90% of modified AASHTO density.

- vii. Soilcrete backfill (class of material stated) where directed by the Engineer.....Unit: m³

The unit of measurement shall be the cubic metre of soilcrete placed on the Engineer's instructions in accordance with Subclause PSDB 3.5(d), measured in place according to the authorised dimensions.

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete as well as for the cost of shuttering if required. The rate will make full provision placing, vibrating and compacting as applicable

- (h) Etc for other fill materials."

PSDB EARTHWORKS (PIPE TRENCHES) (SANS 1200DB)

PSDB 3 MATERIALS

PSDB 3.1 Classes of Excavation

Delete the contents of this clause and replace with the following:

“For this contract, the classes of excavation will be subdivided as follows:

(a) Soft excavation

Soft excavation shall be excavation in all materials and boulders which in the opinion of the Engineer can be efficiently excavated and loaded by a 30t excavator fitted with 'rock bucket' (excavator bucket typically fitted with not more than 3 tines designed to loosen weak rock material).

e) Hard Excavation / Hard Rock

All unweathered sandstone material (in the opinion of the Engineer) which would normally be drilled and blasted if allowed:

- 1) Using Heavy Duty hydraulic breaker (albeit at a much slower rate of production than intermediate above);
- 2) Hard Rock excavation by drilling and pouring-in expanding grout: All material where Engineer agrees cannot reasonably be broken-out by 30t heavy duty hydraulic breaker alone due to access difficulties or extreme hardness.

Any unweathered boulders encountered shall be classified as 'Hard Rock: excavation by hydraulic breaker or expanding grout (as agreed with the Engineer)' where such boulders exceed 0,125m³ (approx. 500 x 500 x 500mm) in volume. Boulders smaller than this size shall not be classified.

PSDB 3.3 Selected Granular Material

For the Ntsonyini and Ngqonweni areas, selected material from approved commercial sources shall be used for both "selected granular material" and ' Selected fill material'.

PSDB 3.4 Selected Fill Material

For Steel, Ductile Iron, GRP and PVC pipes, all material to 300mm above the crown of the pipe shall be measured as selected granular.

PSDB 3.5(a) Backfill Material

In the third line delete "150 mm" and substitute "100 mm".

PSDB 3.5(b) Backfill Material

In the second line delete "PI not exceeding 12" and substitute "PI not exceeding 6".

PSDB 3.5(c) Cement Stabilised Backfill

Add the following new Sub-Clause:

Where scheduled, or directed by the Engineer, backfill shall be stabilised with 8% cement by mass. The backfill material shall have a plasticity index not exceeding 10 and all material must pass through a sieve of aperture size not exceeding that specified in SABS 1200 LB, Sub-Clause 3.2, as amended.

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

PSDB 3.7 Selection

Replace the words "if he so wishes" in the first line of the second paragraph with the words "at his own cost".

PSDB 5 CONSTRUCTION

PSDB 5.1.5 Barricading of Open Excavations in Inhabited Area

Add new Subclause :

"The Contractor shall supply, install and maintain temporary fencing on both sides of the working area and around the perimeter of all agreed additional working areas during construction for prevention of unauthorised access and shall remove on completion of the works. The fencing shall comprise 2m high Bonnox 4 x 4 Mesh fencing, Bonnox pattern 1972/4, with straining posts and straining wires as required and according to supplier's directions and with mesh spacing not exceeding 100mm in both the vertical and horizontal directions. Chevron tape shall be interwoven in a zig zag pattern from the top to the bottom of the fence thereby clearly marking off the working area.

Gates shall be provided by the Contractor at all points as required for construction access purposes. The Contractor shall be held responsible for the control of access at these gates at all times as well as to the worksite during removal and re-erection of fencing. No other opening in the fence shall be permitted and the Contractor shall be responsible for monitoring the fencing on a daily basis and repairing any such opening within the same day that it is detected. Notices in two official languages (English and isiXhosa) shall be attached to the fence where appropriate to indicate that the site is for personnel employed on the Contract only and that unauthorised entry is forbidden."

PSDB 5.4 Excavation

Add to the Subclause :

"Where a pipe is to be laid in a vertically-sided trench with temporary side support, it is necessary to ensure that the compacted bedding and backfill is hard up against the soil forming the trench side by withdrawing the temporary supports stage by stage as the backfill rises up the trench.

Where it is permitted for the pipe trench to cross surfaced roads (Generally paved road crossings will be effected by means of pipe or sleeve jacking), the Contractor shall neatly cut two parallel grooves into and through the "black top" before excavating between the grooves. The grooves are to be set back at least 200 mm from the edge of the excavation face to prevent ravelling of the cut edge. The cost of this operation, where not scheduled separately, will be held to be covered in the general rates for excavation.

PSDB 5.5 Trench Bottom

Add to the subclause :

Where pipes are laid in waterlogged conditions and/or where so instructed by the Engineer a 150mm thick layer of imported single sized stone (19mm size unless otherwise instructed by the Engineer) with a geofabric filter surround ("bidim" Grade A4 or similar approved) shall be constructed under the bedding layer specified for the pipes."

Add the following subclause:

PSDB 5.5.1 Jointing Holes

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

PSDB 5.6 Backfilling

PSDB 5.6.1 General

Add the following:

"Notwithstanding the requirements of subclauses 5.6.1 and 5.6.6, no pipe joint or pipe filling shall be covered by either the bedding, blanket fill or the main fill prior to the successful completion of the visual inspection."

PSDB 5.6.3 Disposal of soft excavation material

Replace the words "unless otherwise required in the project specification." at the end of Subclause 5.6.3 with:

"... or to spoil in accordance with the requirements of subclause PSD 5.2.2.3, as instructed by the Engineer."

PSDB 5.6.4 Disposal of Intermediate and Hard Rock Material

Add the Following:

"Unless otherwise scheduled, the Contractor shall make his own arrangements for the disposal of excess intermediate and/or hard rock material. The disposal / spoil site shall meet with the approval of the Local Authority within whose area it falls, and the spoiling shall comply with the statutory and municipal regulations. An extra-over rate for the cost of all loading, hauling, dumping, spreading, compacting and any other costs or charges will be measured for payment. An additional extra-over rate for overhaul beyond 500m will also be measured for payment."

PSDB 5.7 Compaction

PSDB 5.7.2 Areas subject to Traffic Loads

Add the following:

"All backfill to pipes under roads and in road reserves or future road reserves shall comply with the requirements of subclause 3.5(b) and shall be compacted in accordance with subclause 5.7.2."

PSDB 5.9.8 Cross Drainage Berms

Cross drainage berms are required along all steeply inclined pipeline routes at intervals to be determined by the Engineer, to minimize possible flood damage. The costs of constructing such berms is deemed to be included in the rates for trench excavation."

PSDB 8 MEASUREMENT AND PAYMENT

PSDB 8.3 Scheduled Items

PSDB 8.3.1 Site Clearance and Topsoil Removal

This is measured under SANS1200D.

PSDB 8.3.2 Excavation

Add the following to clause 8.3.2:

a) **Excavate in all materials for trenches, backfill, compact and dispose of surplus/unsuitable material for precast concrete inverted portal culverts:**

2) **600mm width x 600mm depth nominal size for total trench depth:**

e) Not exceeding 1,5 m..... Unit: m³

(ii) Exceeding 1,0 m but not exceeding 2,0m..... Unit: m³

The tendered rate to include allowance for adequate workspace for safety of workers during portal culvert installations.

3) **1200mm width x 600mm depth nominal size for total trench depth:**

(i) Not exceeding 1,5 m....."..... Unit: m³

(ii) Exceeding 1,0 m but not exceeding 2,0m..... Unit: m³

The tendered rate to include allowance for adequate workspace for safety of workers during portal culvert installations.

b) **Extra-over item 8.3.2 above for:**

1) Hard rock excavation.....Unit: m³

2) Hand excavation where ordered by the Engineer in:

(i) Soft material.....Unit: m³

- (ii) Intermediate material.....Unit: m³
- (iii) Hard material.....Unit: m³
- 3) Backfill stabilized with 5% cement where directed by the Engineer.....Unit: m³
- 4) Soilcrete backfill where directed by the Engineer.....Unit: m³

PSDB 8.3.3.1 Deficiency in Backfill Material

Add the following to sub-clause 8.3.3.1(c):
The rate shall also include for compaction of backfill material

PSDB 8.3.3.4 Overhaul

Replace the contents of this item with the following:

"Measurement and payment shall be in accordance with subclause PSD 5.2.5."

PSDB8.3.6.1 Reinstate Road surfaces

- (a) All courses of road pavement layers.....Unit: m³

The volume will be computed from the length of trench as applicable, and the width determined from the applicable side allowances specified in 8.2.3, and the depth from road surface to top of selected fill blanket. Payment for this item will be additional to that for excavation covered by 8.3.2.

The rate shall cover the cost of temporary accommodation of traffic (including the signs and by-passes), arranging for safety of the public, excavation (including breaking up, removal and disposal of surplus material) and the subsequent reinstatement, and shall include the cost of delays and the cost of any risk of having to repair damage.

PSDK GABIONS AND PITCHING (SANS 1200 DK)

PSDK 3 MATERIALS

PSDK 3.1.2 Gabion Cages

Add to the Sub-Clause:

The wire used for the fabrication of wire mesh cages and for lacing and bracing operations shall be zinc-coated mild steel wire with NO PVC coating. The lacing wire will be of the same or larger diameter of that used to manufacture the cage frames.

PSDK 3.1.2 Gabions

Replace Clause 3.1.2 with the following:

Gabion boxes shall consist of double twisted, hexagonal wire mesh of nominal 80 mm mesh, with 4.4 mm o/d frame wire and 2.7 mm o/d mesh wire. Complete with partitions at 1 m centres. All wire to be mild steel to SANS 1580 – 2010, zinc coated by hot-dip galvanizing to SANS 675 – 2009.

Mattresses shall consist of double twisted, hexagonal wire mesh of nominal 80 mm mesh, with 4.4 mm o/d frame and 2.7 mm o/d mesh wire. Complete with partitions at 1 m centres. All wire to be mild steel to SANS 1580 – 2010, zinc coated by hot dip galvanizing to SANS 675 – 2011.

PSDK 3.1.3 Geotextile

Add to the Sub-Clause:

Geotextile filter fabric:

Where the Engineer has authorised the use of geotextile filter fabric, this shall be measured by area as: width x nett length, where the width shall be the full or half-width supplied by the manufacturer which conforms closest to the specified of plus 2 x base width plus 200mm. The tendered rate shall include the cost of supply, placing and losses as a result of overlaps and over excavated trench widths.

Geotextile to conform to the following minimum specifications:

Material:	Nonwoven, needle punched, Continuous Filament, Polyester Geotextile (minimum)
Tensile Strength:	14 kN/m (minimum)
UV Stability:	70% strength retained after 1000 hours
Permeability @ 50mm head:	3.6 m/sx10 ⁻³

The material shall be placed as directed and shall not be exposed to direct sunlight for prolonged periods.

PSDK 3.2 Pitching

PSDK 3.2.1 Stone

Amend the Sub-Clause as follows:

In Table 2, Column 2, for extra heavy, replace 300 with 500.

PSDK 3.2.3 Wire netting

Add to the Sub-Clause:

Wire netting for gabion and mattress cages shall be hexagonal steel wire mesh strengthened by selvages of heavier wire and by mesh diaphragms that divide the cases into 1 m compartments.

Nominal 80 mm mesh shall be used for gabion cages with 2.7 (Refer to PSDK 3.1.2) mm diameter galvanised steel wires.

Nominal 80 mm mesh shall be used for mattress cages with 2.7 (refer to PSDK 3.1.2) mm diameter galvanised steel wires.

Selvage wire shall be galvanised and the diameter shall be a minimum of 4mm.

PSDK 5 CONSTRUCTION

Add new Sub-Clause:

PSDK 5.1.3 Diaphragms

Each diaphragm shall be connected in the same manner to the sides and top panels in addition to the bottom panel.

PSDK 5.2.3 Assembly

Add to the Sub-Clause:

All gabion and mattress cages shall be connected to adjacent gabion and/or mattress cages by lacing the adjacent edges together with 2.0 mm dia. galvanised steel wire. The lacing shall be in accordance with Sub-Clause 5.1.2.

PSDK 5.2.4 Rockfilling

Add to the Sub-Clause:

Particular care shall be taken in the filling gabions and mattresses so as to ensure that the voids in the rockfill are reduced to the minimum that can be reasonably achieved. In order to minimise the voids in the rock filling, the filling shall proceed in layers not exceeding 300 mm deep and each layer shall be rodded and barred so as to compact the rockfill before filling of the next layer commences. Where appropriate, hand packing of selected rock particles shall be carried out.

PSDK 5.2.4.2 Mattresses used in revetments and aprons

Add to the Sub-clause:

Where gabions and mattresses are placed in exposed positions the rock particles forming the exposed faces shall be specially selected so as to present a fair and even surface.

PSDK 5.3.4 Wired Pitching

Add to the Sub-Clause:

The areas in which wired or grouted wire pitching are to be used will be indicated on site by the Engineer.

PSDK 8 MEASUREMENT AND PAYMENT

Add the following new clause:

PSDK 8.2.8 Precast 25/19 dissipaters complete at end of Concrete-lined Open Drains as
per Engineer's detail drawing.....Unit: Number (No)

PSDM EARTHWORKS (ROADS, SUBGRADE) (SANS 1200 DM)

PSDM 3 MATERIALS

PSDM 3.1 Classification for excavations purposes

Delete the clause and replace with the following:

The classification of material for excavation shall be as specified in Project Specification Clause PSD 3.1.2.

PSDM 3.2.3 Selected Layer

Add the following:

The Contractor shall obtain selected subgrade material from selected excavation material on site.

PSDM 5 CONSTRUCTION

PSDM 5.2 METHODS AND PROCEDURES

PSDM 5.2.2 Cut and borrow

PSDM 5.2.2.3 Use of material

Add the following paragraph:

"(e) Commercial sources

The provisions of subclause PSD 5.2.2.5 of SABS 1200 D as amended shall apply."

PSDM 5.2.3.3a) Preparation and compaction of road bed

Substitute the first paragraph with the following:

The roadbed shall be scarified to a depth of 150 mm, watered, shaped and compacted to 93 % of AASHTO density (100 % for sand), except where otherwise ordered by the Engineer.

PSDM 7 TESTING

PSDM 7.3.2 Routine inspection testing

Replace the contents of this sub-clause with the following:

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

The cost of additional testing ordered by the Engineer, and of which the results do not comply with the specified minimum requirement for the material, shall be borne by the Contractor and will be subtracted from the monthly payment certificates.

PSDM 8 MEASUREMENT AND PAYMENT

PSDM 8.3.4 (a) Cut to Fill, Borrow to Fill

Add to Clause 8.3.4(1) the following:

"Where fill material is borrowed from trench excavations the rate shall include the selection from the sides of trenches, transporting, if necessary, stockpiling, preparing, processing, shaping (including forming side channels and benching if applicable), watering, mixing, compacting to the densities specified and finishing the slopes of fills."

Replace the last sentence of this item with the following:

"The unit of measurement shall be the cubic metre of fill and the volume will be calculated in accordance with the authorised dimensions of the embankment and levelled cross-sections.

The tendered rates shall include full compensation for excavating the material as if in soft material, for selecting, loading, transporting, off-loading, watering, mixing and compacting the material as specified. Borrow to fill in this item relates to material from designated borrow areas (provided by the Employer).

Where it is required that material be obtained from commercial sources, payment for procuring the material will be made under item PSDM 8.3.17."

PSDM 8.3.5 Selected layer compacted to 93% of modified AASHTO maximum density

Replace the heading and the contents of this item with the following:

"PSDM 8.3.5 Selected layer using material from designated borrow pits or excavation:

- (a) Compacted to 90% of modified AASHTO density.....Unit: m³
- (b) Compacted to 93% of modified AASHTO density..... Unit: m³

The unit of measurement shall be the cubic metre and the quantity will be calculated from the authorised dimensions of the compacted layer.

- a) The tendered rates shall include full compensation for excavating the material as if in soft material for loading, transporting, off-loading, spreading, watering, mixing, breaking down and compacting the layer."

PSDM 8.3.6 Extra over items 8.3.4, 8.3.5 and 8.3.16 for excavating and breaking down material in hard excavation.....Unit: m³

PSDM 8.3.7 Cut to spoil from

- a) Soft excavation.....Unit: m³
- b) Hard excavation.....Unit: m³

Refer to Clause PSD 3.1.2.

PSDM 8.3.12 Overhaul

Replace this item with the following:

"PSDM 8.3.12 Overhaul

Delete this item as no overhaul will be paid on material for the purposes of this Contract and all the costs for transporting material shall be included in the applicable tendered rates and amounts.

PSDM 8.3.13 Surface Finishes

Add to Clause 8.3.13 the following Clause (c):

"The major earthworks required to bring the verge to the required level and the additional depth of excavation or reduction in fill height as ordered for the topsoil operation shall be measured and paid for under the appropriate excavation item.

Only the following verge item will be measured and paid for separately

- a) Topsoiling (from stockpiles)
 - i) Cut slopes.....Unit: m²
 - ii) Fill slopes.....Unit: m²
- b) Grassing
 - iii) Cut slopes.....Unit: m²
 - iv) Fill slopes.....Unit: m²

Add the following new clauses:

PSDM 8.3.17 Extra over items 8.3.4, 8.3.5 and 8.3.16 for obtaining material from commercial sources to 93% Mod. AASHTO.....Unit: m³

The tendered rate shall include full compensation for the additional cost of finding a suitable source of material, for procuring the material and paying all royalties or other charges to the owner of the source, for transporting the material to the point of use regardless of the distance hauled and for excavating in intermediate, hard or boulder material as required.

Items PSDM 8.3.6, PSDM 8.3.12 and PSDM 8.3.14 do not apply to material obtained from commercial sources..

PSDM 8.3.18 Final finishing and cleaning up of the site of the works.....Unit: Sum

The Contractor shall take note that progressive and systematic finishing and tidying will form an essential part of this contract. On no account shall spoil, rubble, materials, equipment or unfinished operations be allowed to accumulate in such a manner as to unnecessarily be a hindrance to or impede the activities of other contractors or service providers. In the event of this occurring, the Employer shall have the right to withhold payment for as long as may be necessary in respect of the relevant works in the area(s) concerned.

Upon completion of the Works or any portion thereof, the ground, fences, gates and any structures that have been interfered with are to be carefully restored to their original condition and all rubbish, tools, tackle, plant and material must be removed so as to leave the Site in a clean and orderly condition. No additional payment shall be made for work described in this sub-section.

PSG CONCRETE (STRUCTURAL) (SANS 1200 G)

PSG CONCRETE (STRUCTURAL)

PSG 3 MATERIALS

PSG 3.2 CEMENT

PSG 3.2.2 Alternative types of cement

Replace the contents of this subclause with the following:

"Only CEM II/A-V 42,5 (Portland fly ash cement) according to (SANS 50197-1), may be used. The cement may not consist of more than 20% siliceous fly ash blended with the OPC (Ordinary Portland Cement). Should the Contractor wish to use any other type of cement, he shall obtain the Engineer's prior written approval (see 8.1.3.2 and 8.1.3.3).

PSG 3.2.3 Storage of cement

Add the following:

"Cement shall not be stored for longer than 12 weeks without the permission of the engineer."

PSG 3.4 AGGREGATES

PSG 3.4.3 Storage of aggregates

Add the following:

"Where aggregates of differing chloride content are stored on the site, the use thereof in the various classes of concrete, shall be strictly controlled."

"PSG 3.4.4 Aggregate of dolomitic origin

Aggregates for structural concrete shall be of dolomitic origin. The quantity of insoluble matter in respect of concrete made with aggregates of dolomitic origin, determined according to the method described in SANS 677, Appendix C, shall not be more than 15%."

Add the following subclauses:

PSG 3.6.1 REINFORCEMENT

PSG 3.6.1.1 Add the following:

"(a) High tensile steel (identified by capital Y) shall be Grade 450 deformed bars in accordance with notes on drawings)."

(b) Mild steel (identified by capital R) shall be Grade 250 plain round bars in accordance with notes on drawings)."

"PSG 3.9 Waterstops

PVC waterstops shall comply with the requirements of CKS 389."

PSG 3.10 Roofing Felt

Three-ply roofing felt shall comply with the requirements of SANS 92 for type 40 felt.

PSG 3.11 Butyl Rubber Sealing Strips

The dimensions of the sealing strip for use in the water retaining structures are shown on the drawings. The strips shall have a factory-applied bonding layer on one side.

The strip shall have an elongation at break of not less than 300% and a tensile strength of 8,0 MPa. The sealing strip shall be permanently bonded to the prepared concrete surface, in accordance with the manufacturer's instructions.

The completed joint shall be guaranteed to be 100% watertight and to be resistant to the long term effects of chemically treated water.

PSG 3.12 Alkali-Aggregate Reaction

Malmesbury hornfels (shale) or other potentially reactive aggregate 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 (Na₂O equivalent) exceeds 0,60% by mass of cement.

In order to ensure that the above requirement is met, the Contractor may elect to use a non-reactive aggregate that complies with the requirements of SANS 1083. Alternatively, if the Contractor chooses to use Malmesbury hornfels or other potentially reactive aggregate, he shall comply with the following requirements regarding the cement:

(a) Before commencing any particular section of the structure, the Contractor shall ensure that he has enough cement that is not a high alkali cement to complete the section.

(b) Certificates stating the alkali content of each delivery of cement to the Site shall be supplied by the Contractor. These certificates shall be based on tests carried out at a laboratory approved by the Engineer. The cost of testing, including sampling, transporting of samples, and issuing of certificates, shall be borne by the Contractor.

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

(d) High alkali cement delivered to the Site shall be rejected, and the cost of its removal and replacement with cement with an acceptable alkali content shall be borne by the Contractor.

PSG 4 PLANT

PSG 4.1 GENERAL

Add the following subclause:

"PSG 4.1.1 Minimum plant

The Contractor shall have the following minimum plant available and in sound working order:

- (a) Two concrete mixers, each of sufficient capacity to complete a section of the wall between horizontal construction joints within 4 hours and without interruption
- (b) Two weigh-batchers to supply the mixers
- (c) Four concrete vibrators, at least one of which shall be powered by an internal combustion engine
- (d) One air compressor
- (e) Suitable and adequate plant to transport and raise concrete and other material and equipment from ground level to the top of the structure at all stages of construction
- (f) Elevated storage tanks of adequate capacity to ensure that sufficient water will be available before commencement of every major concrete-placing operation

If the Plant used for placing concrete for the structure is electrically or mechanically powered, the Contractor shall also provide some other approved, non-electrically-powered standby means for placing concrete at an adequate rate in the event of a power or mechanical failure of the main Plant.

When the Contractor elects to place a crane inside the walls of the structure during the construction period, he shall communicate with the Engineer in good time to ensure that the design and layout of the panels that form the roof slab and floor allow for such positioning of the crane. When sections of the roof and floor have to be redesigned to accommodate the crane, the redesign cost shall be borne by the Contractor."

PSG 4 FORMWORK

PSG 4.5.1 Design

Add the following:

"All formwork or scaffolding required for any part of the Works shall be designed by the Contractor, and before commencing with the erection of any formwork or scaffolding, the Contractor shall submit the methods he proposes to use to the Engineer for approval. The Engineer has the authority to order alterations to the design or the sizes of any part of the formwork or scaffolding. The Contractor shall check the safety and suitability of all such alterations. The fact that the Engineer has approved or altered any part of the formwork or scaffolding shall not be construed as relieving the Contractor of his responsibility with regard to the strength and stability of the formwork or scaffolding."

PSG 4.5.3 Ties

Add the following:

"No plugs, bolts, ties or clamps of any description used to hold the formwork will be allowed to project into or through the concrete unless expressly approved by the Engineer.

Only approved tie-rods consisting of solid rods (that remain embedded in the concrete) and with removable ends shall be used to hold the formwork of the walls. The removable tie-rod ends shall facilitate removal without damage to the concrete, and no permanently embedded parts of such tie-rods shall have less than 50 mm of cover to the finished concrete surface.

The cavities left in the concrete when the tie-rod end cones are removed shall be soundly caulked with a cement mortar to which an approved shrinkage-reducing agent has been added, and shall be neatly finished to a smooth surface uniform with that of the surrounding concrete.

The cost of supplying special tie-rods as well as the filling of cavities left by the tie-rod cones shall be included in the rates tendered for formwork under the appropriate pay items.

On no account shall formwork be secured to reinforcing bars."

PSG 4.5.4 Concrete Kickers at Horizontal Construction Joints

Add the following:

"All reinforced concrete walls and columns shall have a 100 mm high concrete kicker formed on top of the base or floor. Kicker shall be placed at the same time, in the same pour and with the same material, with the same compaction and density as the as the base or floor on which they are formed.

Concrete kickers to external water retaining walls shall be formed using structural steel channel sections (100 x 50 PFC), placed with legs horizontal. The steel channels shall be secured in position to the Engineer's satisfaction. Concrete in the in kicker shall be placed at the same time, in the same pour with the same material as the footing or floor on which it is formed."

PSG 5 CONSTRUCTION

PSG 5.1 REINFORCEMENT

PSG 5.1.2 Fixing

Add the following:

"The Engineer will inspect the reinforcing after it has been fixed in place, the formwork has been cleaned, cover blocks have been positioned, and before concreting commences.

Welding of reinforcing steel will not be permitted."

PSG 5.1.3 Cover

Add the following:

"The distance between pipes in the concrete and the reinforcing steel shall nowhere be less than

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

or

- (c) the cover specified on the Drawings."

PSG 5.2 Formwork

PSG 5.2.1 Classification of finishes

- (c) Special

Add the following:

"This finish is obtained by first giving the surface a smooth finish with the joints between formwork panels forming an approved regular pattern suitable for the appearance of the structure. All projections shall then be removed, irregularities repaired, and the surface rubbed or otherwise treated until it is smooth with an even texture, appearance and colour.

If the finish of exposed surfaces does not comply with the requirements for uniformity of the texture and appearance, the Contractor shall, when instructed to do so by the Engineer, rub down the exposed surfaces of the entire structure or any part thereof as specified below, entirely at his own cost. All repairs must be completed before the rubbing commences.

The surface shall be saturated with water for at least one hour. The initial rubbing of the face shall be carried out with a medium coarse carborundum stone together with a small amount of mortar of the same cement/sand ratio as the concrete being repaired. Rubbing shall continue until all form marks, projections and irregularities have been removed and a uniform surface has been obtained. The paste produced by the rubbing shall be kept in place. The final rubbing shall be carried out with a fine carborundum stone and water. This rubbing shall continue until the entire surface has a smooth, even texture and is uniform in colour. The surface shall subsequently be washed with a brush to remove surplus paste and powder."

PSG 5.2.2 Preparation for formwork

Add the following: (For water-retaining structures)

"Construction joints shall be positioned as shown on the Drawings."

PSG 5.2.5 Removal of formwork

Add the following subclause:

"PSG 5.2.5.7 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 and slabs."

PSG 5.3 HOLES, CHASES AND FIXING BLOCKS

Add the following:

"Cover blocks for reinforcing and fixtures may be placed into the concrete provided that neither the strength nor any other desirable characteristic (such as the appearance) of the concrete section is affected or impaired in the opinion of the Engineer.

The holes or cavities left by ferrule heads in the concrete of water-retaining structures shall be filled with an approved non-shrink grout applied strictly in accordance with the manufacturer's specifications."

PSG 5.4 PIPES AND CONDUITS

Add the following: (For water-retaining structures)

"All pipes passing through concrete floors, walls or slabs shall be cast into a concrete member simultaneously with the casting of the member. Openings for pipes shall only be left in concrete members when so directed by the Engineer or when shown on the Drawings. Pipes shall be installed in such openings according to the details shown on the Drawings.

If watertightness is a requirement where pipes are cast into walls, floors and slabs, the Contractor shall ensure watertightness where smooth-surfaced pipes are used by using an approved method such as tape wrapping the pipes prior to casting in. The cost of such method will be deemed to be included in the rates tendered for item PSG 8.11."

PSG 5.5 CONCRETE

PSG 5.5.1 Quality

PSG 5.5.1.5 Durability

The exposure conditions of the concrete are classified as "Very Severe to Extreme".

PSG 5.5.1.7 Strength concrete

Add the following: (For water-retaining structures)

"The concrete mixes shall be designed by the Portland Cement Institute or a similar approved laboratory.

The minimum cement content shall be 325 kg/m³. The maximum water : cement ratio shall be 0,55 for ordinary Portland cement (OPC), CEM I 42,5 according to SANS 50197-1, or 0,50 for ordinary Portland cement blended with pulverized fuel ash (PFA).

The cement content shall not exceed 400 kg/m³ OPC in reinforced concrete or 450 kg/m³ OPC blended with PFA in reinforced concrete."

Add the following: (for floors, walls, mass concrete, blinding concrete and grout beneath column plates)

"The concrete mixes shall be designed by the Portland Cement Institute or a similar approved laboratory."

(a) Grade of concrete and position on the Works:

(iii) Floors: Grade 40/20 concrete with steel floated finish in accordance with notes on drawings.

(iv) Walls: Grade 40/20 concrete with class F3 finish on exposed faces and F1 finish on unexposed faces in accordance with notes on drawings.

(v) Mass concrete: Class 15/32.

(vi) Blinding concrete: Class 15/20.

(vii) Grout beneath steel column plates: Approved high strength (50 MPa) shrinkage compensated.

PSG 5.5.3 Mixing

PSG 5.5.3.2 Ready-mixed concrete

Add the following:

"Ready-mixed concrete may be used on the Site. The Contractor shall take samples for testing from every load delivered to the Site."

PSG 5.5.5 Placing

Add the following:

"Concreting of the wall between horizontal construction joints shall be carried out in both directions from a point on the wall in order to close the gap with fresh concrete."

Add the following new subclause:

"PSG 5.5.5.10 PLASTIC SHEETING OVER BLINDING

"A layer of 250 micron polyethylene sheeting shall be placed continuously over blinding to floors of all water retaining structures. The sheets shall be secured to avoid displacement during concrete placement, with overlapping joints sealed to the satisfaction of the Engineer."

PSG 5.5.7 Construction joints

Add the following:

"Horizontal construction joints are permitted in structure walls in positions indicated on the Drawings or approved by the Engineer. Vertical construction joints in the walls are subject to the written approval of the Engineer and the cost of all such vertical or horizontal construction joints will be deemed to be included in the rates for cast-in-situ concrete. This also applies to the preparation of concrete to form construction joints in flume walls as specified on the Drawings.

The construction joints in water-retaining structures shall be made strictly in accordance with the details shown on the Drawings. The joints between screeds and concrete floors shall be regarded as construction joints and the surface of the floor shall be prepared as described for construction joints.

Should the Contractor's method of construction necessitate the placing of a construction or other joint in a position not shown on the Drawings, such method of construction and position of the joint shall be approved by the Engineer in writing. The cost of such joint shall be included in the tendered rates and shall include hydro-demolition surface preparation (or similar approved) of the concrete where steel reinforcement is continuous.

The walls shall be cast in lifts of a height that permits each lift to be poured without interruption in one continuous operation during normal working hours.

It is the Contractor's responsibility to ensure that construction joints are watertight. The Contractor's proposed method for ensuring the watertightness of such joints shall be submitted to the Engineer for his approval.

For construction joints at kickers all additional costs for concrete, preparation, etc will be deemed to be included in the rates tendered for concrete in walls or sides and kicker joints or construction joints will not be measured separately."

PSG 5.5.7.3 Add the following to subclause 5.5.7.3:

"Concrete in all kickers shall be cast simultaneously (in the same continuous pour) and with the same concrete mix as the foundation or floor on which the kicker is based."

PSG 5.5.8 Curing and protection

Add the following:

"The curing methods of retaining the formwork in place or covering with a waterproof membrane are strongly recommended. Concrete will not be paid for unless properly cured and proof of curing is continuously visible on site completed and shall be continued for at least 7 days.

Should a curing compound be allowed by the Engineer then it shall be a resin based curing compound. Curing of columns, shafts and walls shall be done by either retaining the formwork for the required period of time or covering with plastic sheeting. On lesser shafts and walls the Engineer may allow a curing compound for curing."

PSG 5.5.10 Concrete surfaces

Add the following subclause:

"**PSG 5.5.10.4** Where the surfaces of the concrete are to be additionally hardened or protected, the positions of such surfaces and the method to be used will be shown on the Drawings and will be scheduled. Materials or products with a ferrous content will not be allowed.

PSG 5.5.11 Watertight concrete

Add the following:

"The minimum cement content shall be 325 kg/m³. The maximum water: cement ration shall be 0,55 for ordinary Portland cement (OPC), CEM I 42,5 according to SANS 50197-1, or 0,50 for ordinary Portland cement blended with pulverized fuel ash (PFA).

The cement content shall not exceed 400 kg/m³ OPC in reinforced concrete or 450 kg/m³ OPC blended with PFA in reinforced concrete."

Add the following subclauses:

"PSG 5.5.16 Applied loads

No crushed stone covering or any other loads shall be placed on the roof of the structure before the concrete has attained its design strength, unless approved supports are provided.

PSG 5.5.17 Pipes and conduits

All pipes passing through concrete floors, walls or slabs shall be cast into the concrete member simultaneously with the casting of the member. Openings for pipes shall only be left in the concrete members when so directed by the Engineer or when shown on the Drawings. Pipes shall be installed in such openings according to the details shown on the Drawings.

If watertightness is a requirement where pipes are cast into walls, floors and slabs, the Contractor shall ensure watertightness where smooth-surfaced pipes are used by using an approved method such as tape wrapping the pipes prior to casting in. The cost of such method will be deemed to be included in the rates tendered for in item PSG 8.11.

PSG 5.5.18 Soilcrete

Where soilcrete is specified for filling under floor slabs, the soilcrete shall comply with the requirements of subclause PSDB 3.5(d) of section 1200 DB as amended and shall be placed as specified in the subclause.

PSG 5.5.19 Brickwork

Brickwork for water-retaining structures shall be carried out as specified for manholes in subclause 5.6.4 of 1200 LD using bricks conforming to the requirements for bricks in subclause 3.5.1 of 1200 LD.

PSG 5.5.20 Plasterwork

Plasterwork for water-retaining structures shall consist of a single coat, comprising one application of a 1:4 cement: sand: mixture with a woodfloat finish. The thickness of the plaster shall be between 15 and 20 mm. All plaster shall be finished smooth, shall be plumb and corners shall be rounded and square.

PSG 5.5.21 Sterilisation of water retaining structures

Unless otherwise specified, before a water-retaining structure is sterilized, the structure shall have been tested for watertightness as set out in 7.2.5. and the pipelines serving the structure shall have been sterilized. The inside of the structure shall then be thoroughly leaned out and washed down with clean water. Thereafter the roof soffit, beams, columns and walls shall be thoroughly sprayed down, using pressurised equipment, and the floors shall be scrubbed with a calcium hypochlorite solution of concentration 0,15 g/L, as specified in Subclause 5.10 of SANS 1200 L.

On completion of the sterilization, the sterilizing solution shall be run to waste before the water-retaining structure is filled. Should additional work be required inside the structure after a watertightness test has been completed, the structure shall be re-sterilized at the Contractor's expense.

PSG 6 TOLERANCES

PSG 6.2 PERMISSIBLE DEVIATIONS

PSG 6.2.3 Specified permissible deviations (*Example only*)

Add the following:

"Degree-of-accuracy II is applicable.

Every specified permissible deviation is binding in itself. The cumulative effect of permissible deviations will not be considered. The maximum permissible vertical deviation is subject to the other permissible deviations."

Replace subclause 6.2.3(d)(5) with the following:

Permissible deviation		
Degree of accuracy		
III	II	I
mm	mm	mm
5	3	2
50	30	10

"Vertically, per metre of height subject to a maximum of

PSG 7 TESTS

PSG 7.1 FACILITIES AND FREQUENCY OF SAMPLING

PSG 7.1.1 Facilities

Add the following:

"The Contractor shall provide sufficient storage capacity for the concrete cubes and shall test the cubes by means of an approved, calibrated cube testing press installed on Site in a manner approved by the Engineer or shall arrange to have them tested by an approved laboratory.

The cost of all testing, including the cost of sampling, storage and transport of samples shall be included in the rates tendered for concrete work."

PSG 7.3 ACCEPTANCE CRITERIA FOR STRENGTH CONCRETE

Add the following:

"Test results obtained from the supplier of ready-mixed concrete will not be accepted for evaluation in terms of subclause 7.3, but samples for testing shall be taken of such concrete at the point of placing."

Add the following subclause:

"PSG 7.3.6 Testing for watertightness

Water for testing shall be provided by the Contractor and he shall be responsible for providing all necessary equipment that may be required for filling the structures.

The structure shall be filled with water at a uniform rate not exceeding 2,0 m in 24 hours until the top water level has been reached. The water level will then be carefully noted and recorded by the Engineer in relation to a fixed bench mark, and shall be maintained by the addition of further water for a stabilizing period to permit complete absorption of water by the concrete.

The stabilizing period may be 7 days for a maximum design-crack width of 0,1 mm or 21 days for 0,2 mm or greater. After the stabilizing period, the level of the liquid surface shall be recorded at 24-hour intervals for a test period of 7 days. During this 7-day test period the total permissible drop in level, after allowing for evaporation, shall not exceed 1/500th of the average water depth of the full tank, or 10 mm.

The evaporation shall be measured by the mean drop in level caused by the evaporation of the water in three flat containers floating in the water being recorded.

In the event of appreciable leakage being evident at any stage of the filling or testing or in the event of the Engineer considering the final degree of watertightness to be unsatisfactory, the Contractor when ordered by the Engineer shall discontinue such filling or testing and shall, at his own expense, take approved steps immediately to rectify the leakage, until a satisfactory test is obtained, which shall prove to the Engineer that a sufficient degree of watertightness has been obtained

The costs of emptying a water-retaining structure which cannot be drained shall be borne by the Contractor. The water shall be discharged in a manner approved by the Engineer and shall be such that the Employer can utilise the water if he so desires.

The water shall not be used as a medium for additives to effect remedial work or to stop leaks.

The costs of retesting the structure for watertightness shall be borne by the Contractor."

PSG 8 MEASUREMENT AND PAYMENT

PSG 8.1 MEASUREMENT AND RATES

PSG 8.1.1 Formwork

Delete "or splays over 20 mm x 20 mm" FROM THE FIRST LINE OF PARAGRAPH 8.1.1.2.

Add the following to paragraph 8.1.1.2:

"Splays up to and including 25 mm x 25 mm will not be measured separately and will be deemed to be included in the formwork costs."

Add the following paragraphs:

"PSG 8.1.1.7 For construction joints at kickers, all additional costs for formwork to edges up to 300 mm high will be deemed to be included in the rates tendered for vertical formwork to sides of walls and will not be measured separately in narrow widths.

PSG 8.1.1.8 No formwork will be measured to edges of blinding layers under structures, and the cost thereof (if needed) will be deemed to be included in the rates tendered for concrete in blinding layers.

PSG 8.1.1.9 Back-shuttering or formwork to top revealed surfaces of sloping or conical formwork will only be measured to surfaces of over 40° and up to 85° to the horizontal.

PSG 8.1.1.10 Formwork to horizontal surfaces in pump stations, valve chambers, manholes or sumps can either be removed through the manhole cover opening or the Contractor may use permanent formwork at his own cost as no claims in this regard will be considered."

PSG 8.1.2 Reinforcement

Replace the contents of this subclause with the following:

"The unit of measurement for steel bars shall be the ton of reinforcement in place, in accordance with the Drawings or as authorised by the Engineer.

The unit of measurement for welded steel fabric shall be the kilogram of fabric reinforcement in place, and the quantity shall be calculated from the net area covered by the mesh, excluding overlaps.

Clips, ties, separators, stools and other steel used for positioning reinforcement will not be measured, unless these are shown on the bending schedules.

The tendered rate shall include full compensation for the supply, delivery, cutting, bending, welding, placing and fixing of the steel reinforcement, including all tying wire, stools, supports and waste."

PSG 8.1.3 Concrete

Delete ", or the plan size of the excavation where additional excavation is provided to facilitate erection of forms" from the second line of paragraph 8.1.3.1(c).

PSG 8.4 SCHEDULED CONCRETE ITEMS

PSG 8.4.3 Strength concrete

Add the following after the last sentence:

"In the case of structural floor screeds, the unit of measurement shall be the square metre and the average thickness and proportions will be stated."

Replace "Unit: m³" with "Unit: m²"

PSG 8.4.4 Unformed surface finishes

(b) Steel-floated finishes

Add the following subitem:

"(i) Extra over subitem (b) for special finishing tolerances to top of outside ring walls as specified Unit: m²

The tendered rate shall include full compensation for the additional cost of finishing the ring walls to closer tolerances as specified on the Drawings and in clause PSG 6.2.3 (i)."

Replace item 8.4.5 with the following:

"PSG 8.4.5 Extra over subitems 8.4.2 and 8.4.3 for aggregate of dolomitic origin in concrete mixes

(a) Coarse aggregate in:

- (i) (Class of concrete stated).....Unit: m³
- (ii) Etc for other classes of concrete

(b) Fine aggregate in:

- (i) (Class of concrete stated).....Unit: m³
- (ii) Etc for other classes of concrete

The unit of measurement shall be the cubic metre of concrete containing the dolomitic aggregate.

The tendered rates shall include full compensation for any additional expense for using aggregate of dolomitic origin."

PSG 8.5 JOINTS

Replace "Unit: m" with "Unit: m or m²"

Add the following:

"Joints shall be Sikaswell S-2 swellable sealant, Sikaswell P2507 profile, sikadur-comb waterproofing tape, sikaflex pro-3i."

Add the following items:

"PSG 8.9 MISCELLANEOUS WORK OTHER THAN METALWOR.....Unit: as scheduled

Separate items will be scheduled for each type of miscellaneous work.

The tendered rates shall include full compensation for providing all labour, materials and equipment required to carry out the work, for all preparatory work, for constructing the work scheduled in a workmanlike manner and for finishing off and cleaning up when the work has been completed.

PSG 8.10 TESTING FOR WATERTIGHTNESS:

- (a) (Structure stated).....Unit: sum
- (b) Etc for other structures

The unit of measurement shall be the number of each structure successfully passing the specified watertightness tests to the satisfaction of the Engineer.

The sums tendered shall include full compensation for the provision of all labour, plant and materials necessary for carrying out the test for watertightness as specified.

PSG 8.11 CASTING IN PIPES WITH OR WITHOUT PUDDLE FLANGES

- (a) Up to 300 mm nominal bore:
 - (i) Through (description and thickness of structural elements).....Unit: number
- (b) Over 300 mm up to 600 mm nominal bore:
 - (i) Through (description and thickness of structural elements).....Unit: number
- (c) Etc. for other nominal bores in increments of 300 mm

The unit of measurement shall be the number of each size of pipe installed.

The tendered rates shall include full compensation for installing the pipe where new pipes are used (with or without a puddle flange) in the exact position as shown on the Drawings, for splitting or cutting the formwork where required, for ensuring watertightness where required and for all additional costs required to install the pipes specified or shown on the Drawings.

New pipes shall be measured under the items of the relevant section of the specifications.

PSG 8.12 NO FINES CONCRETE

100mm NF 19 layer including unformed surface finishes:

- (a) Indicate position of NF concrete.....Unit: m²
- (b) Other positions.....Unit: m²

The unit of measurement shall be the square metre of NF concrete layer constructed.

The tendered rate shall include full compensation for constructing the NF concrete layer as specified in the Particular Specification PC: No Fines Concrete including supplying of all materials, preparing the surface to receive the NF concrete and for all else that may be necessary to complete the work.

PSG 8.13 SOILCRETE

- (a) Indicate position of soilcrete casting.....Unit: m³
- (b) Other positions.....Unit: m³

The unit of measurement shall be the cubic metre of soilcrete constructed or placed.

The tendered rate shall include full compensation for construction the soilcrete as specified in clause PSG 5.5.18 including supplying of all materials, preparation of surfaces to receive soilcrete and for all else that may be necessary to complete the work.

PSG 8.14 SCREEDS

- (a) Floor screeds (1:3) with falls including V-joints to form panels and a smooth steel-trowelled finish/power float finish to top:
 - (i) Description of application and thickness.....Unit: m²
 - (ii) Etc. for other applications and thicknesses

The unit of measurement shall be the square metre of screeds constructed.

The tendered rate shall include full compensation for constructing the screeds as specified including supplying of all materials, preparing the concrete surface to receive the screeds and for all else that may be necessary to complete the work.

PSG 8.15 CLEANING OF EXISTING STRUCTURES Unit: m²

The unit of measurement shall be the square metres shall be the square metres of surface to be cleaned. The minimum pressure rating of the waterjet (if applicable) will be stated in the Bill of Quantities. The surface must be accepted by the Engineer as cleaned of any dirt, grease, stains and other contaminants to an acceptable standard.

PSG 8.16 WATERTIGHTNESS TESTING

Watertightness tests shall be paid by a lump sum separately for each structure, or by number for components of structures successfully passing the test as scheduled. The sum or number shall cover the cost of all water, labour, equipment and

materials to carry out the tests, as specified in 7.2.5, including all that is required for the installation of temporary watertight closures and associated props/anchors for openings. It shall also include the rectifying of faults and re-testing to achieve a test result to the satisfaction of the Engineer. No extra payment will be made for re-testing during the Defects Liability Period if leaks in the structure have been observed, thus leading to the Engineer's instruction to undertake the re-testing.

PSG 8.17 STERILISATION OF WATER-RETAINING STRUCTURES.....Unit: Sum

The tendered sum shall include full compensation for sterilizing the structure as specified in PSG 5.5.21.

STRUCTURAL STEELWORK (SANS 1200H)

PSH 3 MATERIALS

PSH 3.1 Structural Steel

Add to the Sub-Clause:

Except where scheduled to the contrary or shown on the drawings, the grade of steel to be used in the manufacture of the following shall be that grade normally supplied by reputable manufacturers approved by the Engineer:

All structural steelwork which shall include ladders, safety cages and platforms, shall be manufactured in conformity with SABS 1431 to the following grades:

- Hot-rolled Sections: S355JR
- Hot-formed Hollow Sections: S355JR

Except where shown to the contrary on the drawings or in the schedule of quantities.

All steelwork not specified as Stainless Steel to be sand blasted to SA 2.5 and hot-dip galvanised to SABS 763.

All stainless steel shall be grade 304L, except where shown to the contrary on the drawings or in the schedule of quantities.

Grade 3Cr12 steel shall be used where scheduled or shown on the drawings and shall be fully pickled and passivated prior to installation.

PSH 3.3 Steels Used For Cold-Formed Sections

Add the following to Clause 3.3:

Cold formed sections are to be provided in accordance with BS 2994: 1967.

PSH 3.5 Welding Consumables

Add the following to Clause 3.5:

All welds to be designed to transmit full member strengths and to be 6 mm fillet welded unless specified.

PSH 3.6 Bolts, Nuts And Washers

All bolted connections to be designed in accordance with SABS 0162-1:2005.

PSH 5 CONSTRUCTION

Add the following to Clause 5:

All structural steel works to be carried out in accordance with SABS 2001 – CS1:2005 unless specified otherwise elsewhere.

PSH 5.1.2 Contractor to Provide Shop Details

Add to the Sub-Clause:

The Contractor shall prepare his own shop details based on the dimensions and details given on the drawings and will be required to submit his shop details to the Engineer at least 3 weeks prior to fabrication. Written consent must be obtained from the Engineer, prior to commencing fabrication. The Contractor is still responsible for ensuring that the shop details are dimensionally correct.

PSH 5.2 Fabrication

Add the following to Clause 5.2:

Fabrication of steelwork shall be sequenced so as to limit welding distortion and the possibility of locked-in stresses.

PSH 5.2.6 Handrails

Add to the Sub-Clause:

Handrailing shall be of tubular construction in GMS or Grade 304L stainless steel of an approved proprietary make as scheduled.

Hand and knee rails shall be not less than 32 mm O.D. (wall thickness not less than 1,6 mm) and the height of the handrails (centre) shall be 1 000 mm above walk-way level, with knee rails located approximately midway between.

Stanchions shall be not less than 44 mm O.D. (wall thickness not less than 1,6mm) and shall have ball type or spun and flared connectors to suit horizontal or angled handrailing as required. The base plates shall not be less than 8mm thick.

In general all bends in the hand and knee railing shall be 140 mm radius. Handrails shall be either side or top mounted and shall be fastened with stainless steel nuts, bolts and washers.

Spacing between stanchions shall be determined by site conditions but in no case shall it exceed 1 800 mm c/c. At bends, stanchions shall be provided on either side at a distance of 300 mm from mid-bend.

Finished handrailing shall be true to line and level and connections shall be securely fixed by means of 2 No. stainless steel pins, finished flush on each side of the joints (to the approval of the Engineer).

All ends shall have closures joining the hand and knee railing.

The rate quoted per metre is to include for the supply and installation of the handrail, knee rail, portion of a stanchion, footing, Chemical type holding down bolts and nuts (expanding anchors will not be acceptable) and is to be inclusive of all cutting, mitring, welding, grinding and waste.

PSH 5.2.7 Ladders

Add to the Sub-Clause:

Stairs and ladders are to be provided in accordance with the details shown on the drawings.

PSH 5.2.8 Open Grid Floors

Add to the Sub-Clause:

Open grid steel flooring is to be cut and framed to the required panel shapes and sizes all in accordance with the details shown on the drawings.

PSH 5.2.10 Protective Treatment

Add to the Sub-Clause:

All mild steel shall be hot-dip galvanised except where shown to the contrary on the drawings or in the schedule of quantities. Hot-dip galvanising shall conform to SABS 121;2000 for heavy duty coatings or equivalent. Screwed and socketed tubing shall be galvanised in compliance with BS 1387. Galvanised malleable cast iron fittings shall comply with SABS 509.

PSH 5.2.11 Pipe Clamps and Brackets and/or Supports (New Sub-Clause)

Clamps and brackets around pipes and supports under pipes and valves are to be constructed to the details shown on the drawings and are to be provided with all necessary bolts for fixing to concrete.

Where pipes and valves are supported inside concrete chambers on fabricated steel pipe supports, a layer of 6 mm thick GP rubber sheet (Shore hardness 65) shall be attached to the top surface of the steel support by contact adhesive prior to receiving the pipe or valve to be supported. The rubber is to extend 20mm beyond the edges of the plate.

PSH 5.3.4 Welding

Add the following to Clause 5.3.4:

Details of the weld procedures, consumables to be used in the welding process as well as shop drawings shall be submitted to the Engineer for approval at least 14 days prior to fabrication.

All welding is to be carried out by suitably qualified coded welders. No welding is to take place without the approval of the Engineer.

PSH 5.3.6 Grouting

Add to the Sub-Clause:

The Contractor will be fully responsible for all grouting work under this Contract.

PSH 6 TOLERANCES

PSH 6.1.3 Accuracy of Erection

Add to the Sub-Clause:

The accuracy of erection shall be the degree of accuracy II as tabulated but amended as follows: In items d)1) and d)2) of the table the Degree of Accuracy given as " ± 5 " shall be read as " ± 3 ".

PSH 7 TESTING

PSH 7.1 Test Certificates

Delete the part sentence "in terms of the project specification" from the wording of the Sub-Clause and add the words "when so requested by the former" at the end of the sentence.

PSH 8 MEASUREMENT AND PAYMENT

PSH 8.3 Scheduled Items

Add the following introduction to the subsequent Sub-Clauses:

The tendered rates shall cover the cost of preparing shop details (where applicable), the supply of all materials, fabrication, process control, loading, transporting to Site, off-loading, erection (unless separately included), setting into concrete or brickwork and grouting in. They shall also include for the supply of all nuts, bolts, holding down bolts, washers, rivets, cutting to waste, all temporary bracing, templates and shuttering necessary for installing, transporting and erecting.

Where the scheduled items for steelwork include corrosion protection, then the price stated shall also include for such protection as specified in SABS 1200 HC as amended by PSHC. Similarly the materials and corrosion protection for nuts, bolts, washers etc shall match the steelwork ordered.

Where the requirements of the above introduction conflict with the requirements of Sub-Clauses 8.3.1 to 8.3.6 inclusive the requirements of the introduction shall take precedence. Holding down bolts (i.e. bolts secured in concrete, brickwork etc shall be of the Chemical type (expanding anchors will not be acceptable).

m outer edge to outer edge at a maximum tension which shall not exceed the maximum working tension and other working properties of the shade netting during periods of maximum contraction."

PSH 8.9 (a) Open grid floors:

Add the following:

- (i) RS 40 HDG Rectagrid pressure locked (40mm x 40mm) Mentis or equivalent banded panels with 30mm x 4.5mm bearer bars in sump grid.....Unit: m²

b) Frames and kerbs for flooring:

- (ii) 45mm x 45mm x 5mm HDG angle section with fishtail anchors at minimum 300mm centres, cast into concrete.....Unit: m

PSL MEDIUM PRESSURE PIPELINES (SANS 1200 L)

PSL 1 SCOPE

Replace Clause 1.1 with the following:

This specification covers the supply and installation of pipelines, specials and fittings for rising mains, gravity mains, pipework for pumping installations and reservoirs as well as reticulation.

PSL 2 INTERPRETATIONS

PSL 2.4 Abbreviations

Add the following:

"HDPE	:	High Density Polyethylene
uPVC	:	Unplasticized Polyvinyl Chloride
mPVC	:	Modified Polyvinyl Chloride
oPVC	:	Orientated Polyvinyl Chloride
DI	:	Ductile Iron
GRP	:	Glass Reinforced Polyester
CML	:	Cement Mortar Lining
FBMDPE	:	Fusion Bonded Medium Density Polyethylene"

PSL 3 MATERIALS

PSL 3.1 General

The materials and construction of all pipes, fittings, valves and specials shall comply with the appropriate SANS, BS or other appropriate specification, whether stated or not, and shall be approved by the Engineer. Only full-length pipes bearing the relevant standard's mark will be acceptable. Cut pipes shall only be used at pipe junctions to position valves and specials as shown on the drawings, and at connections to structures. When laying the pipes the markings shall be visible from above.

The Contractor shall be responsible for the structural and hydraulic design of all fabricated steel pipe specials (puddle pipes in hydraulic test point anchor blocks, offtake chambers, isolating valve chambers, meter chambers, non-return valve chambers etc) where these are not standard off-the-shelf items designed and guaranteed by the manufacturer for the purpose intended (see also PSL7 for quality control requirements for specials).

Add the following subclauses:

PSL 3.1.1 Materials Control

PSL 3.1.1.1 Checking Material Lists and Drawings

In the case of materials to be supplied by the Employer as "free issue", not more than 4 weeks after the contract has been awarded the Contractor shall complete his check of the available materials in the stock yards against the drawings and advise the Engineer of any shortages or omitted items.

The materials stored in the stock yard/s for "free issue" by the Employer to the Contractor shall be fully inspected by the Contractor to confirm compliance with the specification and once satisfied, the Contractor shall sign acceptance of the material where after, any damage or other problems with the materials so accepted by the Contractor shall be the responsibility of the Contractor.

If any variations in the contract are authorised, the Contractor shall ensure that any additional items to be supplied by the Contractor (or the Employer where applicable) are ordered in good time so as not to cause delay to the works.

The Contractor shall check the delivery timing of all items and ensure that it is in line with the Contract program. Any critical items that could be delivered late are to be brought to the attention of the Engineer.

The delivery status of materials is to be checked and followed up upon by the Contractor throughout the contract.

PSL 3.1.1.2 Materials Control – General

The Contractor is held responsible for the inspection and control on site of all the materials and equipment for the duration of the Contract. Once material and equipment has been accepted, any subsequent damage shall be made good to the satisfaction of the Engineer at the expense of the Contractor. Damage to internal linings and external coatings that are necessary and incidental to good welding practices and the manufacturing of pipe specials are excluded.

Any item damaged beyond repair shall, at the discretion of the Engineer, either be replaced at the Contractor's expense or the value reimbursed in full to the Employer as appropriate.

PSL 3.1.1.3 Acceptance of Pipes, Fittings and Materials

Before acceptance of any pipes, fittings or other items of equipment the Contractor is to carry out a thorough inspection to ensure that the materials have been delivered undamaged and are as ordered.

Pipes shall be checked for:

1. Identification
2. Certification
3. Soundness and Internal lining
4. Ends bevelled correctly
5. Circumference according to specification and within tolerance

Inspection of pipe fittings, valves and other equipment shall include, but is not limited to:

1. Identification
2. Certification
3. Material schedule and rating
4. Lining, where specified
5. Coating where specified
6. Circumference according to specification and tolerance
7. Damage to items – example flange faces

Defective items shall not be accepted, but marked, quarantined and immediately reported to the Engineer.

If accepted, the Contractor shall take the required steps to ensure that all delivery documentation together with signed acceptance notes is filed in the Construction Dossier.

PSL 3.1.1.4 Material Storage

The Contractor shall store all items so that no damage occurs whilst awaiting installation. Where practical, items are to be stored in lockable containers for protection from the weather and pilferage.

All piping, pipe fittings and equipment stored outside or awaiting installation are to be protected from the weather, stormwater and soil wash and stored on pre-prepared surfaces. Pipes taken over from the Employer shall receive the required attention in order to ensure safe storage in yards, protected from fires, vandalism and incidental damage that can reasonably be prevented.

PSL 3.1.1.5 Handling Pipe, Fittings and Equipment

Strict supervision shall be maintained at all times when handling pipes and equipment. Particular attention is to be given to correctly rated lifting gear, slings and lifting beams. All lifting gear is to be inspected regularly for signs of wear and tear in terms of the relevant Safety Legislation and Clauses. Equipment is to be lifted at the recommended points specified by the manufacturer. Pipe is to be lifted with a lifting beam and slings, which shall be fitted at quarter points around the pipe. Due care shall be taken when fitting and placing slings to ensure that ancillary items do not get crushed during lifting. Pipe coating is to be protected by padding or otherwise from scuffing damage during lifting.

The equipment utilized for lifting pipes is subject to approval by the Engineer, which approval shall in no way absolve the Contractor of any responsibility in this regard, and all equipment judged unsuitable according to this specification or found to be unsuitable in practice shall be removed from site and replaced at the Contractor's expense. It is prohibited to handle pipes using chains or any other device involving metal contact with the pipe coating.

The Contractor shall ensure that all lifting equipment complies with the relevant safety regulations at all times.

Wet sponge tests shall be done to detect holidays on coatings and linings (where appropriate) of the pipes.

The Contractor shall, at his own expense, test each and every surface area, internal lining (where appropriate) as well as external coating during construction as per this specification. Testing for holidays shall be done after inclusion of materials, manufactured specials and equipment, as well as pipes, into the permanent works. Any defects found shall be repaired and the costs for remedial work shall be deemed to be included in the tendered rates for the construction of the pipeline. These tests and results shall be recorded on the Quality Control Plan as approved by the Engineer.

PSL 3.4 Steel Pipes, Fittings and Specials

PSL 3.4.1 General

Add to the subclause:

“All steel pipes and fittings under this contract shall be to the dimensions and details shown on the drawings or schedule of quantities. All pipes, fittings and specials shall have their relevant item numbers painted onto the exterior surface prior to despatch from the factory.

Steel pipes shall be checked for acceptance by the Contractor in accordance with SANS 719 and including the integrity of the coatings and linings.”

Further, it is a contractual requirement that all Steel pipe and fabricated steel specials shall be fabricated in accordance with an approved quality control plan (QCP). Manufacture shall not commence until such time as the QCP has been approved by the Employer’s Agent. The Contractor shall, in consultation with the Engineer, prepare and submit for approval a draft QCP within 14 days of award of the contract.

The Engineer shall approve the QCP, subject to amendments if necessary, and advise the Contractor accordingly within 14 days of receipt of the draft QCP. The QCP shall address inter alia the following tests/inspection:

TYPICAL QUALITY CONTROL TESTS OR INSPECTIONS	
PARAMETER	COMMENT
Material certification	To comply with the relevant standards
NDE testing	To comply with the relevant standards
Verification of tolerances	eg. “Go, No-Go” gauges
Surface preparation	eg cleanliness and blast profile
Coating / lining performance criteria	To comply with the relevant standards
Material identification	To comply with the relevant standards
Personnel certification (including welders and NDE)	To comply with the relevant standards
Weld preparation	To comply with the relevant standards
Compliance with dimensional tolerances	To comply with the relevant standards
Hydrostatic testing	To comply with the relevant standards
Coating/lining thickness tolerances	To comply with the relevant standards

An independent Inspectorate employed by the Engineer shall verify that the QMP is being adhered to and sign-off acceptance of each and every special delivered to site. No specials shall be incorporated into the Works until signed-off. A Method Statement for any remedial works required to achieve compliance shall be agreed with the Engineer and the costs of all such work be to the Contractor’s account.

PSL 3.4.2 Pipes of NB up to 150mm

In the second and third lines delete ‘medium class, shall be screwed and shall comply with the applicable requirements of SABS 62’ and substitute with ‘heavy duty class to SANS 62 Part 1 unless otherwise specified, shall have plain ends, and be hot dipped galvanized to SANS 121.

PSL 3.4.3 Pipes of NB over 150mm

Delete the contents of this sub clause and substitute:

PSL 3.4.3.1 Grade of Pipe

All pipes supplied shall comply with SANS 719/71, as amended by this project specification.

SANS 719 Grade B steel shall be used for pipes unless otherwise specified in the drawings or in the schedule of quantities

PSL 3.4.3.2 Welds

Pipes shall be manufactured from steel strips or plates continuously welded along the seams and the height of the inner weld reinforcement shall not exceed 1mm. In the case of pipes used with couplings, the external weld reinforcement shall be ground flush with the outer wall of the pipe over a suitable distance of the pipe. Pipes must have a continuous helical seam but for smaller than 300mm diameter, longitudinal and circumferential seams would be acceptable.

PSL 3.4.3.3 Hydraulic Testing at the Factory

Each pipe shall be hydraulically tested in accordance with SABS 719, clause 7.3 to 3500kPa.”

PSL 3.4.4 Fittings and Specials

Add the following:

"All bends, fittings and specials shall be manufactured from straight pipe specified elsewhere unless otherwise stated in the Bills of Quantities

The lengths of the pipes shall be as dimensioned on the drawings but shall be verified on site prior to fabrication.

All steel pipes & fittings larger than DN 150 to be FBE or solvent free epoxy coated and lined to minimum thickness of 400 micron unless otherwise specified.

All steel bends, fittings and specials shall be fabricated to the dimensions and details shown on the drawings and/or described in the Bills of Quantities.

Where drawings containing pipework and fittings do not have dimensions and have not been individually itemized on the drawings or bill of quantities, the pipework design, supply, delivery, handle install, test and commission is the Contractors responsibility. This shall be scheduled in the bill of quantities, as well as described in the Project Specifications and/ or indicated indicatively in the drawings.

The sides of taper pieces shall diverge at an angle of not more than 11° to each other.

All steel pipes & fittings larger than DN150 to have either a minimum 4.5mm wall thickness to SABS 719 Grade B or to have a diameter to thickness ratio of 125, whichever is greater.

Individual bends, fittings and specials DN150 and smaller shall be hot dip galvanised to heavy duty grade in accordance with SANS 121 after fabrication. Where a hot dipped galvanised fitting is to be welded to a coated and lined pipe, the galvanising is to be abraded off prior to welding. The external coating at the welded joint is to be primed and coated with an approved anti corrosion system as specified elsewhere.

Bends, fittings, and specials Larger than DN150 shall have the internal lining and external coating made continuous ("made good") as specified elsewhere for welded joints on coated and lined pipes.

Bends, fittings and specials shall be manufactured and tested in accordance with the specification for straight pipe and additionally with Section 8 of BS EN 10311: 2005 and BS 10224: 2002. The nominal dimensions of each bend, fitting and special required are itemised in the Bills of Quantities and/or on the drawings and 'exact length' tolerances shall be adhered to – subject to verification on site prior to fabrication. All plain ends on bends, fittings and specials shall have the plain ends prepared for butt welding except those plain ends that are to be jointed with adaptor joints or bell ends.

Bends shall generally be of the formed type except where otherwise stated or shown on the drawings.

The bend, fitting, and special fabricator shall supply written confirmation that all hand welding was carried out by coded welders.

The Contractor will be responsible for the design and provision of strengthening webs, crotch plates, gussets etc as may be necessary to prevent excessive deflection or deformation of fittings and specials when subjected to hydraulic pressure tests, and the tendered rates for the work will be deemed to include for the design and provision of this reinforcing wherever necessary. All calculations are to be submitted to the Employers Agent prior to fabrication. All crotch plates, wrappers, collars and gussets to be provided by the Contractor under this Contract are to be manufactured from SANS 719 Grade B steel, or of the same grade as the main pipe.

Bends shall be fabricated in accordance with the Table below.

Deflection of Angle	
Up to and including 3 °	One pipe end scarfed on site
Exceeding 3 ° and up to and including 9 °	Mitre cut (two pipe ends scarfed on site)
Exceeding 9 ° but less than 15 °	2 segment bend
15 ° and larger but less than 45 °	3 segment bend
45 ° and larger but less than 60 °	4 segment bend
60 ° and larger but less than 75 °	5 segment bend
75 ° and larger but less than 90 °	6 segment bend

Long radius bends shall have a centre to face radius of at least 2.5 times the pipe diameter.

Bends greater than 90° shall be fabricated from combinations of items from the table above.

Shop drawings of bends, fittings and specials shall be submitted to the Engineer for approval prior to manufacture.

All flanged bends, fittings and specials shall be hydraulically tested at the fabricator's premises to the same pressure that they will be subjected to during the hydraulic testing of the completed pipeline. No visible signs of leakage will be permitted.

All welding shall conform to SABS 0167-1984 and SABS 044 specifications.

All welded fittings and flanges shall be documented as per specifications and welders must be qualified to WQR. All welds are to be 100% visually inspected inside and out. Examination and testing of welds shall be performed in accordance with section PSL 3.4.8.

Cutting and welding of flanged bends, fittings and specials will not be permitted on site. Any adjustments required due to on site conditions will have to be made at the fabricator's premises and all coating and lining repairs and tests completed prior to being returned to site."

Add the following new subclauses:

PSL 3.4.5 Stainless Steel Pipework

Pipework fittings and specials shall comply with the dimensional requirements specified for mild steel pipe work, fittings and specials. The wall thickness shall be not less than 4,0 mm for pipes of diameter up to 150 mm and not less and 5,0 mm for pipes exceeding 150 mm in diameter, or as called for on the pipe schedules.

Stainless Steel pipework, fittings and specials shall be Grade 304L and shall not be supplied coated unless otherwise specified.

Plain ends of pipes and fittings shall be covered and protected against damage whilst being transported and stored.

PSL 3.4.6 Puddle Collars and Anchoring Flanges

Puddle collars and anchoring flanges used as pipe anchorages shall be of the same dimensions as corresponding flanges but those cast into concrete walls are to be undrilled. The collar/flange shall be capable of transmitting a longitudinal force 33% greater than the internal hydraulic pressure to be applied when testing, multiplied by the area of the bore and, under that condition, the stress in the material shall not exceed its yield stress.

Where puddle collars are shown on the drawings as being 20 mm thick, those collars are not required to transmit thrust, their purpose being to assist with the waterproofing of the concrete chambers by increasing the path that ground water might have to take to enter the chambers.

Where polyethylene pipes are cast into concrete structures, they shall be specially prepared and adapted by positioning a custom-made tight-fitting natural rubber sealing sleeve around the circumference of the pipe and in the case of structured-wall pipe creating shear keys through removing small segments of the outer wall. The rubber seal shall be 10 mm thick and 200 mm wide or 80% of the width of the wall and shall be 60 to 65 shore hardness, with a vulcanised joint. It shall need to be stretched over the pipe circumference to ensure a tight fit.

PSL 3.4.7 Closure Pipes

Closure pipes, which are to be cut on site to the exact lengths, shall have the diametrical tolerances specified for the pipe ends applied over the full length of the pipe. Closure pipes shall be supplied in standard lengths.

PSL 3.4.8 Welding Tests at fitting Fabrication Shop(s)

PSL 3.4.8.1 Qualification Tests for Welding Procedures

Only appropriately coded welders may be used.

The qualification tests for welding procedures shall be carried out generally in accordance with the requirements of the American Petroleum Institute API 1104. The detailed procedure to be adopted during manufacture shall be established and the quality of the welds so produced shall be determined by carrying out one transverse tensile weld test and two guided cold bend tests on suitable coupon plates.

The tests are to be carried out before fabrication of fittings is commenced.

The coupon plates shall be prepared either from plates of the same material as the pipe and welded in a similar manner to that to be used during production, or by cutting suitable specimens from a pipe selected at random by the Engineer from the first production. The coupon plate for the tensile weld test and those for the guided cold bend tests shall be prepared in accordance with the requirements of SANS 719.

The qualification tests shall be considered satisfactory if:

- a) The weld has a joint efficiency greater than 95% of the minimum specified tensile strength of the parent metal and,
- b) The bend test specimens are capable of being bent around a former with a diameter equal to six times the nominal thickness of the plate to an angle of 180 degrees without developing a crack, except at the arises of the specimen, of length or width greater than 3 mm.

Failure to pass the above qualification tests shall result in the rejection of any pipes welded with the procedure used and the preparation of a new qualification of procedure test.

Any changes in the electrode case type used or change of flux used shall require a qualification test before approval of the procedure is granted.

PSL 3.4.8.2 Radiographic Examination of Shop Welds

The Contractor shall include in his prices for the supply of fittings and specials, the cost of carrying out, under the supervision of the inspector appointed by the Employer, examination of shop welds on the following basis:

- a) One hundred percent radiographic examination of all welds deposited manually or semi-automatically in fittings and specials which cannot be hydraulically tested prior to the fittings and specials being installed in the pipeline.
- b) Ten percent radiographic examination of all welds deposited manually or semi-automatically in specials and fittings that are to be tested hydraulically prior to the fittings and specials being installed in the pipeline.

The Engineer shall in all cases determine which welds are to be radiographed on the quantity basis specified above. All radiographs and records thereof made by the Contractor shall be made available to the Engineer to enable him to determine whether the welds are acceptable or not and no coating, lining or wrapping of pipes shall be permitted until the welds have been accepted by the Engineer. To avoid unnecessary delays, at the option of the manufacturer, radiographs may be approved by the manufacturer's inspectors subject to them being subsequently approved by the Engineer.

When a section of the weld is shown by radiography to be unacceptable, and if the limits of the deficient weld are not defined by the radiograph, additional radiography shall be carried out at the Contractor's expense until the limits of the deficiency are determined.

Repairs shall be made to defective welds at the Contractor's expense. All repair welds shall be identified with a stamp marking, indicating which welder conducted the repair. Repaired welds shall be radiographed at the Contractor's expense

PSL 3.7 Other Types of Pipes

PSL 3.7.2 Polyethylene Pipes

Delete this Subclause and replace with the following:

PSL 3.7.5 Ductile Iron Pipes

Ductile Iron pipes, fittings and accessories shall be fitted with spigot and socket rubber ring joints and shall comply with the relevant requirements of BS, EN 545: 2010 and ISO 2531- 2009.

The following documents form a part of this Specification to the extent specified herein. In any case of conflict, the requirements of this Specification shall prevail. The latest issues shall apply.

BS EN545: 2010	:	Ductile Iron pipes, fittings, accessories and their joints for water pipelines – Requirements and test methods.
ISO 2351 – 2009	:	Ductile Iron pipes and fittings, fittings, accessories and their joints for water pipelines – Requirements and test methods.
ISO 4179	:	Ductile Iron pipes for pressure and non-pressure pipelines – Centrifugal cement mortar lining – general requirements.
ISO 8179-1/2	:	Ductile iron pipes – External zinc coating with finishing layer.
ISO 8180	:	Ductile iron pipes – Polyethylene sleeving.
ISO 4633	:	Rubber seals-Joining rings for water supply, drainage and sewerage pipelines-Specification for materials
EN15189	:	Ductile Iron pipes – External polyurethane coating
BS EN 14901:2006	:	Epoxy coating for Ductile Iron pipes and fittings

PSL 3.7.5.1 Ductile Iron Fittings and Accessories

All bends, fittings, couplings and other accessories for ductile iron (DI) pipe shall be fabricated from ductile iron (DI) and shall comply with the test pressures as specified.

Corrosion protection coatings (external) and linings (internal) for fitting and accessories shall be as specified for pipes save that, where appropriate, hand application of linings and coatings may be used.

Repair work shall be carried out as for pipes.

PSL 3.7.5.2 Corrosion Protection of Ductile Iron (DI) Pipes

Unless otherwise stated, ductile iron pipes shall be cleaned and then externally zinc sprayed with a finishing layer (coating) to ISO 8179-1.

Pipe ends shall be coated as follows:

1. External surface of spigot: Zinc spray coating with finishing layer
2. Flanges and sockets (face and internal surface): Bituminous paint or synthetic resin paint to supplement the zinc spray coating. All paints shall be approved for use on potable water applications by an approved body (USA Environmental Protection Agency (EPA) or similar).

External Zinc Coating and Finishing Layer

The external coating of centrifugally spun ductile iron pipes shall comprise a layer of metallic zinc, covered by a finishing layer of bituminous or synthetic resin paint compatible with zinc. Both layers (zinc and finishing layer) shall be works-applied using suitable spray equipment.

The metallic zinc coating shall cover the external surface of the pipe and provide a dense and continuous uniform layer. It shall be free of bare patches, areas of lack of adhesion or other defects and shall be visually uniform. The mean mass of zinc shall not be less than 200 g/m². Zinc purity shall be at least 99.99%.

The finishing layer (bituminous or synthetic resin paint) shall be physically and visually uniform over the entire metallic zinc layer and shall be free from defects such as bare patches, areas of lack of adhesion, air bubbles, pinholes, runs and sags. The mean thickness of the finishing layer shall not be less than 70 µm and the local absolute minimum thickness shall be 50 µm.

Shop and Field Repairs

Damage to coatings where the area of total removal of zinc has a width exceeding 5 mm or other areas designated by the Engineer shall be repaired in the following manner:

Where applicable, remove the finishing layer by mechanical or other means, to 50mm beyond the zinc area to be repaired, to achieve a sound, clean zinc substrate surround.

Repair the damaged area by means of metallic zinc spray or by means of a zinc rich paint containing at least 90% zinc by mass as appropriate. The mean mass of the cured applied zinc paint dry film shall not be less than 200 g/m². The zinc paint repair shall terminate 10 to 15 mm from the finishing layer of the repair site. The zinc repair site shall appear visually uniform and shall be free of defect.

Once the zinc repair has cured completely, the entire area shall be painted with bituminous or synthetic resin paint, overlapping at least 20mm onto the sound undisturbed finishing layer and allowed to cure. The finishing layer shall be defect free and appear to be visually uniform and shall be allowed to cure completely before being handled or buried.

Polyethylene Sleeving

Where specified for Ductile Iron pipes as an additional external corrosion protection barrier to the zinc coating and finishing layer, polyethylene sleeving shall comply with ISO 8180 – 1995. The nominal thickness of the sleeving shall not be less than 200 µm and the density shall be between 910 and 930 kg/m³.

Internal Cement Mortar Lining

The cement mortar lining of ductile iron pipes shall constitute a dense, homogeneous layer covering the entire internal surface of the pipe barrel. It shall be works applied by centrifugal spinning process or by centrifugal spray head or a combination of these methods. Troweling to achieve a smooth internal bore shall be permitted.

The cement mortar mix shall comprise cement (or high alumina cement) to ENV 197-1, suitably graded sand (with no organic impurities, fine clay particles or other deleterious matter that may adversely affect the mortar quality) and potable water. Chloride-free admixtures shall be permitted with the approval of the Engineer. The ratio of sand to cement shall not exceed 3.5 by mass. The water / cement ratio shall be determined for the particular lining process and this ratio shall be maintained to achieve the relevant specifications.

The freshly applied lining shall be cured by approved means to provide sufficient hydration of the cement and, after curing, the cement mortar shall have a minimum 28-day compressive strength of 50 MPa.

The surface of the cement mortar lining shall be uniform and smooth and shall have a nominal lining thickness and minimum lining thickness as indicated below. Trowel marks may be evident but there shall be no recesses, intrusions or local defects which reduce the thickness to below the minimum thickness specified below. Upon installation, the pipes shall have a minimum Hazen Williams smoothness coefficient of 120 (C >= 120).

Fine crazing or hairline cracking associated with cured cement-rich mortars will be acceptable provided that there is no evidence of mortar disbondment from the substrate. The maximum permissible shrinkage crack width and radial displacement is given below.

CEMENT MORTAR LINING THICKNESS AND PERMISSIBLE CRACK WIDTH			
Diameter Nominal (DN)	Lining Thickness		Maximum crack width and radial displacement
	Nominal ¹	Tolerance ²	
40 to 300	4.0	-1.5	0.4
350 to 600	5.0	-2.0	0.5
700 to 1200	6.0	-2.5	0.6
1400 to 2000	9.0	-3.0	0.8
NOTE:			
1. Pipe ends may have a chamfer not exceeding 20 mm in length			
2. Negative tolerance specified only			

Shop and Field Repairs

Where cement mortar lining repair is deemed to be necessary, it shall be repaired in the following manner:

Defective mortar shall be carefully removed to ensure that adjacent sound mortar is fully bonded to the ductile iron pipe substrate.

The adjacent sound mortar shall not be feathered but shall be cut-back at approximately an 80° angle to achieve a “dove-tail” joint.

All mortar shall be removed from the repair area to achieve a clean ductile iron pipe substrate and the repair area shall be washed with copious quantities of potable water.

The repair shall be effected using either a rich cement mortar or a compatible polymer mortar (EPIDERMIX 338 or similar approved) which shall be worked in by hand; care being taken to avoid the inclusion of air bubbles. Latex additives, designated (by EPA or similar body) as being suitable for use on potable water installations may be used.

Large Repair Areas.

The repair shall be smoothly and neatly trowelled to match the adjacent pipe profile.

PSL 3.7.6 Glass Reinforced Polyester Pipes (GRP)

Glass Reinforced Polyester pipes and fittings shall conform to ASTM D3262 and ASTM 3754 and AWWA C 950.

The applicable SABS specification for these pipes is:

SABS 1748 – 2004 Part 1 Glass - Fibre – Reinforced Thermosetting Plastics (GRP) pipes Part 1 Pipes for Water Supply, Sewerage or Drainage.

The manufacturer shall have an ISO 9001: 2008 Quality Management System.

Installation

Installation shall be in accordance with SABS 1200 LB and LD for Flexible Pipes. Pipes shall be either plain ended with Double Bell couplings or Bell and Spigot. A typical pipe will be described as PN 16 DN 700 SN 5000 GRP pipe

ESR - Glass shall be used for sewer applications and E- Glass shall be used for water applications.”
but after any repair welder has had ten consecutive repairs approved, the extent of the radiography of the repairs conducted by the welder may be decreased by agreement between the Engineer and the Contractor.

PSL 3.8 Jointing Materials

PSL 3.8.2 Flexible Couplings

Delete the subclause and replace with the following:

“Where ordered, steel flexible couplings are to be of the “Viking Johnson”/“Klamflex”/“Aqualok” or similar approved type without central registers, each comprising one centre collar, two special flanges, two rubber rings and hot dipped galvanised mild steel bolts.

Steel couplings shall be assembled strictly in accordance with the manufacturer's instructions and all bolts shall be torqued to the value recommended by the manufacturer. On completion of hydraulic pressure testing of the installation, the entire joint shall be protected as described in Clause PSL 3.9.3.8.

The tendered prices for laying and jointing are to include for the supply of all necessary materials, plant and labour to complete the joint and necessary corrosion protection as specified.

Flexible couplings shall conform generally to BS 10311: 2005 for slip-on type couplings and shall be of approved manufacture. They shall be capable of being tightened and released without damaging or improperly distorting the rubber seating rings and shall be designed to prevent the rubber rings being blown out under pressure or sucked in under vacuum.

Each coupling is to be capable of withstanding the test pressure applicable to the pipes with which they are to be used without exceeding a stress in the steel of 67% of the yield point.

Mild steel couplings shall be protected by an approved epoxy coating system such as an approved solvent-free epoxy (SFE) system such as “Nordbak 1” or similar approved system and applied within 4 hours of abrasive blast cleaning the metal surfaces of the coupling in accordance with ISO 8501-1 Grade Sa 2½. Nuts, bolts and washers shall be hot dipped galvanised. The plain end of the pipe shall be properly prepared, and in the case of steel pipes before corrosion protection, so as to accept the flexible coupling.

Adaptor couplings and anchoring adaptor joints shall comply with the above specification for flexible couplings and be of a similar design, but one end shall be flanged to enable connection of plain ended pipes to flanged joints. The adaptor joints

are to be complete with bolts and nuts for connecting the flanged joint to the anchoring flange situated generally 300 mm to 400 mm from the plain end of pipe. All bolts, nuts and washers are to be hot dipped galvanised. In order to anchor the plain ended pipe to the flanged joint all of the bolts for the flanged joint are to pass through the anchoring flange and are to be fitted with nuts and washers at the flanged joint and on either side of the anchoring flange.

Dismantling joint shall comply with the above specification for flexible couplings and be of a similar design, but both ends shall be flanged to enable connection of two flanged joints. The adaptor joints are to be complete with bolts and nuts for connecting to each flange. All bolts, nuts and washers are to be hot dipped galvanised. “:

PSL 3.8.3 Flanges and Accessories

Add the following:

"All flanges, gaskets, bolts, nuts washers and other appurtenances required for the execution of the work under this Contract shall be supplied and installed by the Contractor under this Contract and shall comply with the following:

1. **The sizes and drillings shall comply with SANS 1123** as shown on the drawings or as scheduled in the Bills of Quantities.
2. **Flanges** shall be sized and drilled to match the pressure rating of the adjacent fitting or pipe for pipes and fittings rated > 16 bar.
3. Flanges cut from steel plate shall be machined flat on the front face, but with a raised face.
4. All PE flange connections to PE or other materials shall be of the HP type unless otherwise stated.
5. For PE flanges, the spigots shall be of sufficient length to enable both HE butt welding and HW welding.
6. Backing flanges for PE shall be manufactured from galvanised or powder coated steel
7. The use of standard stub ends for PE pipes shall not be permitted.
8. The body of PE flanges shall be manufactured in the injection moulding process or alternatively, in the case of larger dimensions, from a piece of homogeneous semi-finished material. Semi-finished materials manufactured from wound rods or the subsequent application of other forms of reinforcing shall not be permitted.
9. Proof that flanges and accessories are manufactured in accordance with DIN EN ISO 9001 shall be provided.
10. No machining need be carried out on the back face (except where insulating flanges are to be installed) provided that face is sufficiently flat to ensure square bedding of the bolt heads and nuts and provided that all weld reinforcement is removed.
11. Temporary end covers shall be provided by the Contractor for protection of flanges, and prepared plain ends of pipes and fittings to prevent damage to internal lining during transportation and during handling on site.
12. All piping and flanged surfaces shall be cleaned before connections are made.
13. The (raised) faces of flanges that are in to be in contact with gaskets shall be masked and shall not be painted or coated. The mating flange shall then receive one coat of an approved rust inhibitor. Care shall be exercised to ensure that after the application of all coatings there are no runs or drips on the mating surfaces of the flanges and that the flange profiling is clearly visible over the entire face. Excessive coating build up in flange bolt holes that could snag bolts will not be permitted.
14. Flanged joints shall be connected with the specified bolts, nuts and double washers (one under the bolt head the other under the nut) all of which are to be supplied by the Contractor.
15. All bolts, tie-bolts, nuts and washers shall be galvanised to SANS 121: 2011 and shall comply with the relevant requirements of SANS 135: 2011 and SANS 136: 2008 where applicable.
16. The length of each bolt shall be such that after the bolt has been tightened, the end of the bolt shall project beyond the outer face of the nut, but not by more than two threads. Tie-bolts on restrained/anchoring couplings shall be fitted with “backing nuts” and washers.
17. Each flanged joint is to be fitted with an approved and suitably rated gasket and sealed watertight such that there will be no visible sign of leakage under the specified factory and field test pressures and under the in-service working conditions (pressures).
18. All bolts are to be tightened in a predetermined pattern with opposing bolts being tightened sequentially. When all bolts are tight, each bolt is to be torqued to the required/recommended torque in a predetermined pattern with opposing bolts being tightened sequentially.

All bolt threads shall be liberally coated with “Copper slip” or similar approved compound prior to assembly.

All GMS nuts, bolts, washers, threaded bars and all other GMS or uncoated metal surfaces, both in buried and exposed situations, shall, after successful pressure- testing and after thorough brushing / chipping to remove concrete splatter etc, de-greasing and detergent cleaning and clean water rinsing, shall be corrosion protected as described in PSL 3.9.3.18 and PSL 3.9.3.19."

PSL 3.8.4 Loose Flanges

Add the following:

“Flange jointing material, when installed in the complete pipeline, shall be capable of withstanding transient pressures of up to the specified field test pressure. Under this condition no damage shall be caused or leakage shall occur through the joint. Bolts and nuts shall be galvanised to SANS 121: 2011 and shall comply with the relevant requirements of SANS 135: 2011 and SANS 136: 2008 where applicable. Upon completion, bolt heads, washers and nuts shall be wrapped with the “Denso Mastic

Blanket System” comprising of a priming solution, mastic blanket, petrolatum tape and lay-flat sheeting as described in PSL 3.9.3.8. “

PSL 3.9 Corrosion Protection

PSL 3.9.2 Steel Pipes

Delete Sub-Clauses 3.9.2.1 and 3.9.2.2 and replace with:

“Steel pipes, fittings, flanges and specials shall have their surfaces thoroughly cleaned by Grit blasting to a finish complying with the requirements of SIS 05 59 00 for a Sa 2½ finish. Grit for blast cleaning shall be in accordance with SABS 064.

Surfaces shall, within 4 hours after cleaning, be primed with the specified primer or if no primer is specified, with the first coat of the specified system.

All materials used shall be of the highest quality and in accordance with the manufacturer's requirements. Particular care shall be taken to ensure compatibility of all materials used with others forming part of the corrosion protected system. Manufacturer's application and overcoating times and specific instructions relating to curing periods and humidity limitations shall be strictly adhered to.

Corrosion protection systems shall not be applied over any surface containing traces of grit, grease, oil, loose rust, millscale or any contaminants or corrosion products. All surfaces shall be absolutely dry.

Welds and adjacent parent metal shall be ground smooth and all weld spatter removed. Sharp edges shall be avoided and where they are evident the removal shall be effected by grinding to a radius of not less than 3 mm.

The Contractor shall arrange for the Engineer or his representative to be present during surface preparation and coating application to ensure compliance with the specification.

Add the following new subclauses:

PSL 3.9.2.1 Holiday Testing

All Holiday Testing shall be carried out with an instrument approved by the Engineer. The sparking detection test shall conform to the standards as set out in SANS 1217:2001. The Contractor shall familiarise himself with the dielectric strength (breakdown strength) of all the coatings and linings he works with for the different pipe sizes. The Contractor shall also have an in depth knowledge of the Holiday Testing equipment he works with, in order to calculate the Corona discharge effect for the typical brush being utilised, with reference to the specific ambient conditions for any specific test.

All Holiday Testing shall be executed at a voltage which is set at 50% of the value of the dielectric strength of the lining or coating being tested. The Contractor shall carefully analyse the loss in test voltage as a result of the Corona Effect, specific to the ambient conditions surrounding the test. The test voltage of the Holiday Testing equipment shall be adjusted such that the voltage drop as a result of the Corona Effect will be taken into account when the actual 50% threshold of the dielectric strength is calculated.

The Holiday Test equipment shall be calibrated by an approved supplier and checked every 30 minutes or every time a test at a different location is started. Each piece of equipment shall have a unique identification number with calibration certificates and detail of equipment utilized shall be submitted to the Engineer for approval. Method statements for the process of holiday testing shall be submitted to the Engineer for approval.

The correct equipment for the type of application will be utilized. For example, where pin holes have been repaired and re testing for effectiveness of repair work being done, the Contractor shall utilize the correct equipment to effect same and this shall include the use of a pencil brush which concentrates the efforts of holiday testing at the repair. Where spark tests are performed on Tape Wrap systems, the minimum brush width shall be 300 mm. The brushes utilized shall be brass bristle cone brushes. The typical brush speed shall be 200 to 300 mm/sec when doing spark tests.

The Contractor shall, at his expense, test each and every surface area, that is internal lining (where applicable) as well as external coating, during construction as per this specification. Testing for holidays shall be done after inclusion of materials, manufactured specials and equipment, as well as pipes, into the permanent works. Any defects found shall be repaired and the costs for remedial work shall be deemed to be included in the tendered rates for the construction of the pipeline. These tests and results shall be recorded on the quality control plan as approved by the Engineer.

PSL 3.9.2.1.1 Inspection, Detection and Repair of Holidays

Complete sets of transistorised portable holiday detection equipment with adjustable output voltage with interchangeable 200 mm brush and full circle electrodes, adaptable for use on damp or dry surfaces of coatings of pipes, buried valve bodies, fittings and couplings of any diameter in the range DN 200 to DN 1200 are to be provided, tested, maintained and recharged when necessary by the Contractor, for use by the Engineer's Representative in inspecting coatings, wrappings and external protection of pipes, valves, fittings and couplings at the site of the Works and/or the point of delivery in accordance with the following:

When laying of pipes or fittings or covering of pipes, buried valve bodies, fittings or couplings with padding or concrete is proceeding in more than one 250 metre long section of the working strip on any day, the Contractor shall provide a sufficient number of complete sets of holiday detection equipment in addition to the holiday detection equipment required by his own staff to permit the person appointed by the Engineer to carry out holiday inspections simultaneously at each such section of the working strip.

The Contractor shall include in his tendered rates an allowance to cover the provision by him of all the necessary equipment for the Engineer's Representative as set out above as well as any and all extra labour and equipment necessary for all special handling of pipes, valves and fittings which is required in order to facilitate the following standard holiday detection operations which will be carried out by the Engineer or his Representative.

During laying operations the full circle electrode of the holiday detector will be passed over all the external surface of each pipe, except such area as may be covered by a belt sling or other approved handling tackle not exceeding 600 millimeters in total width used for supporting the pipe in the course of the laying operation immediately prior to lowering the pipe into its trench. Only if a holiday is detected in the course of the inspection described above, will the entire external surface of the pipe have to be inspected by passing the full circle electrode of the holiday detector over the full length of the pipe. At the laying site the holiday detection equipment will also be used to check the external coating of fittings before laying and to check completion of external coatings over welded joints or couplings after hydraulic pressure testing of the pipeline.

The Contractor shall so carry out his laying work as to provide reasonable time and access to the Engineer for the purpose of the inspections described above. The tendered rates for pipework shall be deemed to include for all holiday detection described in this Specification.

All work ordered by the Engineer in writing to be carried out by the Contractor in assisting in any holiday detection inspection which the Engineer may carry out in addition to the standard operations described above and proving of repairs mentioned below shall be carried out by the Contractor at agreed rates.

All holidays, voids, pinholes or other flaws in the coatings or wrapping or completed external covering to welds, couplings or buried valve bodies are to be made good by the Contractor at his expense. Holiday testing and repairs to free issue pipes prior to acceptance by the contractor are dealt with separately under Clause PSL 3.9 and items are included in the Bill of Quantities for the repair of such defects.

Protective coating or wrapping to pipes and fittings or completed external covering to joints and buried valve bodies which are inadequately bonded, damaged by abrasion, below the minimum thickness, do not comply with the materials specifications and are in any other manner defective must be removed and replaced at the expense of the Contractor. All pinholes and other defects located by means of the holiday detector shall be repaired to the satisfaction of the Engineer and proved sound by the holiday detector.

The coating of each pipe shall be inspected and holiday detected by the Contractor, immediately prior to being laid and these inspections will be witnessed and signed off by the Engineer or an appointed third party inspection authority. Two thirds of the circumference of each pipe and fitting will be inspected outside the trench, after the pipe/fitting has been transported to the construction site where it is to be laid. This inspection is to be carried out shortly before each pipe is hoisted for laying in the trench. The balance of the circumference of each pipe/fitting will be inspected once the pipe/fitting has been laid in the trench. This will require the pipe/fitting to be rotated to facilitate inspections.

All remedial work that is required shall be effected immediately upon detection of any holidays. The cost of holiday testing and effecting remedial work to the coating of the pipe at the installation location, as a result of construction or transportation or storage damage, shall be deemed to be included in the tendered rates for the laying of the pipe/fitting.

Each and every external coating make good at welded joints, shall be holiday tested around the full circumference and be subject to approval in terms of the relevant Quality Control Procedure. All costs associated with holiday detection and any costs of effecting remedial work, shall be deemed to be included in the tendered rates i.e. no special or "extra over" payments will be made for external repairs or make goods at joints.

All pipe specials being corrosion protected with an external epoxy coating, shall be holiday tested before being incorporated into the works as well as holiday tested after inclusion into the works. All the costs of holiday detection and any costs for effecting remedial work shall be deemed to be included in the rates for the laying of the pipe/fitting.

The corrosion protection systems on all fittings and manufactured specials shall be holiday tested once included into the permanent works. All the costs of holiday detection and any costs of effecting remedial work shall be deemed to be included in the tendered rates for the laying of the pipeline.

The appropriate wet sponge tests shall be conducted on the internal surfaces of all epoxy linings, and particularly on reinstated areas and make good at joints, and on manufactured specials and repairs to linings. This will be carried out from time to time and again before final cleaning of sections of the pipeline that are completed. All the costs associated with wet sponge holiday detection and any costs for effecting remedial work shall be deemed to be included in the rates for the laying of the pipeline.

PSL 3.9.2.1.2 Holiday Testing of Pipe at Pipe Yards (Free Issue Pipe Only)

In the case of free issue pipe, the external pipe coatings will be checked at the point of delivery, as supplied by the pipe manufacturer. All defects will be indicated on the Independent Third Party Test Reports. Some of the defect repairs will have been carried out under the pipe supply contract. The Contractor shall be required to repair the remaining defects at the cost of the Employer. Items will be provided for this purpose in the Bill of Quantities.

It shall be the Contractor's responsibility to detect defects in free issue pipes, including their ends, coatings and linings before taking receipt. The Contractor shall execute holiday detection tests on all the pipe coatings in the pipe yard before uplifting and transportation commences and this will be subject to witnessing and sign off by the Engineer or an appointed third party inspection authority. This will determine the baseline to be used when handling and transportation damage, if any, is assessed.

PSL 3.9.2.1.3 Holiday Testing of Pipe at Work Fronts

The coating and lining, if appropriate, of each pipe shall be inspected and holiday detected by the Contractor immediately prior to being laid and these inspections shall be subject to witnessing and sign off by the Engineer or an appointed third party inspection authority. Two thirds of the circumference will be inspected outside the trench, after the pipe has been transported to the construction site where the pipe will be laid, and the balance of the circumference will be inspected once the pipe has been laid into the trench and rotated 180°. All testing shall be marked on the pipe from start of test point to completion of test point. All remedial work shall be effected immediately upon detection of any holidays. The cost of holiday testing and effecting remedial work to the coating of the pipe at the installation location as a result of construction or transportation damage by the Contractor shall be deemed to be included in the tendered rates for the laying of the pipe.

PSL 3.9.2.1.4 Holiday Testing on Tape Wrap Systems

Each and every external coating repair at welded joints, that are repaired with a tape wrap system, shall be holiday tested and subject to approval in terms of the relevant Quality Control Plan. All costs for the holiday detection shall be deemed to be included in the tendered rates for the laying of the pipe.

PSL 3.9.2.2 Hot Dip Galvanising

Where ordered or specified, galvanised steel pipework shall comply with SANS 121 and be entirely coated with zinc after fabrication by complete immersion in a zinc bath. The finished surface shall be clean and uniform and any excess being removed. The zinc deposit shall exceed 0.700 kg / m²

PSL 3.9.2.3 Repairs to Epoxy Coatings

In addition to the contents of this clause, the contents of PSL 3.9.3.4 shall also be applicable.

PSL 3.9.3 Protection against Electrolytic Corrosion

Change the heading of this subclause to:

PSL 3.9.3 Protection against Electrolytic Corrosion and general repair and making good procedures for linings and coatings."

In the fifth line delete 'terms of the project specification' and substitute with 'the PSL specification or unless specified elsewhere.'

Add the following new subclauses:

PSL 3.9.3.1 Preparation of Steel Surfaces for Repairs and/or Reinstatement of Internal Lining and/or External Coating

The following method is applicable to the preparation of exposed steel surfaces prior to the carrying out of any repair procedure to internal linings and/or to external coatings. This specification is applicable to all steel surfaces that have been stripped of its corrosion protection layer, internally or externally, as a result of the manufacturing of specials, construction activities or pipe laying, welding and/or damages caused by handling or latent defects in application.

Degreasing:

All bare metal surfaces shall be degreased in order to remove grease and oil from the pipe surface as a first step in the preparation process i.e. before grit blasting and/or power brushing starts. Degreasing shall be carried out using an approved water based solvent degreaser such as that complying with SANS 1216 or, for use in enclosed systems, with SANS 1365. The surface shall then be cleaned with potable water and left to dry completely before the next step is taken.

Grit Blasting – Internal Lining Repair:

Grit blasting of bare metal surfaces shall take place after degreasing of the area. Abrasive material used for blast cleaning shall be free from oil or grease, as shall be the compressed air used in air blast cleaning.

The finished grit blasted surface shall be to Sa 2½ of ISO 8501-1 with a 75 micron angular profile. Hackles shall be removed with coarse abrasive paper.

Transition areas from internal lining to bare metal which has been grit blasted, shall be smooth without rough edges or flaking appearances.

All grit blasting within the pipe line that is under construction, shall be performed by way of a "vacuum blast" process in order to limit the generation of dust. Grit blasting shall, under all circumstances, be carried out using equipment suitable for the size of the work to be undertaken.

Damp hessian sacking or other suitable material is to be temporarily fixed around the pipe on both sides of the work areas to prevent damage to the adjoining pipe coating/lining.

All residual dust and debris shall be removed.

Before work commences, the Contractor shall provide the Engineer with a method statement for approval for each type/location of grit blasting.

Power Brush – External Coating Repair:

Power brushing of bare metal surfaces shall take place after degreasing of the area as specified. The area that has been power brushed shall be free from rust, laitance, dust, oil or other deleterious matter before the application of primer. Any areas in the region where power brushing took place shall be free from signs of disbonding of lining and/or coating. The surface finish, once power brushing has been completed, shall conform to minimum St 2 standard.

PSL 3.9.3.2 Preparation Mixing and Application of Epoxy Compounds

When mixing two part epoxies the base and activator shall be mixed in accordance with the manufacturer's instructions. Mixing in the original container will only be permitted by means of methods that ensure full integration of different parts of the compound into a homogeneous compound with the characteristics as intended by the manufacturer. The different parts of the compound shall not be diluted. Mixing shall only be allowed with full batches and reduction of volumes from mixing packs by means of weight or volume measurement, which will result in smaller portions to be mixed, will not be allowed. In the application of the epoxy the following shall be strictly in compliance with the manufacturer's instructions:

- T1. Method of application (Type of brush or roller.)
- T2. Over coating time.
- T3. Temperature range for application.
- T4. Method of mixing base and activator.
- T5. Number of coats to achieve the specified thickness.
- T6. Safety aspects e.g. Eye and hand protection, ventilation, fire precautions, etc.
- T7. Note that roller and brush applicators shall be replaced once the product application expiry time has been reached on any specific applicator tool.

Uncured epoxy must be regarded as being toxic and shall be handled in accordance with the manufacturer's instructions. Adequate lighting and ventilation shall be provided whilst working within the pipeline.

Only solvent free epoxy repair kits shall be utilized to repair the internal linings of the pipeline. This specification refers to "two part epoxy" as an epoxy repair kit which consists of a base and an activator approved by the Engineer and could be products similar to "Denso ST100", "Sigma SF 523", "Nordbak", etc.

For the repair of cement mortar linings, "Epidermix 338" or similar approved shall be used.

The Contractor's tendered rates for the laying of the pipe shall be deemed to include for all the repairs and make-goods that have to be effected in order to deliver a serviceable and acceptable pipe line. (This excludes such repairs as instructed by the Engineer as a result of manufacturing defects, if any).

Two-part epoxy may only be applied on steel surfaces prepared as specified in PSL 3.9.3.1.

PSL 3.9.3.3 Making Good of Cement Mortar Lining at Welded Joints

All cement mortar lined pipes shall have their cement mortar lining stopping a minimum of 25 mm from each plain end and from each end and it shall be 'chamfered' by 15 degrees to provide a positive dove-tail joint for the epoxy repair plug after field welding to another pipe.

When cement mortar lined straight steel pipes are cut, the cement mortar lining is to be cut back between 25 mm and 50 mm from the cut end of the pipe and "chamfered" by approximately 15 degrees to provide a positive dove-tail joint for the epoxy mortar repair plug after butt welding.

The surfaces are to be prepared as specified in PSL 3.9.3.1.

In the case of plain ended pipes, after welding, a band of "Epidermix 338" or similar approved epoxy, shall be applied internally on the uncoated steel adjacent to the cement mortar lining to a width to suit the cement mortar lining "cut back" and to a thickness to suit the mortar lining thickness of the pipe.

In the case of collared or bell ended pipes, the repair shall be made using a mortar mix and the plain end of the adjoining pipe shall be pushed into the bellmouth (or into the external sleeve when there is no bellmouth) in such a way that the mortar band is compressed and makes contact with the transverse face of the cement mortar lining of both pipes as follows:

Immediately before joining the pipes, a slurry of Ordinary Portland Cement (OPC – CEM I 32.5) mixed with a suitable SBR Latex for use with OPC (Nitrobond SBR from Fosroc or similar) and clean water in the proportions 1:1 shall be applied to the shoulders of the cement mortar linings in the sleeve and spigot ends of the pipes to be joined. Thereafter a sufficient suitable mix of dry plaster sand and OPC (CEM I 32.5) in a proportion of 1:1 by mass and sufficient liquid (Nitrobond SBR mixed 1:1 by volume with water) to produce the correct consistency for plastering shall be troweled against the shoulder of the cement mortar lining in the sleeve end.

As the pipes are pushed together, the cement mortar lining in the spigot end shall be pressed against the mortar in the sleeve end to make a continuous lining. The excess material that is squeezed into the bore of the pipes is to be removed by drawing a suitable plug that is 5 mm smaller than the bore of the cement mortar lining across the joint. The plug that is used shall be such as to render an even and smooth finish to the mortar at the joint. The timing of when the plug is pulled through is critical and shall be carefully controlled.

PSL 3.9.3.4 Repair and Making Good of Solvent Free Epoxy Linings

In addition to the contents of clause 3.9.2.3 of SABS 1200L, the following shall be applicable:

Il making good of internal solvent free epoxy linings at damaged areas and at welded and flanged joints that is required to ensure continuous internal corrosion protection to steel surfaces shall be carried out strictly in accordance with the solvent free epoxy manufacturer's specifications. The surfaces are to be prepared as specified in PSL 3.9.3.1.

The epoxy material shall be sufficiently thixotropic that 500 micrometers dry film thickness can be achieved in one application without sagging. The material shall be applied to the clean, dry, abraded area so as to fully cover it and extend to no less than 50 mm of the edge of the abraded area. A "halo" of abraded area shall be visible around the repair material.

After curing, the repaired section and at least 250 mm of the surrounding area, shall be tested for electrical insulation defects as specified elsewhere. There shall be no electrical insulation defects.

The Contractor shall ensure that repairs and particularly the making good of linings at welded joints, is carried out progressively as the pipe is being laid and shall not be permitted to lag behind for more than three pipe lengths at each working front.

PSL 3.9.3.5 Repair of Cement Mortar Lining

Free issue pipes with linings damaged prior to acceptance by the Contractor shall be marked and recorded by both the Contractor and the Engineer's Representative and then repaired by the Contractor. The payment rate for repair shall be made at the scheduled rate. Once the Contractor has completed any repairs (if necessary) and accepted the pipes from the Employer, any subsequent damage to the lining in the pipes shall be repaired by the Contractor at his expense.

Any repairs necessary on pipe supplied by the Contractor shall be carried out at the Contractor's expense.

All repair procedures shall be subject to the prior approval of the Engineer. Generally, a crack is to be ground out using a mechanical grinder down to the steel wall to form a "dove-tail" groove with a minimum width of 8 mm. Care must be taken not to grind any of the steel pipe wall. The groove shall be rendered free of laitance, dust, oil, grease, fractured aggregate and other deleterious matter. The steel pipe wall internal surface shall be rendered free of rust and other deleterious matter by wire brushing (apply white spirit if necessary). The groove shall be filled with "Epidermix 338" (or equivalent approved), mixed and applied in accordance with the procedure set out in PSL 3.9.3.3.

PSL 3.9.3.6 Repair of FBMDPE Coating (Large Areas)

A large area repair is defined as an area larger than 650 mm².

Free issue pipes with external coatings damaged prior to acceptance by the Contractor shall be marked and recorded by both the Contractor and the Engineer's Representative and then repaired by the Contractor. The payment rate for repair shall be made at the scheduled rate. Once the Contractor has completed any repairs (if necessary) and accepted pipes from the Employer, any subsequent damage to the coating in the pipes shall be repaired by the Contractor at his expense.

Any repairs necessary on pipe supplied by the Contractor shall be carried out at the Contractor's expense.

All damaged and blistered FBMDPE coating caused by welding or other mechanical means shall be removed back to sound coating by mechanical grinding or other approved means.

The exposed steel surface shall be power wire brushed to remove dirt, scale, rust and other foreign matter to a surface profile equivalent to a Class St 2 finish. Weld spatter shall be removed by chipping or grinding to a smooth surface flush with the surrounding steel. Welds shall have a smooth contour free from sharp edges, protrusions and undercut. Sharp edges and protrusions shall be removed by grinding to a smooth radius of curvature of not less than 3 mm.

Degreasing of the exposed steel surface shall be done in terms of Clause PSL 3.9.3.1.

The surrounding sound FBMDPE surface shall be feathered from steel surface to maximum thickness and then abraded to a distance of 100 mm beyond the defective area. The abrasion shall be carried out with clean emery paper of 80 to 100 mesh so as to produce a suitably rough surface profile without causing the removal of excessive amounts of protective material. Virgin Sintakote powder is to be melted into the defect to ensure proper mechanical bonding with the steel surface and chemical bonding with the existing Sintakote. The melting of the virgin material shall be such that melting is not effected with an open flame. The melted powder shall be shaped with a hot spatula to form a smooth surface over the repair area.

Under no circumstances will patching of damaged areas by means of pieces of tape wrap, be allowed.

PSL 3.9.3.7 Repair of FBMDPE Coating (Small Areas)

A small area repair is defined as an area less than 650 mm².

A small area repair is effected by means of the application of a hot spatula to repair the defect, provided that there is a residual layer of polyethylene adhering strongly to the steel surface. Alternatively, virgin Sintakote powder material may be melted with heated spatula over the damaged area, to fill the mechanical damages in the coating and fuse with the surrounding coating material, all as per the manufacturer's recommendations.

At each pinhole detected by the Holiday test, the surrounding area shall be abraded to 25mm beyond the defective area. The abrasion shall be carried out with clean emery paper of 80 to 100 mesh so as to provide a suitably rough surface profile without causing the removal of excessive amounts of coating material. A hot spatula shall be utilized to work Sintakote into the pinhole defects. It is noted that any cluster of pinholes within a radius of 25mm shall be regarded as one defect.

PSL 3.9.3.8 Repair of Three Layer Polyethylene Coatings

Free issue pipes with linings damaged prior to acceptance by the Contractor shall be marked and recorded by both the Contractor and the Engineer's Representative and then repaired by the Contractor. The payment rate for repair shall be made at the scheduled rate. Once the Contractor has completed any repairs (if necessary) and accepted pipes from the Employer, any subsequent damage to the coating in the pipes shall be repaired by the Contractor at his expense. All making good of the exterior coatings at damaged areas that is required to ensure continuous corrosion protection to steel surfaces shall be carried out strictly in accordance with an approved method statement that is to be prepared by the Contractor.

Any repairs necessary on pipe supplied by the Contractor shall be carried out at the Contractor's expense.

The basic requirements are the careful cut back of the outer sleeve and removal of the residual adhesive layer. The exposed surfaces are to be prepared as specified in PSL3.9.3.1 and this is to be followed by the application of an approved epoxy material followed by the application of a shrink sleeve covering the whole of the affected area with an overlap of no less than 50 mm.

The epoxy material shall be sufficiently thixotropic that 500 micrometres dry film thickness can be achieved in one application without sagging.

After curing, the repaired section and at least 250 mm of the surrounding area, shall be tested for electrical insulation defects as specified elsewhere. There shall be no electrical insulation defects.

PSL 3.9.3.9 External Coating Repair on Continuity Bonds

Electrical continuity bonding shall be carried out by a cathodic protection sub-contractor.

After successful testing of each weld in the presence of the Engineer's Representative the pipe coating shall be repaired in accordance with PSL 3.9.3.4.

The cable ends shall be covered with "Denso" mastic prior to tape wrapping.

PSL 3.9.3.10 External Corrosion Protection of Welded Joints and Coating Repairs

All factory coated steel pipes will be supplied with the external coating cut back 100 mm from each pipe end. Where pipes are to be cut, either on site, or for the purpose of fabricating bends, fittings and specials, or in the event of the pipe coating being damaged, the pipe coating shall be cut back 100 mm from the intended cut area before the pipe is cut. Damp hessian

sacking or other suitable material is to be temporarily fixed around the pipe to prevent damage to the pipe coating during welding operations. Once welding is complete, and all weld splatter and burnt coating has been removed, the welded pipe joints shall be wrapped in the following manner.

The following specification is based on "Denso" products and systems. Alternative products and procedures may be proposed by the Contractor and, if approved by the Engineer, they may be used. Irrespective of which products are approved by the Engineer and used by the Contractor, all procedures shall be carried out strictly in accordance with the Contractor's method statements which must conform to the manufacturer's recommendations.

A fundamental outcome is a sound and continuous coating that is free from wrinkles and that does not have any entrapped air pockets or any air bubbles.

Surface Preparation:

The bare metal shall be cleaned and wire brushed to minimum St 2 standard and, degreased with white spirit. The adjacent pipe coating shall be cleaned to a minimum of 300 mm either side of the joint and the edges "feathered" to achieve a tapered transition over a distance of 100 mm. The sound, parent coating surface shall be roughened with sandpaper over an area 250 mm either side of the joint.

Priming:

The entire pipe and coating surface over a length of 250 mm on either side of the joint shall be primed using "Denso Primer D" (or equivalent approved). Care shall be taken to obtain a thin even film with no runs or sags. The primer shall be allowed to cure until "tack dry" before the application of the tape commences. Priming may only be carried out on those areas that are to be wrapped that same day. If primed areas are to be left overnight, those areas shall be re-primed before wrapping.

Profiling Tape:

A 1,5 mm thick x 50 mm wide "Denso profiling Mastic with a petrolatum Sealing Tape" (or equivalent approved) shall be applied to the full circumference of the weld bead in accordance with the manufacturer's specifications. Care shall be taken to ensure a smooth profile and to avoid air bubbles being trapped beneath the tape. (Note: The profiling tape may be omitted at the discretion of the Engineer. Tenderers shall nonetheless allow for the profiling tape in their tendered rates).

Tape Wrapping:

The joint shall then be wrapped (minimum 55 % overlap) with a petrolatum system including mastic profiling puddy, butyl rubber/bitumen tape and PVC backing film "Denso Ultraflex 1250 Polyethylene/Bitumen" tape, or similar approved, starting at the roughened section (250 mm from the welded joint) in accordance with the manufacturer's requirements to create a 500 mm wide wrapping, centred over the welded joint. A 100% overlap is required on the first and last revolutions of the tape wrapping operation. It is important that tension in the tape be released when the wrapping of the last half circumference of the pipe. The Contractor shall ensure that the wrapping overlaps or covers a minimum of 150 mm of the pipe coating. A secondary or outer tape wrap layer is then to be applied over the first layer with a 10% tape overlap.

An alternative tape wrapping system that may be used is the "Densotherm 35 Hot Applied Bitumen Tape" system. The procedures are similar to those for the "Denso" system described above except that the underside of the tape shall be heated as it is applied and the overlaps and seams of the tape are to be sealed by means of a heated tool.

PSL 3.9.3.11 External Corrosion Protection of Shop-Fabricated Pipe Bends and Fittings

The external coating of shop fabricated bends and fittings shall be carried out as follows:

- Where a substantial part of the external coating on the parent pipe is intact, the coating repairs/make good shall be carried out in accordance with PSL 3.9.3.5 or
- Where black (uncoated pipe has been used), the coating shall be carried out with an approved solvent-free epoxy (SFE) system such as "Nordbak 1" or similar approved system or
- Where only a relatively small proportion of the external coating on the parent pipe remains, all of the remaining coating shall be removed and the entire bend/fitting shall be coated with an approved solvent-free epoxy (SFE) system such as "Nordbak 1" or similar approved system.

All crotch plates and wrappers/collars shall be coated with an approved solvent-free epoxy (SFE) system such as "Nordbak 1" or similar approved system.

After application of the SFE coatings to the crotch plates and collars/wrappers, approved mastic (refer PSL 3.9.3.8) shall be placed in all crevices that may become moisture traps.

No additional payment will be made for any of this work as the costs are deemed to be included in the scheduled rates for bends and fittings.

PSL 3.9.3.12 External Corrosion Protection of Site-Fabricated Pipe Bends and Fittings

The coating repairs/make good shall be carried out in accordance with PSL 3.9.3.10.

PSL 3.9.3.2 Payment for Inspection and Testing

Repairs by the Contractor will be subject to inspection by the Engineer and the Employer's Third Party inspection agent. Should additional expenditure be incurred by the Employer's inspector, due to any failure of the prescribed tests, then such additional expenditure shall be reimbursed to the Employer by the Contractor and shall be deductible from the Payment Certificates.

PSL 3.9.5 Joints, Bolts, Nuts and Washers

Replace clause with

"All joints, bolts, nuts and washers shall be hot-dip galvanised in accordance with SABS 121 unless stated otherwise. Electroplating shall not be permitted.

Where nuts and bolts are required for jointing, couplings, etc., there shall be 2 sets of washers per nut and bolt unless otherwise specified.

Where additional corrosion protection is specified the relevant clauses of PSL 3.9.6 shall also apply."

PSL 3.9.6 Corrosive Soil

Change the heading of this subclause to:

PSL 3.9.6 Additional Corrosion Protection

Replace clause with the following:

"Unless scheduled or ordered separately, steel or cast iron pipes, fittings, valves and joints shall be treated as follows:

PSL 3.9.6.1 Wrapping of Permanently Exposed and Cast-in Pipes and Fittings

All coated and/or galvanised steel pipes which are to be **permanently exposed (above and below ground) and cast in concrete** shall, in addition to the specified corrosion protection at flange/adaptor/anchoring joints, be protected with the "Denso rubber Bitumen/Acrylic Pipeline Tape (Steelcoat 500)" system or similar approved UV resistant coating. The pipe surface shall be prepared and the coating applied in strict accordance with the manufacturer's instructions. In the case of cast-in pipes, the wrapping shall extend for at least 150mm on either side of the soil/concrete/air interface.

Surface Preparation:

- (i) Remove all Grit and/or dust before priming at the average spread rate as specified by the manufacturer.
- (ii) The adjacent coating shall be cleaned to a minimum of 300 mm beyond the section to be wrapped.
- (iii) Grease and oil shall be removed with a non-volatile solvent. The surface shall then be cleaned with potable water and allowed to dry completely.

Priming:

- (i) "Denso Primer D" shall be applied to the prepared surfaces extending 300 mm on either side of the area to be wrapped at a nominal coverage rate of 8 m² per litre. Care shall be taken to obtain an even film with no runs or sags. Only those areas that are to be wrapped the same day shall be primed to avoid any recontamination to the pipe. If primed areas are to be left overnight, these areas shall be re-primed before wrapping. Any surface oxidation, or other foreign agents shall be removed by reprocessing through the necessary cleaning steps.
- (ii) The flow of primer shall be regulated so that the pipe surface is entirely covered. Solvents shall be allowed to flash off for a minimum of 30 minutes before application of tape or mastic. Uncoated, flooded, or areas primed over improperly cleaned pipe, shall be cleaned to the satisfaction of the Engineer and re-coated.

Tape Wrapping:

The joint shall be spirally wrapped (minimum 55% overlap) with "Denso rubber Bitumen/Acrylic Tape (Steelcoat 500)" (or approved equivalent) in accordance with the manufacturer's requirements, to at least 150mm regardless of diameter, beyond the concrete/soil or concrete/air interface and at least 1 000mm beyond the soil/air interface in the case of pipes extending above ground. A 100% overlap is required on the first and last revolutions of the tape wrapping operation. Care shall be taken to ensure a smooth profile and to avoid air bubbles being trapped beneath the tape. The tape shall not be stretched and it is important that tension in the tape be released when the wrapping of the last half circumference of the pipe.

In the case of pipes cast into concrete, the profiling tape shall stop 20mm short of any puddle flange.

PSL 3.9.6.2 External Corrosion Protection for Pipes, Joints, Fittings and Fasteners in Chambers

(a) Pipes and Fittings

For steel pipes and fittings in chambers with the same coating as mentioned in PSL 3.4.3 and 3.4.4, shall be protected by an additional UV resistant paint top coat of Re-coatable Polyurethane (Carbothane 134za) minimum dry film thickness of 40 micron unless specified elsewhere.

(b) Flanges and Flexible Adaptor / Anchoring Joints

All flanges and flexible joints and adaptor/anchoring joints and their associated bolts, nuts and washers, **shall**, notwithstanding that the flexible and adaptor/anchoring joints will be epoxy coated as specified elsewhere, **be protected as described below**.

(Note: This specification is based on a "Denso" system. Alternative products may be used, subject to approval by the Engineer).

Surface Preparation:

The entire surface area of the flange/adaptor/anchoring joint, and its bolts, nuts and washers, up to no less than 250 mm either side of the joint, shall be cleaned of all dirt and other deleterious matter. The cleaned area, up to 200 mm either side of the flange/adaptor/anchoring joint, shall then be wire brushed.

Priming:

The cleaned flange/adaptor/anchoring joint, bolts, nuts, washers and the adjoining 200 mm length either side shall be primed with "Denso Priming Solution", or if moisture is present, with "Denso S105 Paste".

Application of Mastic Blankets:

Narrow strips cut from "Denso Mastic Blanket" shall be applied to the flange/ adaptor/anchoring joint to achieve a smooth profile with a 50 mm splayed fillet being formed at the joint/pipe interface. Care shall be taken, particularly at bolts, to avoid the formation of air pockets. Complete "Denso Mastic Blankets" shall then be applied (mastic side down) to the flange/adaptor/anchoring joint until the flange/adaptor/anchoring joint is completely enveloped.

The blanket shall be overlapped at least 50 mm and shall extend at least 150 mm along the pipe barrel on each side of the flange/adaptor/anchoring joint. The ends of the blanket shall be bound to the barrel of the pipe on each end with 100 mm wide "Denso Tape". The "Denso Tape" overlaps shall be 50 mm and shall extend 100 mm onto the blanket and 150 mm onto the pipe barrel.

Application of Protective Sheeting:

The entire flange/adaptor/anchoring joint shall then be wrapped with 350 micron polyethylene sheeting which shall end 400 mm beyond the joint. The protective sheeting shall be secured to the pipe barrel and along the seam with 48 mm wide "Denso Adhesive Tape"

The "denso" petrolatum system shall be used, including mastic profiling putty, petrolatum tape and Ultraflex PSA 180 tape

(c) **Nuts, Bolts and Washers (Fasteners)**

In buried situations and/or in chambers below ground level, upon completion, bolt heads, washers and nuts shall be wrapped with the "denso" petrolatum system including mastic profiling puddy, petrolatum tape and Ultraflex PSA 180 tape as described in PSL 3.9.3.10."

PSL 3.9.6.3 External Corrosion Protection for Pipes, Joints, Fittings and Fasteners below-ground (buried) exposed

(a) **Buried Pipes (short runs)**

This involves the external corrosion protection for buried short pipe lengths for GMS pipes, epoxy coated steel pipes and uncoated steel pipes that have not been mentioned above.

The pipes mentioned above shall be protected with a "denso" petrolatum system including mastic profiling puddy, petrolatum tape and Ultraflex PSA 180 tape or similar approved coating. The pipe surface shall be prepared, and the coating applied in strict accordance with the manufacturer's instructions.

Surface Preparation:

- (i) Remove all Grit and/or dust before priming at the average spread rate as specified by the manufacturer.
- (ii) The adjacent coating shall be cleaned to a minimum of 300 mm beyond the section to be wrapped.
- (iii) Grease and oil shall be removed with a non-volatile solvent. The surface shall then be cleaned with potable water and allowed to dry completely.

Priming:

- (i) "Denso Primer D" shall be applied to the prepared surfaces extending 300 mm on either side of the area to be wrapped at a nominal coverage rate of 8 m² per litre. Care shall be taken to obtain an even film with no runs or sags. Only those areas that are to be wrapped the same day shall be primed to avoid any recontamination to the pipe. If primed areas are to be left overnight, these areas shall be re-primed before wrapping. Any surface oxidation, or other foreign agents shall be removed by reprocessing through the necessary cleaning steps.
- (ii) The flow of primer shall be regulated so that the pipe surface is entirely covered. Solvents shall be allowed to flash off for a minimum of 30 minutes before application of tape or mastic. Uncoated, flooded, or areas primed over improperly cleaned pipe, shall be cleaned to the satisfaction of the Engineer and re-coated.

Tape Wrapping:

The pipe shall be spirally wrapped (minimum 55% overlap) with by "denso" petrolatum system including mastic profiling puddy, petrolatum tape and Ultraflex PSA 180 tape (or approved equivalent) in accordance with the manufacturer's requirements. A 100% overlap is required on the first and last revolutions of the tape wrapping operation. Care shall be taken to ensure a smooth profile and to avoid air bubbles being trapped beneath the tape. The tape shall not be stretched and it is important that tension in the tape be released when the wrapping of the last half circumference of the pipe.

(b) **Fittings, Valves, Flanges and Flexible Adaptor / Anchoring Joints**

Every **buried** cast iron/steel coupling, joint, flange, valve, or small unsheathed portions of pipe near the joint (flange) where scheduled, shall be protected by the following "Denso" or equal approved anti-corrosion system:

After the pipework has been satisfactorily tested (and bonded at the couplings for electrical continuity if applicable) the exposed portion of the coupling, joint or flange and the unsheathed portions of the pipes at the joint and the bodies of all buried valves are to be covered with an approved "denso" petrolatum system including mastic profiling puddy, petrolatum tape and Ultraflex PSA 180 tape applied strictly in accordance with the manufacturer's instructions.

The external sheathing system, which shall be to the approval of the Engineer, shall be carried out as follows:

All loose dirt, rust, mill scale and flaking paint shall be removed by wire brushing all exposed metal surfaces. An approved priming solution shall be applied by brush with care being taken to ensure all exposed metal surfaces are coated.

"Denso", "Corromastic" or equal approved mastic profiling puddy is to be packed around the joint and/or valve body to form an even contour for the application of "denso" petrolatum tape and Ultraflex PSA 180 tape. A fillet is to be formed between the flange and the pipe barrel/valve body and, in the case of flexible couplings, mastic profiling puddy is to be packed around the bolts to a height of 3 mm above the bolts. Care must be taken to ensure that no air is entrapped.

A layer of petrolatum impregnated tape is to be spirally applied with a minimum overlap of 50 mm. All air pockets are to be removed.

An overwrap of adhesive PVC (Ultraflex PSA 180) tape is to be spirally applied with a minimum of 25 mm overlap and with at least two laps over the untreated sheathing on either side of the joint.

The whole sheathed area of the joint and pipe is to be subjected to holiday detection and, if proved sound and approved by the Engineer, may be covered with "padding" sand."

(c) Nuts, Bolts and Washers (Fasteners)

In buried situations and/or in chambers below ground level, upon completion, bolt heads, washers and nuts shall be wrapped with the "denso" petrolatum system including mastic profiling puddy, petrolatum tape and Ultraflex PSA 180 tape as described in PSL 3.9.3.10."

PSL 3.9.6.4 External Corrosion Protection for Pipes, Joints, Fittings and Fasteners above-ground exposed

(a) Pipes and Fittings

For above ground steel pipes and fittings not cast in concrete, larger than DN150 and the same coating as mentioned in PSL 3.4.3 and 3.4.4, shall be protected by an additional UV resistant paint top coat of Re-coatable Polyurethane (Carbothane 134za) minimum dry film thickness of 40 micron unless specified elsewhere.

For above ground steel pipes and fittings not cast in concrete, smaller than and including DN150 with the same coating as mentioned in PSL 3.4.2, no additional corrosion protection wrap/paint is applied.

(b) Valves, Flanges and Flexible Adaptor / Anchoring Joints

For all Flexible and Flanged Joints in above ground application with the same coating as mentioned in PSL 3.4.3 and PSL 3.4.4 shall be protected by an additional UV resistant paint top coat of Re-coatable Polyurethane (Carbothane 134za) minimum dry film thickness of 40 micron unless specified elsewhere.

(c) Nuts, Bolts and Washers (Fasteners)

All bolts, washers, threaded bars etc mentioned in PSL 3.8.3 is to be corrosion protected completely and generously by an approved heavy-duty, self-heating, surface tolerant, hand painted, flexible polymer-modified wax corrosion-inhibitor such as 'Chesterton 740 or similar approved heavy duty rust guard' minimum dry film thickness of 36 micron

PSL 3.9.6.5 External Corrosion Protection for Pipes, Joints, Fittings and Fasteners above ground in buildings / pumpstations

(a) Pipes and Fittings

For steel pipes and fittings in buildings and pump stations (non-immersed conditions), larger than DN150 and the same coating as mentioned in PSL 3.4.3 and 3.4.4, shall be protected by an additional UV resistant paint top coat of Re-coatable Polyurethane (Carbothane 134za) minimum dry film thickness of 40 micron unless specified elsewhere.

For steel pipes and fittings in buildings and pump stations (non-immersed conditions), smaller than and including DN150 and the same coating as mentioned in PSL 3.4.2 there shall be no need for additional corrosion protection. However, if majority of the pipework in the specific location (pump station / building) is Epoxy coated then over coat with UV resistant paint top coat of Re-coatable Polyurethane (Carbothane 134za) minimum dry film thickness of 40 micron (colour to suit valves and couplings).

(b) Fittings, Valves, Flanges and Flexible Adaptor / Anchoring Joints

For all Flexible and Flanged Joints in above ground application with the same coating as mentioned in PSL 3.4.3 and PSL 3.4.4 shall be protected by an additional UV resistant paint top coat of Re-coatable Polyurethane (Carbothane 134za) minimum dry film thickness of 40 micron unless specified elsewhere.

(c) Nuts, Bolts and Washers (Fasteners)

All bolts, washers, threaded bars etc. mentioned in PSL 3.8.3 is to be corrosion protected completely and generously by an approved heavy-duty, self-heating, surface tolerant, hand painted, flexible polymer-modified wax corrosion-inhibitor such as 'Chesterton 740 or similar approved heavy duty rust guard' minimum dry film thickness of 36 micron

Add the following new sub-clause:

PSL 3.10 Valves

Change the heading of this clause to the following and add:

PSL 3.10 Valves and Other Mechanical/Electronic Accessories

PSL 3.10.1 Isolation Valves (General)

Unless otherwise stated, all isolation and scour valves shall be of the Waterworks Pattern Sluice Valve type.

The following general requirements shall be met:

- a) The valve class shall be at least equal to that of the pipework in which it is to be installed. All valves shall be rated for a working pressure of at least 1,6 MPa (Class 16), unless otherwise specified in the drawings and schedule of quantities.
- b) The valves shall be supplied with non-rising type spindle. Spindles shall be threaded such that two turns of the hand wheel shall effect a movement of 25 mm on the valve gate. This allows for easy identification of the valve diameter.
- c) The valves shall be fitted with a cast iron cap attached to the spindle by means of a Stout brass screw with hexagonal head or with a handwheel as indicated on the drawings or specified in the Schedule of Quantities. The handwheel shall indicate the direction of closing.
- d) The valves shall be **CLOCKWISE CLOSING**.
- e) The design of the valve guides shall be such that all valves supplied can be mounted in any position.
- f) The stuffing box may either be of the conventional type with gland packing with a gland secured with 2 No. bolts and nuts. The nuts shall be of the Tee pattern and the gland stuffing box shall be capable of holding four rings of a standard size of gland packing. The gland stuffing box shall be capable of being repacked under working pressure, preferably with the gate in the open position. The gland shall fit neatly and snugly into the stuffing box. The base of the gland and the stuffing box shall be chamfered to force the packing against the spindle.

Alternatively the sealing of the spindle in the body may be by means of O-rings which are retained in position by means of machined Grooves in the valve body and which seal against the spindle. If this type of valve is offered, tenderers should indicate with their tender the cost of a service head for each size of valve offered. Such service head shall be supplied complete with seals, gate, spindle and cap.

- g) The valves shall be double flanged and drilled in accordance with SABS 1123 appropriate to the Class of valve required/specified.
- h) Each valve shall be supplied with 2 No. full face gaskets and the requisite number of bolts, nuts and washers to suit the valves. Sufficient bolts, nuts and washers shall be supplied for both faces of the valves. The cost of these items shall be included in rates tendered.
- i) The valves shall be drop tight at the specified working pressure applied to one side of the gate and the other side subject to open end conditions.
- j) In addition to the above conditions (i) when called for in Schedule of Quantities, valves for installation on fire hydrants shall be drop tight when subjected to working pressures within in range 345 kPa to 1380 kPa under unbalanced open end conditions, and chattering of the gate in its guides during operation of the valves shall be reduced to a minimum to prevent damage to the valve seats.

Every valve shall be internally and externally fusion bonded epoxy powder coated to a minimum 250 micron DFT, as standard.

PSL 3.10.1.1 Resilient Seal Valves

- a) General

Valves shall be double flanged and be resilient seated and unless otherwise specified, the valves shall be of the non-rising spindle type.

The valves shall be capable of withstanding the nominal pressure and specified test pressure and shall have the capability to seal drip tight bi-directionally. The valves shall generally be manufactured in accordance to SABS 664.

- b) Gate Design

The gate shall be fully rubber encapsulated inside and outside therefore to ensure drip tight sealing and avoid corrosion. The gate shall further have a drain hole, preventing stagnant water or impurities from collecting.

Rubber utilised in the coating of the wedge shall be inert and shall not impart odour, taste and colour and shall be suitable for drinking water applications. The gate nut shall not be fixed to the wedge, thereby reducing opening torques.

c) Gate and Body Design

The gate shall have optimally placed guides of wear resistant plastic so as to reduce the torques as well as reduce wear between the rubber and the coating on the body. The bore of the body shall be straight through design in order to allow cleaning with a badger.

d) Valve Bonnet

The valve shall utilise 3 independent bonnet seals which shall include a set of stem steels embedded in non-corrosive material, a back seal to prevent leakage when changing seals, and wiper ring to protect against debris entering the valve.

Two friction washes (sizes 50mm – 200mm) and thrust ball bearings (250mm – 600mm) shall be incorporated to ensure smooth spindle operation as well as to reduce opening and closing torques.

A full circle thrust collar shall be utilised to ensure low torque operation. O-ring stem seals shall be replaceable under pressure for sizes 50mm – 200mm.

e) Spindle

Spindles shall be made of stainless steel. The stem threads shall be rolled to maintain steel structure and increase strength and, to ensure smooth thread edges and consequently a low operating torque.

f) Body and Bonnet Assembly

The rubber bonnet gasket shall fit in a recess in the valve bonnet preventing blow out of the seal under surge conditions. The bonnet bolts shall pass through the gasket and sunk into the bonnet and sealed for corrosion protection.

An edge protecting ring shall permanently be fitted around the body and bonnet joint in order to protect the coating during transportation and installation.

PSL 3.10.1.2 Wedge Gate Valves

Wedge Gate Valves shall be of the Waterworks Pattern Sluice Valve type and be manufactured to a standard of not less than that specified in SABS 664.

The following special requirements shall be met:

- a) The lugs on the gate and the spindle are to conform to 3.2.3 of SABS 664 and are to be machined to a good fit and finish.
- b) Valve trim shall be either Type B (Gun metal trim) or Type C (Stainless Steel trim) as specified in SABS 664 Clause 3.5.5. Tenderers must indicate in their tender what type of trim is offered.
- c) Seat rings shall comply with Clause 3.5.6 of SABS 664 and shall be pinned into position.
- d) The stuffing box may either be of the conventional type with gland packing with a gland secured with 2 No. bolts and nuts. The nuts shall be of the Tee pattern and the gland stuffing box shall be capable of holding four rings of a standard size of gland packing. The gland stuffing box shall be capable of being repacked under working pressure, preferably with the gate in the open position. The gland shall fit neatly and snugly into the stuffing box. The base of the gland and the stuffing box shall be chamfered to force the packing against the spindle.
- e) Valves which incorporate a thrust plate of the horseshoe type will NOT be considered.
- f) Every sluice valve shall be provided with substantial guides cast on each side of the gate, preferably extending to the top of the nut box and operating along corresponding guides cast in the sides of the valve body. (Brass trim only).
- g) When called for in the Schedule of Quantities, valves shall, in place of the guides described in (f) above, be fitted with machined bronze guide shoes on either side of the gate operating in accurately matching machined bronze guide channels fixed on the sides of the valve body. The bronze guides shall be of phosphor bronze to B.S. 1400 PB 2-0.

The gate valves shall be supplied with the gland packing installed and shall be either "Maxmech Style M57, Chesterton 1724" or similar approved.

PSL 3.10.1 4 Butterfly Valves

The valves shall be manufactured in accordance with BS 5155 (cast iron and carbon steel butterfly valves for general purposes), as far as is applicable.

The Contractor is referred to the Umgeni Water Particular Specification for Double Flanged Butterfly Valves for sizes from 400NB where working pressure does not exceed 40BAR (4000kPa) and the Umgeni Water Particular Specification for Valves.

Where conflict exists, the requirements in this specification shall take precedence. Thereafter the Umgeni Water Particular Specification for Double Flanged butterfly valves shall take precedence over the Umgeni Water Particular Specification for Valves

The following criteria for construction shall be met:-

a) Body

Where wafer-lug type butterfly valves are specified, these shall be of the wafer-lug type, with drilled/tapped bolt holes, to allow the valve to be used at maximum working pressures of respectively 20 and 16 bars in terminal positions. This is to allow downstream pipework to be disassembled with the upstream pipework under pressure.

Valves designed for to allow the valve to be used at maximum working pressures of 16 bars at terminal positions unless otherwise specified in the drawings or schedule of quantities.

Bodies shall be one piece casting Ductile Iron, UTS 400 MPa, YP 250 MPa, (elongational 12%) grade EN GJS-400-15 to BS EN 1563 or equivalent for sizes up to 1500mm. Sizes above shall be of cast steel grade 480 to BS 1504-161. Bodies shall never be in contact with the fluid conveyed and shall be fully protected internally by the resilient seat.

b) Disc

Shall be cast or stamped, spherically machined and positively splined or keyed internally to the driving shaft. (Use of plinths or bolts is totally prohibited).

Selection of the disc material shall be made taking into account the aggressivity of the fluid. (Cupro-aluminium or stainless steel 316 or equivalent).

c) Shaft

Butterfly valve technology shall be such that the shaft will never be wetted. (Dry shaft) Stainless Steel, AISI 420 of high mechanical characteristics shall be used.

It shall be positively splined or keyed to the disc. The upper and lower shaft and tie-bolt, when assembled to the disc, shall give in effect a one-piece shaft/disc assembly. At least three bearing assemblies, consisting of steel outer shell, with sintered bronze inner lining, coated with Teflon, facing shall be used.

The upper shaft shall be carried in two bearings, the lower in one.

d) Liner

The resilient, synthetic rubber seat shall be easily replaceable (bonded liners are prohibited) and shall entirely cover the inside of the body overlapping over the sides to form the seal between the body and matching pipework.

Where necessary, it shall be keyed to the body with annular grooves in the bore of the valve. The design shall be such as to allow the disc to seal drop-tight to the liner so that there is no ingress of fluid to the shaft area.

e) General

Valves with "O" Ring Shaft Backup Seals shall not be considered. The Manufacturer shall be able to offer alternative grades to cope with various fluids.

Quarter-turn handles shall be supplied for valves up to and including 150mm nominal diameter. The handle shall be lockable in all intermediate positions and be adaptable to the valves.

For valves larger than 150mm a gear shall be used. The gear operator shall be designed with a worm and nut system. The gear operator shall be irreversible in any position. The gear shall have a handwheel and an indicator protected by plexiglass, showing the position of the disc. If specified, limit switches shall be fitted, mounted in a waterproof and dustproof housing.

The direction of opening of the butterfly blade shall be such that the bottom of the blade moves in a downstream direction.

All handwheels shall be fitted with a suitably sized shear-pin that shall fail before damage can be done to the drive gearing of the valve.

Where specified, U-section wafer-type valves, as described in BS 5155, shall be acceptable, provided that:

the valve is suitable for individual bolting of each flange and the dimension between the inside faces of the flanges is not less than 3D, where D is the diameter of the flange bolts as specified in BS 4504: Part 1, or SABS 1123

PSL 3.10.2 Air Release Valves

The Contractor is referred to the Umgeni Water Technical Specification for Air Release and Vacuum Break Valve. Where conflict exists, the requirements in this specification shall take precedence.

a) Function

The required valves shall provide any of the functions, or combination of functions, described below as specified in the schedule of quantities:

- Pipeline filling
- Uninterrupted high volume air discharge through the large orifice.
- Pipeline draining or Column Separation
- Uninterrupted high volume air intake through the large orifice.
- Pipeline full and operating
- Discharge of disentrained pressurized air through the small orifice.
- Rapid Filling / Column Separation

The valve must incorporate an integral surge alleviation mechanism which will automatically dampen surge pressures due to rapid air discharge or the subsequent rejoining of separated water columns.

b) Construction and design

The air release and vacuum break valve shall be of a compact single chamber design with solid cylindrical High Density Polyethylene control floats housed in a tubular stainless steel or corrosion protected body with stainless steel ends secured by means of stainless steel tie rods.

Large orifice sealing shall be effected by the flat face of the control float seating against a nitrile/EPDM rubber 'O' Ring housed in a dovetail Groove circumferentially surrounding the large orifice. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice on a natural/EPDM rubber seal affixed to the control float.

The intake/discharge orifice area shall be equal to the nominal size of the valve i.e. a 150mm (6") valve shall have a 150mm (6") intake/discharge orifice. The air valve class shall be at least equal to that of the pipework in which is to be installed, with a minimum working pressure of at least 1,6 MPa (Class 16).

Surge Alleviation Mechanisms

The valve shall have an integral surge alleviation mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure due to high velocity air discharge or the subsequent rejoining of separated water columns. The limitation of pressure rise must be achieved by deceleration of approaching water prior to valve closure. Relief mechanisms that act subsequent to valve closure cannot react in the low millisecond time span required and are therefore unacceptable.

Relief mechanisms shall activate at a maximum differential pressure of 5kPa between the inside and outside of the valve.

Where specified, the air valve shall be fitted with a stainless steel spring or similar device to immediately activate the air release function to the surge alleviation mechanism.

c) Performance Requirements

The valve design shall be proven and performance criteria shall have been confirmed by a recognized independent authority.

The selected air valve range shall have factory test results which verify the claimed air intake and air release performance characteristics.

Air valve ranges without verified factory performance tests will not be accepted.

PSL 3.10.3 Float Control Valves

Float Control Valves shall be hydraulically controlled dual diaphragm end line type control valves with either a direct or remote pilot to facilitate automatic control of levels in tanks and reservoirs with an inherent slow closing characteristic to automatically reduce induced pressure when closing.

Float valves shall have a concentric cast iron body and bonnet, which shall be coated and lined with fusion bonded epoxy powder coated to 250 microns.

The spacer piece and plug assembly shall be manufactured from solid HDPE and the diaphragms shall be manufactured from proprietary elastomer as specified by the manufacturer. The internal filter mechanism shall be manufactured from LG2 brass and 304 stainless steel. The control orifice, trim and fasteners shall all be manufactured from Grade 304 stainless steel.

Valve construction shall be such that deformation, leaking or damage of any kind does not occur when the valve is subjected to testing pressures of 1.5 x the designed working pressure.

The valve shall be supplied with a direct or remote (as specified), magnetic two level latch type pilot with a fixed deadband. The pilot shall be constructed of brass with stainless steel trim and shall be fitted with an "Eclipse shallow pot" type magnet. The pilot float arm shall be constructed from stainless steel and the ball from polypropylene.

The pilot shall be able to remain "closed" or "open" when the water surface is turbulent and shall only change state at either end of the deadband.

Where a filter is specified to prevent debris from entering the valve, it shall be a cone filter manufactured from powder coated mild steel.

Float valves shall be supplied with stud connections suitable for alignment to flanges conforming to PN16 ratings of BS EN 1092 standards, or as otherwise specified in the drawings or specifications.

Float valves shall be suitable for operating under a static pressure of 16 bar and shall be able to operate at a residual pressure of at least 0.1 bar.

PSL 3.10.4 Meters

PSL 3.10.4.1 Woltmann Type

Water meters used in this application in nominal bore sizes from 40mm to 150mm must comply with the South African Bureau of Standards Specification No. 1529-1:1994 and Section 18 of the Trade Metrology Act No. 77 of 1973 and Regulation 80 of Part II of the Trade Metrology Regulations.

All Water Meters, sizes 40 mm to 100 mm, must be tested and sealed by an authorised officer in a SANAS (S.A.B.S. 0259) accredited laboratory, situated within the borders of the Republic of South Africa.

The Water Meter must be of the Woltmann WP helical vane inferential velocity type with the following capabilities:-

METER SIZE (mm)	40	50	80	100	150	200	250	300
Max. Flowrate $q_s \pm 2\%$ (m ³ /h)	90	90	200	250	600	1000	1600	2000
Permanent Flowrate $q_p \pm 2\%$ (m ³ /h)	50	50	120	180	450	700	1000	1500
Transitional Flowrate $q_t \pm 2\%$ (m ³ /h)	1.0	10	2.0	2.0	4.0	6.0	11.0	15.0
Minimum Flowrate $q_{min} \pm 5\%$ (m ³ /h)	.35	0.35	0.5	0.6	2.0	4.0	6.0	12.0
Starting Flow (m ³ /h)	0.15	0.16	0.22	0.25	0.90	1.2	1.8	1.8
Maximum Working Pressure (Kpa)	1600	1600	1600	1600	1600	1600	1600	1600
Body Length (mm)	311	200	200	250	300	350	450	500

In addition, the meters offered must comply with the following:-

- Epoxy coated cast iron body.
- Counter to be encased in a Copper can with mineral glass lens sealed to IP 68 standards to prevent condensation from forming under the lens, thus providing clear reading in any environment.
- Scratch resistant mineral glass counter window able to withstand the impact of a 25mm steel ball dropped onto the centre from a height of one metre.
- Counter unit must be equipped to generate pulse outputs, as per the following:

<u>Meter sizes 40 mm to 100 mm</u>	One pulse per 10 litres One pulse per 1 000 litres
<u>Meter sizes 150 mm & 200 mm</u>	One pulse per 100 litres One pulse per 10 000 litres

Meter must have the following features to facilitate convenience of on-site replacement :

- (a) Fully shrouded, pre-calibrated replaceable mechanism.
 - (b) Helical vane fitted in a shrouded cartridge designed to direct the entire volume of water through the measuring element ensuring body impact is negligible on the accuracy.
- Must be suitable for Vertical, Horizontal or Inclined Installation.
 - Meters must be capable of measuring reverse flows within the same Class B accuracy envelope as per the Specification (No. 1529-1, 1994) for forward flow, i.e. $\pm 5\%$ q_{min} & 2% q_p to q_s .
 - Meter must be provided with a pressure tapping (1/4 BSP), into which a pressure gauge or pressure transducer can be fitted to measure the downstream pressure of the meter.
 - Suitable for water temperatures up to 50°C and maximum working pressure of 1 600 kPa, unless otherwise specified in the drawings and schedule of quantities.
 - All internal plastic components to be constructed of virgin materials.
 - The meter must perform within the legal accuracy specification, with a length of pipe, the same diameter as the meter, three diameters long, free from fittings and valves, fitted at the inlet to the meter body and one diameter long fitted to the outlet of the meter body.
 - Each Meter must be backed with a two year warranty against faulty workmanship and/or materials.

Spare parts for all Water Meters offered must be available in South Africa and still be available for a period of ten years after the purchase of the water meter.

PSL 3.10.4.2 Electromagnetic Type

The magnetic flow meters shall be flanged to SANS 1123 for process connection sizes and pressures specified in the BOQ. Installation shall form part of the mechanical portion of the Works. The primary element casing shall be of 3CR12/mild steel, appropriately coated, painted and treated for corrosion protection. The tube material shall be at least of 304 stainless construction with a polyurethane lining. The electrodes shall be constructed of 316 stainless steel. The sensor shall have an environmental protection rating of IP68 with factory potted terminal housing and shall be equipped with integral cables long enough to reach the transmitter. No cable joins will be permitted. The transmitter shall have microprocessor-based electronics with local flow rate and total indication in an IP65 enclosure. The transmitter enclosure must be installed above any flood level.

The transmitter shall conform to the following:

Power supply	:	230V AC power supply 50Hz
Outputs	:	4 x OCT digital programmable outputs Isolated (Fwd Pulse, Rev Pulse, Empty pipe, low battery) 1 x passive 4-20mA
Range	:	0.1-10m/s
Accuracy	:	Error better than 1% of full scale > 0.5m/s
Repeatability	:	0.2% of span

The transmitter shall have Profibus, Hart Ethernet configurable connections.

PSL 3.10.4.3 Ultrasonic Type

No strap-mounted or clamp-on type ultrasonic flow meters shall be accepted.

The ultrasonic flow meters shall be the in-line type and shall be flanged to SANS 1123 for process connection sizes and pressures specified in the BOQ. Installation shall form part of the mechanical portion of the Works.

The primary element casing shall be of mild steel, appropriately coated, painted and treated for corrosion protection. The tube material shall mild steel construction with a polyurethane lining. Where a stainless steel casing and tube is specified, the grade shall be EN 1.4404 (AISI 316L). The wetted transducers and transducer holders shall be constructed of stainless steel EN 1.4404 (AISI 316L).

The sensor shall have an environmental protection rating of IP68 with factory potted terminal housing and shall be equipped with integral cables long enough to reach the transmitter. No cable joins will be permitted.

The transmitter shall have microprocessor-based electronics with local flow rate and total indication in an IP65 enclosure. The enclosure shall be of die-cast aluminium or stainless steel (EN 1.4404) construction. The transmitter enclosure must be installed above any flood level.

All externally mounted flowmeters and components shall be of stainless steel construction unless otherwise specified. All internally mounted flowmeters and applicable components shall be of mild steel construction unless otherwise specified.

The transmitter shall conform to the following:

Power supply	:	230V AC power supply 50Hz
Outputs	:	4 x OCT digital programmable outputs Isolated (Fwd Pulse, Rev Pulse, Empty pipe, low battery) 1 x passive 4-20mA
Range	:	0.1-10m/s
Accuracy	:	Error better than 1% of full scale > 0.5m/s
Repeatability	:	0.2% of span

The transmitter shall have Profibus, Hart Ethernet configurable connections.

PSL 3.10.5 Strainers

All strainers shall be “Y” type configuration and shall conform to the following:

- Cast iron body and lid and shall be fusion bonded epoxy coated both inside and outside.
- Face to face dimension of all flanged strainers shall be according to EN 558-1 GR 1. Strainers shall be supplied with stud connections suitable for alignment to flanges conforming to PN16 ratings of BS EN 1092 standards, unless otherwise specified in the drawings and schedule of quantities..
- Strainers shall be suitable for operating under a static pressure of 16 bar, unless otherwise specified in the drawings and schedule of quantities.
- The screen shall be a fine-meshed double screen manufactured from stainless steel able to restrain parts bigger than 0.5mm for sizes DN 40mm – DN 150mm, and able to restrain parts bigger than 0.6mm for sizes DN 200mm – DN 300mm.
- All fastening bolts and nuts to be stainless steel.

PSL 3.10.6 Reflux Valves

The Contractor is referred to the Umgeni Water Particular Specification for Valves. Where conflict exists, the requirements in this specification shall take precedence.

a) General

Reflux valves shall be double-flanged, for horizontal and vertical mounting, of robust construction and suitable for the operating head and close drop tight, unless otherwise permitted in the Project Specification.

Bodies shall be one piece casting Ductile Iron, UTS 400 MPa, YP 250 MPa, (elongational 12%) grade EN GJS-400-15 to BS EN 1563 or equivalent for sizes up to 1500mm. Sizes above shall be of cast steel grade 480 to BS 1504-161.

The body, cover and door shall be of the Ductile Iron grade EN GJS-400-15 to BS EN 1563 or equivalent approved/ The door shall be fitted with a zinc-free phosphor-bronze face, closing on a corresponding bronze face, in the body.

The valves must be of the “non-slam” type, for horizontal or vertical installation. Unless otherwise specified, all reflux valves shall be fitted with an external counterweight arm to ensure non-slam closure.

External spring assisted closure will also be permitted. Valves with a stainless steel perforated cone, or resilient conical diaphragm, are also acceptable.

Wafer-type reflux valves shall have ductile iron bodies with domed 316 stainless steel gates. Seats shall be machined with a dove-tail groove to accommodate an O-ring to ensure drip-tight sealing.

Valves shall be installed between suitable retaining flanges, which shall be independent of any other piece of equipment.

Valves shall be guaranteed to be leak tight in their particular application.

Valves shall be coated externally and lined internally in accordance with the Umgeni Water Particular Specification for Valves.

b) Nozzle-type Reflux valves

Nozzle-type or “Silent” check valves shall be double flanged. The “globe” style of construction shall be used.

The design shall be such that the disc does not rely on back flow for closure. Closure shall be performed by a stainless steel spring that pushes the disc against the stainless steel seat.

The valve shall be fully open under normal operating conditions.

Discs shall close with a positive action and no possibility of slamming shut during any stage of the closing or opening operation. The spring assisted low inertia internal components must ensure rapid closing and minimise secondary slam even at high flow deceleration rates. The disc shall at all times stay perpendicular to flow.

The valve disc shall be of ductile iron grade EN-GJS-400-15 construction. Valve rings shall be of EN 1.4404 construction.

The bearings shall be of bronze construction or superior.

All internal components shall be of stainless steel construction, including the shaft, stopper, spring, bolts, nut, and setscrew.

External fasteners (flanged connections) shall be mild steel (hot dip galvanized).

PSL 3.10.7 Flow Limiting Valves

The Contractor is referred to the Umgeni Water Particular Specification for Valves. Where conflict exists, the requirements in this specification shall take precedence.

The limiter valve shall consist of a wafer pattern with rubber control ring orifice inserts, which effects a consistent flow control within $\pm 10\%$ of the rated flow for a differential pressure across the valve over a range as specified. The valve must sit between two flanges.

The valve body shall be of stainless steel grade 316 construction. The control rings shall be made of flexible nitrite elastomer rubber and shall be able to move on a tapered seat in the body as the flow increases and be replaceable. The valve shall be complete with control rings for the specified flow.

The valve design shall be proven and performance criteria shall have been confirmed by a recognized independent authority.

The valve class shall be at least equal to that of the pipework in which it is to be installed. All valves shall be rated for a working pressure of at least 1,6 MPa (Class 16), unless otherwise specified in the drawings and schedule of quantities.

PSL 3.11 Manholes and Surface Boxes

Add the following sub-clause:

PSL 3.11.7 Pipeline Markers

Where so instructed by the Engineer or as shown on the drawings, the Contractor shall erect pipeline markers. These markers will be precast concrete units manufactured out of 25 Mpa concrete to the dimensions shown on the drawings and shall comply with SABS 1200 GA Concrete (Small Works).”

Add the following new sub-clause:

PSL 3.12 Padlocks for Manholes, Air Valve Chambers, Reservoirs etc.

All padlocks for use in locking manholes, air valves chambers, valve chambers, reservoirs etc shall be "lock-a-like" 70 mm Discus Lock with all working mechanisms treated with copper slip. The cost of padlocks will be deemed to be included in the Contractor's rates for the manhole cover and/or locking bar."

PSL 4 PLANT

PSL 4.1 Handling and Rigging

Add the following:

"The plant and rigging equipment used for the handling of pipes shall be such that no pipe shall be overstressed during any operation.

In the transportation, loading and unloading of pipes, the Contractor shall at all times operate and maintain an adequate fleet of vehicles to ensure that pipes or their protective linings and coatings are not damaged. In particular, the use of excavation equipment for handling of pipes will not be permitted.

Pipes shall be moved with the use of padded slings of width sufficient to prevent damage to the coating. Chain slings, hooks, wire ropes, rope slings without canvas covers, composition belt slings with protruding rivets and any other equipment liable to damage the coating shall not be used. Slings shall be suitably rated for the loads to be handled and in good condition. The use of deteriorating and frayed slings is prohibited.

All pipes are to be lifted and handled with the aid of a "spreader" lifting beam. Special care shall be taken to ensure that no damages occur to pipes or coatings as a result of pipes sliding on or hitting adjacent pipes. The dragging or skidding of pipes and specials in contact with the ground shall not be permitted.

Whenever pipes are stacked, or otherwise stockpiled, or are transported, use shall be made of suitable resilient material as dunnage which shall not disintegrate or deteriorate when exposed to the elements for prolonged periods or under loads from adjacent pipes (See PSL 4.1.1 below). Pipes shall be stacked with a minimum clearance of 50 mm between adjacent pipe walls and a minimum of 75 mm clear of the ground.

The ends of the pipes should be kept covered by suitable end pieces to prevent damage through the intrusion of foreign matter. Level, cleared ground, free of vegetation should be chosen for the stacking site.

Fire breaks are essential, and pipes must be protected from damage by vandals or animals"

Add the following sub-clauses:

"PSL 4.1.1 Stacking and Storage of HDPE Pipes

All pipes shall be delivered in 9m or 12 m lengths.

Pipes of different PN designations shall not be transported or stacked together. Stacks shall be kept separate and carefully marked.

PE pipes must be evenly supported in order to prevent distortion. All bearing surfaces must be free from contact with sharp objects. Any projecting sections such as stub flanges must be supported to prevent damage.

The pipes shall be stacked in uniform stacks, as described below:

The area for stacking of pipes shall provide a suitably regular surface onto which to place the pipes.

Care should be taken to ensure that, prior to commencement of stacking, the area is free of rocks and other debris that may cause damage to the pipes.

Pipes shall be stored on timber planks (dunnage) of minimum dimension 75mm x 75mm placed directly on the prepared surface at a maximum 1.5m centres. The planks shall be of sufficient length that, once the pipe or multiples of pipes are chocked, the plank extends to at least 100mm beyond the outside edge of the outside chock. Every pipe shall be chocked, regardless of whether it is constrained by pipes on either side and pipes shall be chocked such that a gap of at least 50mm is maintained between pipes. All chocks are to be secured (screwed/nailed) to the spacer plank to ensure that they cannot be moved/removed.

Pipes shall not be stored more than 3 (three) high and all the requirements for stacking and chocking between layers of pipes shall be as set out above.

Add the following sub-clause:

PSL 4.1.2 Stacking of Ductile Iron Pipes

The pipes shall be stacked in uniform stacks, sockets at the same end, as described below:

Bottom Layer: The bottom layer shall be laid on 2 timbers, arranged in parallel; one timber being 1m from the socket end and the other 1m from the spigot end. The pipes shall be laid parallel with one another. The sockets touch and shall not be in contact with the ground.

The pipes at the two ends shall be secured at the socket and spigot with large wooden wedges nailed to the timbers. The intermediate pipes shall be secured at the spigot end only, using smaller wedges.

Upper Layers: Each tier consists of parallel pipes laid in line vertically. Each tier is separated by timbers slightly thicker than the difference in diameter (socket – barrel).

Fittings and accessories shall be packed in robust timber crates and secured in position to prevent chaffing in transit.

The contractor shall supply all necessary timber dunnage/crating necessary to stack the pipes in accordance with the above specification. Timber dunnage shall be sufficiently robust to prevent crushing or breaking and shall be of sufficient size to prevent contact with the ground.

Add the following sub-clause:

PSL 4.4 Packing

Goods should be suitably packed in such manner as will ensure safe and efficient transport by road or rail, and the Contractor shall include in his prices for whatever packing may be necessary in this respect. Small items particularly liable to damage or loss in transit should be crated. All crates and packing material shall, after use, become the property of the Employer, unless distinctly specified otherwise, or if returnable, shall be so at the Contractor's expense.

PSL 5 CONSTRUCTION

PSL 5.1 Laying

PSL 5.1.1 General

Add to the Sub-Clause:

"The Contractor will be responsible for clearing the areas required for pipe storage that shall include the removal of rock, stones and all combustible material. He/she shall also be responsible for maintaining the area in a clean and tidy condition for the duration of the Contract.

The Contractor is to allow for any and all costs in regard to the storing of pipes in his tendered rates for supply and delivery in the case of pipes supplied by the Contractor or the rates for collect from storage and transport to site in the case of free issue pipes should he require secondary storage of the free issue pipes.

Upon delivery of the pipes, fittings, specials and valves, these will be inspected jointly by the Engineer's Representative and the Contractor. Any items found to be damaged shall be returned to the factory for repair or replacement, in which case the costs of additional transport, repair or replacement shall be borne by the Contractor if the pipes were supplied by the Contractor and not by the Employer.

The Contractor will be held fully responsible for the care and safety of all pipes and fittings, etc, on site, and shall bear the cost of all renewals, which may be necessary to make good losses, damages or breakages. Furthermore, he shall be fully responsible for handling and re-loading material at the storage areas and for transporting and offloading of all such materials to the Site of the Works.

Before commencing pipelaying, the Contractor shall properly distribute pipes, fittings and specials, along the trenches. Valves and couplings shall not be distributed until they are actually required for laying in their designed position."

Add the following new subclause:

PSL 5.1.2 Damage

Add the following:

"The Contractor shall be responsible for protecting pipes fittings and valves from grass fires at all times and shall keep grass cut short in the vicinity of all pipework items.

Should trenches be inundated by water, there is a risk of movement of the pipes by flotation. The Contractor shall ensure that trenches are not flooded by stormwater and that pipes laid in the trench are backfilled as soon as possible after laying, except at joints made with couplings or flanges which must be kept visible until the pipeline has been satisfactorily tested.

Steel pipes with welded joints may, after all specified testing and corrosion protection has been satisfactorily completed and with prior approval from the Engineer, be backfilled at the same time as backfilling the pipeline.

Should movement of the pipes occur, the Contractor shall remove the pipes from the trench and thoroughly clean and relay the pipes. This work shall be carried out at the Contractor's expense."

PSL 5.1.3 Keeping Pipelines Clean

Add the following:

The Contractor shall take all of the steps necessary to prevent flooding of the Works and hence ensure that all work is carried out in the dry, and that the ingress of dirt and or dirty water into the pipes is pro-actively prevented. The ends of all laid pipes must be closed at all times when work is not being carried out.

Add the following sub-clauses:

"PSL 5.1.3.1 Cleaning Pipe Internals

The Contractor shall ensure that all pipe work installed is free from any internal contaminants. All traces of dirty water, slag, splatter, swarf, cuttings, coupons, welding rod ends, grinding dust, dirt and other debris are to be removed from the inside of the pipe as it is installed.

The relevant safety procedures are to be followed when entering pipes.

The Contractor shall ensure that all dust, grit and powder that accumulates in the pipe as a result of grit blasting for the repair of internal linings, be removed from the pipe in an acceptable manner before the internal lining repairs are carried out.

Once the lining repair has been completed, cleaned off and inspected, that specific section of the pipe shall be blocked off to prevent any further access by workers.

The Contractor shall take note that flushing of the completed pipeline may not be allowed after construction has been completed and therefore clean house keeping practices will be required under all circumstances during construction. The tendered rates for pipe laying shall include for the clean house keeping practices required.

Each section of the pipeline is to be internally inspected and passed by the Engineer once construction has been completed. If the pipework is not satisfactory, the Contractor shall re-clean the pipe at his own expense until the pipe is passed by the Engineer. The Engineer reserves the right to utilize cameras or any other means to inspect inaccessible areas.

PSL 5.1.3.2 Cleaning of Valves and Fittings

All flanges, valves, fittings and equipment may only be installed in pipe work after they have been thoroughly cleaned. Flange faces shall be checked for damage before being incorporated into the permanent works and any damage shall be reported to the Engineer."

PSL 5.1.4 Depths and Cover

Add the following:

"Water mains shall be so laid in road verges that the minimum cover from the finished surface level to the top of the pipe barrel is 800 mm. Under carriageways, water mains shall be laid horizontally and so that the minimum cover is 1 000 mm, the change to the cover under the carriageway from the verge being affected as specified in Subclause 5.1.4.2 of SABS 1200 L. Bulk supply mains shall be laid so that the minimum cover, in all situations, is 1 000mm."

Add the following new subclauses:

PSL 5.1.8 End Caps

The Contractor shall, at the end of each day's work, fit end caps to the open ends of the pipeline under construction. The end caps shall be manufactured in such a manner that it can be fitted to seal off the pipeline to the extent that it is totally dust and water proof. The end cap shall be able to withstand a pressure of 5 m head of water externally when fitted.

End caps shall be maintained during non-working periods.

The tendered rates for the laying of pipe shall be deemed to include for the supply, fitment, and maintenance of the end caps."

PSL 5.2 Jointing Methods

PSL 5.2.2 Flanges (Steel Pipelines)

In the heading delete "(Steel Pipelines)"

Add the following:

"Before being brought together, the ends of the pipes, fittings, couplings and flanges are to be inspected and cleaned to ensure that all parts forming the joint are undamaged and clean.

When joining flanges, the faces shall be cleaned thoroughly and an approved full faced jointing material (compressed fibre cement or other approved gaskets on flanged joints), cut properly to size, is to be inserted immediately before bringing the two flanges together. Before closing the joints, the flanges must be parallel to each other, with all bolts inserted in the bolt holes. After the fittings have thus been aligned and well supported, the joint shall be bolted up to a uniform tightness using torque wrenches to achieve the required compression force on the gasket.

Only full-face gaskets are to be used, the jointing material shall be flush with, or protrude beyond, the outer circumference of the flange (this is not applicable to raised face flanges). On completion of the joint, the flanges and bolts shall be protected as described in Clause PSL 3.9.3.8."

Add the following Subclauses:

PSL 5.2.3.1 Radiographic Examination of Welds

The Contractor shall include in his tendered rates for supply (if appropriate), handle, lay and bed of all pipes, bends, fittings and other specials for the cost of carrying out, under the supervision of an inspector appointed by the Engineer or Employer, examination of shop and field welds on the following basis:

a) Field Welds:

All welds will be tested and adjudicated in accordance with API 1104. Radiographic testing is to be carried out on 100% of the welds.

Repairs of welds will be permitted in accordance with approved repair procedures. Repairs shall be re-examined using the relevant non-destructive testing method. All costs associated with the repair of defective welds will be borne by the Contractor.

b) Fabrication of Bends, Fittings and Specials

- i) ONE HUNDRED percent radiographic examination of all weld deposited manually or semi-automatically in bends, fittings and specials which cannot be hydraulically tested because they have a plain end.
- ii) FIFTY percent radiographic examination of all welds deposited manually or semi automatically in all flanged bends, fittings, and specials which are to be tested hydraulically.

c) On-Site Fabrication of Bends, Fittings and Specials

ONE HUNDRED PERCENT radiographic examination of all weld deposited manually or semi-automatically in bends, fittings and specials.

The Engineer will, in all cases, determine which welds are to be radiographed on the quantity basis specified above. All radiographs and records thereof shall be made available to the Engineer to enable him to determine whether the welds are acceptable or not and no lining or wrapping of pipes, bends or fittings shall be permitted until the welds have been accepted by the Engineer. To avoid any unnecessary delays, at the option of the fabricator, radiographs may be approved by the manufacturer's inspectors subject to them being subsequently submitted to, and approved by the Engineer.

When a section of the weld is shown by radiography to be unacceptable and, if the limits of the deficient weld are not defined by the radiograph, additional radiography shall be carried out at the Contractor's expense until the limits of the deficiency are determined.

In the event of any welded joint proving unsatisfactory when the pipeline is subjected to radiographic tests, the Contractor shall be held responsible for all costs involved in repairing the joint or cutting it out and welding a new section of pipe, as may be ordered by the Engineer, and thereafter restoring the lining and wrapping, if these have become damaged, all to the satisfaction of the Engineer.

All repair welds shall be identified with a stamp marking, indicating which welder conducted the repair. Repaired welds shall be tested at the Contractor's expense.

After jointing and testing, the protective lining and wrappings are to be rendered continuous with the same materials as applied to the body of the pipe. Holiday detection tests shall be carried out in the field to ensure continuity of lining and wrapping

The tendered prices for supplying (when appropriate), transporting, laying, jointing and testing of pipes are to include for all the work described above and for the supply of all necessary materials, including welding, all necessary plant and labour.

d) Production Testing of Welds (Not applicable to pipes supplied by the Employer)

The Contractor shall also include in his prices for the supply of pipes the cost of carrying out at the factory, non-destructive tests of shop production welds (additional to the qualification tests for welding procedure) on the following basis:-

One pipe from each one hundred pipes produced shall be selected at random and specimens for two guided cold bend tests and one transverse tensile test shall be cut therefrom and tested in accordance with SABS 719:1971, Section 7.

In the case of the guided cold bend tests, where welding is carried from one side only, bend - specimens shall be tested with the rest of the bend in tension; where welded from both sides the specimens shall be tested with the inner and outer welds in tension alternately.

Tensile tests shall be carried out as for the qualification tests.

The pipes from which successfully tested specimens have been taken shall be trimmed to the maximum possible length and shall be accepted by the Employer for payment purposes as full standard pipe lengths.

In the event of the welds of any pipe failing to reach the standard of acceptance, such pipe shall be rejected. Two further plate coupons shall be prepared from different pipes, selected at random by the Engineer, for each specimen that has failed to reach the required standard. In the event of such additional tests proving to be satisfactory repairs to the pipe originally failing any test will be permitted by the Engineer and such repairs and subsequent re-test shall be at the Contractor's expense. In the event of the additional tests also failing to reach the required standard the Engineer shall have the right to reject the entire batch of pipes from which the coupon plates were cut.

PSL 5.2.3.2 Welding Procedure

Welding shall, unless otherwise prescribed in the approved welding procedure, commence at the top of the joint and proceed downwards. In addition to the root weld, at least two further passes shall be made, none of which is to exceed 3 mm in depth but this is subject to the approved welding procedure.

PSL 5.2.3.3 Aligning

The alignment of abutting ends shall be such that the offset does not exceed 1,5 mm. Line-up clamps ("dogs") shall not be used for the "fit-ups". The use of "bridges and wedges" or any other method that may reduce the pipe wall thickness when removed or in any way introduce unnecessary stresses into the pipe is forbidden.

PSL 5.2.3.4 Weather Conditions

Welding shall not be performed under conditions that could affect the quality of the welded joint (e.g. high moisture or windy conditions). Windshields may be used where practical.

PSL 5.2.3.5 Clearance

The minimum clearance around the pipe during welding shall be 500 mm or such other minimum distance that may be required to facilitate compliance with the approved welding procedure. When welding in the trench, adequately sized "fox holes" shall be excavated/formed so as to provide adequate access for the welders. The cost of which is to be included in the submitted rates for excavation of trenches

PSL 5.2.3.6 Visual Inspection

ONE HUNDRED percent of each joint will be examined and the following criteria shall be met:

All welds shall be substantially uniform in appearance with the inner and outer weld beads not exceeding 1 mm and 3 mm in height respectively unless otherwise required in terms of the approved welding procedure.

Undercut will not be permitted under any circumstances.

The weld, heat affected zone, and surrounding parent metal shall be free from cracks, porosity and trapped slag.

All weld splatter must be removed prior to corrosion protection application.

PSL 5.2.3.7 Non-Destructive Testing After Construction

The Employer's Cathodic Protection Professional Services Provider will carry out coating integrity surveys along the full length of the pipeline as prescribed in the Employer's Cathodic Protection Specification.

Any defect(s) found in the pipeline coating, as a result of the PCM or DCVG testing shall be located and repaired by the Contractor at his expense.

In the case of PCM testing, all coating defects identified with an area greater than 0,5 square centimetre per 12 metre length of pipeline shall be located and repaired.

In the case of DCVG surveys, all coating defects identified with a value greater than 3% IR (or such other value as may be determined and agreed following analyses of the results of the first section which undergoes DCVG testing) shall be located and repaired. The agreement between the Contractor and the Engineer on this baseline, will be set as the criteria for the coating repair requirements by the Contractor on the whole pipeline.

Depending on the extent of the defects identified during PCM or DCVG testing, the Engineer may call for a further survey after the initial defects have been repaired by the Contractor, the cost of which testing shall then be borne by the Contractor.

PSL 5.2.3.8 Quality Control

Records of which welds were carried out by each individual welder as well as non-destructive testing results shall be submitted to the Engineer monthly. Should there be repetitive or serious defects, this information shall be forwarded to the Engineer immediately."

PSL 5.5 ANCHOR/THRUST BLOCKS AND PEDESTALS

Add to the Sub-Clause:

For continuously welded or flanged steel pipes, anchor/thrust blocks will not be required at tees, bends, terminal valves and end caps.

However, anchor/thrust blocks are required at tees, bends, terminal valves and end caps for all socketed Ductile Iron and PVC pipes.

PSL 5.10 Disinfection of Potable Water Pipelines

Delete the clause and replace with:

"The entire pipeline disinfection will be monitored by the Engineer's Representative and/or the Employer's personnel. The disinfection criteria are stringent and the Contractor shall keep the pipeline clean throughout the Contract.

The Contractor will be required to submit a detailed method statement for approval by the Engineer. A minimum requirement will be that the method statement deals with the method of dosing and how the dosing rate will be controlled to ensure a uniform distribution throughout the pipeline being disinfected, the chemicals to be used, the anticipated range of dosing rates and equipment to be used, and the name and qualification the Contractor's person supervising the disinfection.

Once a successful hydraulic test of the entire pipeline has been achieved and the connections have been completed, the pipeline shall be drained. The pipeline shall then be re-charged in accordance with PSL 7.3.4 – "Initial Filling of the Pipeline". Whilst being charged, a sodium hypochlorite solution shall be dosed at a temporary connection(s) made at an air valve(s), which will be confirmed by the Engineer in order to achieve a theoretical total chlorine concentration of 25 ppm (mg/l).

Once the entire pipeline has been filled in this manner, it shall be left for a 24-hour period. Thereafter, total chlorine concentrations shall be measured at each scour point. A concentration of 20ppm total chlorine will be considered acceptable. Should this concentration not be achieved at all scours, the Contractor shall take all steps considered necessary by the Engineer to achieve satisfactory disinfection, at his/her own cost.

Once satisfactory disinfection has been achieved, the pipeline shall be drained via the scour valves (or by other means approved by the Engineer) and sufficient sodium thiosulphate (typically 1 part of total chlorine) shall be dosed into the scour-wet wells to fully neutralise the chlorine before discharging to watercourse.

The pipeline shall then be re-charged in accordance with the stated procedure and, after 24 hours, samples shall be taken and sent to an approved laboratory for analysis (at no cost to the Employer). Should the following limits not be achieved, the Contractor shall carry out at his/her own cost, all steps deemed necessary by the Engineer to achieve satisfactory disinfection.

Water Quality Limits:

PARAMETER	COUNT
<i>e. coli</i>	0
Coliforms	0
Faecal Streptococci	0

The cost of the provision of water and all chemicals for disinfection shall be deemed to be included in the tendered rates”

Add the following new subclause:

“PSL 5.11 Pipeline Markers

Markers are to be erected 300 mm off the edge of the pipe trench to the left of the trench and at right angles to the trench centre line at all horizontal changes of direction and on both sides of all road and river crossings, at valve chambers and at intermediate intervals of 50m unless agreed with the Engineer.

At bends the marker will be erected at the P.I. point of these 300 mm offset lines.”

PSL 5.12 Cement Stabilising Bedding and Selected Fill around Pipes

Where shown on the drawings or directed by the Engineer, the bedding and selected material around the pipe shall be stabilized with 8% by mass of OPC. This is applicable to water course crossings, under trafficked areas and on steep slopes.

In all cases, the cement shall be added to the bedding / selected fill material outside the trench and in such a manner so as to achieve full dispersion of the cement in the material and achieve Optimum Moisture Content when placed and compacted around the pipe. Excess water content is to be avoided so as not to create a ‘concrete encasement’ of the pipe.

PSL 6 TOLERANCES

PSL 6.2 Control Points

Add the following:

“On completion of the contract, the Contractor shall provide the Engineer with a list of as built coordinates (Accurate to 0.1 m) for all air valves, scour valves, isolation valves and standpipes. The cost of providing this information shall be deemed to be included in the rates tendered for the individual items.”

PSL 7 TESTING

PSL 7.2.1 Dye-Penetrant Test

all fillet welds shall be subject to dye penetrant testing the cost of which shall be deemed to be included in the tendered rates for pipelaying.

PSL 7.2.2 Radiographic Examination

butt-welded joints and bell-end joints shall be radiographically tested in accordance with PSL 5.2.3.

PSL 7.3 Water for Hydraulic Pressure Test

As the Employer is unable to supply water for testing, items to collect and convey water from Mthatha Dam to the nearest suitable air valve tee filling point shall be scheduled for payment.

PSL 7.3.1 Test Pressure and Time of Test

Add the following to the subclause:

“The sections in which the pipeline may be tested will be at the discretion of the Contractor, except that the pipeline shall be tested in sections not exceeding a maximum allowable length of 2 000 m unless otherwise agreed by the Engineer. The Contractor shall make due allowance in the construction program and in the tendered rates for the entire testing operation including for the provision of temporary end stops and any other costs incurred associated with testing the pipeline.

The pipe shall not be tested until the associated structural concrete for anchorage has cured for 28 days or until such concrete has attained the specified design strength. In the case of cement mortar lined pipes, once filled, the pipe shall be left for 24 hours to permit maximum saturation of cement mortar linings.

The section to be tested shall be pressurised to the specified pressure and left for 24 hours, during which period, the pressure drop (if any) and the quantity of water required to be pumped in to restore the test pressure shall be measured and recorded. In addition, all flexible and flanged joints shall be visually inspected and there shall be no sign of leakage.

At all times when there is water in the pipeline, and particularly during filling, testing and draining of the pipeline, all air valves shall be in operation and their individual isolating valves shall be open."

PSL 7.3.1.2 Delete the contents of this subclause and replace with the following:

"Subject to the provisions of 7.3.1.3 and 7.3.1.4, the test pressure for field testing shall be 1.25 times the designated working pressure at any point on the longitudinal section of the pipeline up to a maximum of 1.0 MPa, above which it shall be the designated working pressure plus 0.5 MPa.

For the purposes of this calculation, the designated working pressure shall be taken as the pressure rating of the pipe."

PSL 7.3.1.4 Delete the contents of this subclause and replace with the following:

The field test pressure shall not exceed the appropriate of the values in the following table.

Type of pipe	Applicable materials standard	Maximum field pressure at any point of the pipeline
Steel	SANS 62-1, SANS 62-2, SANS 719	50% of the hydraulic test pressure
Ductile iron	SANS 50545	Allowable site test pressure (PEA)
Reinforced concrete	SANS 676	75% of hydraulic test pressure
Prestressed concrete	SANS 975	75% of hydraulic test pressure
Fibre cement	SANS 1223	75% of hydraulic test pressure
GRP	SANS 1748-1	1.5 times the rated pressure class
Polyethylene (PE)	SANS 4427	1.5 times the rated pressure of the pipe
Steel-mesh-reinforced PE	SANS 370	1.5 times the rated pressure of the pipe
Polypropylene	SANS 15874-2 and SANS 15874-3	1.5 times the rated pressure of the pipe
uPVC	SANS 966-1	1.5 times the rated pressure of the pipe
mPVC	SANS 966-2 or SANS 1283	1.5 times the rated pressure of the pipe
oPVC	SANS 16422	1.5 times the rated pressure of the pipe

Add the following new subclauses:

PSL 7.3.4 Initial Filling of Pipeline

The entire process for filling the pipeline at any time during testing or disinfection shall be carried out under the supervision of the Engineer and will also be monitored by the Engineer and/or the Employer's personnel. Under no circumstances will the Contractor be allowed to carry out filling of the pipeline without the supervision of the Engineer, neither shall he/she permit any other persons to carry out such filling without the written permission of the Engineer.

Any damage to the pipeline caused by non-compliance with this Sub-Cause shall be rectified at the Contractor's expense.

PSL 7.3.5 Connections after Testing

The connections of the new pipework to the existing pipework shall only be carried out after the pipeline testing has been completed and accepted by the Engineer. For this reason, testing must be carried out against a blank flange or bullnose end cap at these locations.

PSL 8 MEASUREMENT AND PAYMENT

PSL 8.2 Scheduled Items

PSL 8.2.1 Supply, Lay and Bed Pipes Complete with CouplingUnit : m

Rename this subclause PSL 8.2.1 a) and add the following:

"A maximum payment of 80 % of the tendered rates will be made for a completed section of pipeline which has not yet been hydraulically pressure tested and disinfected. A further payment of 20% of the tendered rates will be made upon successful completion of the pressure testing and disinfection for the relevant section of pipeline.

The rates tendered for the laying and bedding of pipes, bends, fittings, and valves, shall be deemed to include the costs associated with the field pressure testing and disinfection of the pipeline.

Pipelines will be measured by length over all lengths as laid. No deduction will be made for specials and valves. Separate items will be scheduled for each diameter and each type and class of pipe laid.”

Add the following subclause:

PSL 8.2.1 b) Collect from Designated Pipe Yard/s, Transport, Lay, Bed and pressure test Pipes Unit : m

Pipelines will be measured by length over all lengths as laid. No deduction will be made for specials and valves. Separate items will be scheduled for each diameter and each type and class of pipe laid.

The rates shall cover the cost of the collection of the pipes from pipe yard, transportation to the site of the works, offloading and placing/stringing to suit the contractor’s laying methods, handling, inspecting, bedding, laying, jointing, cutting, testing and, when relevant, disinfecting the pipes and the joints.

A maximum payment of 80 % of the tendered rates will be made for a completed section of pipeline which has not yet been hydraulically pressure tested and disinfected. A further payment of 20% of the tendered rates will be made upon successful completion of the pressure testing for the relevant section of pipeline.

Water for filling pipelines by tanker is measured separately.”

PSL 8.2.2 Extra-over 8.2.1 a) and 8.2.1 b) for the Supplying, Laying and Bedding of Specials Complete with Couplings.

Add the following:

“A maximum payment of 80 % of the tendered rates will be made for a special once installed in the pipeline which has not yet been hydraulically pressure tested and disinfected. A further payment of 20% of the tendered rates will be made upon successful completion of the pressure testing and disinfection for the relevant special.

The rates for the supply and installing of valves and specials shall cover the cost of any cutting, trimming, and jointing of pipes required for the installation of valves, bends and fittings in the positions shown on the drawings. Unless specific provision is made in the Bills of Quantities, no separate payment will be made for forming of any additional joints and/or for the supply of additional jointing materials which may be required for the connection of cut pipes.

The rates tendered for the laying and bedding of pipes, bends, fittings, and valves, shall be deemed to include the costs associated with the field pressure testing and disinfection”.

PSL 8.2.3 Extra-over 8.2.1 a) and 8.2.1 b) for the Supply, Fixing and Bedding of Valves

Add the following:

“A maximum payment of 80 % of the tendered rates will be made for a valve once installed in the pipeline which has not yet been hydraulically pressure tested and disinfected. A further payment of 20% of the tendered rates will be made upon successful completion of the pressure testing and disinfection for the relevant special.

The rates for the supply and installing of valves and specials shall cover the cost of any cutting, trimming, and jointing of pipes required for the installation of valves, bends and fittings in the positions shown on the drawings. Unless specific provision is made in the Bills of Quantities, no separate payment will be made for forming of any additional joints and/or for the supply of additional jointing materials which may be required for the connection of cut pipes.

The rates tendered for the laying and bedding of pipes, bends, fittings, and valves, shall be deemed to include the costs associated with the field pressure testing and disinfection”.

PSL 8.2.15 Special Wrapping in Corrosive Soil

Change the heading of this subclause as follows:

PSL 8.2.15 Additional corrosion protection of Pipes, Specials, Joints, Valves and Fittings

a) Additional Corrosion Protection of Flanges and Flexible Adaptor/Anchoring JointsUnit: No.

Separate items will be scheduled for flanges, flexible joints and adaptor/anchoring joints of each diameter and type. The unit of measurement shall be the number (No) of paired flanges/joints protected as specified in the specifications. The rate will include for all materials, manufacturing, delivery, painting, wrapping and erection of each unit.

b) Additional Corrosion Protection of Buried Valves, and specialsUnit: No or m

Separate items will be scheduled for valves, flexible and flanged joints and pipes of each diameter and type. The unit of measurement shall be the number (No) of buried paired couplings, joints, flanges or valves as specified or the length of pipe as specified. The rate will include for all materials, manufacturing, delivery, painting and erection of each unit.

In the case of valves, the rate shall include for protection of the whole of the valve body, all flanges integral to the valve, the connecting flanges to the valve i.e. including the two flanges of the pipework connected to either side of the valve, and the packing of mastic (without tape or sheathing) over the gland adjusting bolts and nuts."

c) Additional Corrosion protection of Cast-in Pipes and Fittings.....Unit: No or m²

If separate items are scheduled, for each diameter of cast in pipe and fittings to be wrapped, the unit of measurement shall be No. of completed wrappings inclusive of the encasement length. The rate will include for all materials, manufacturing, delivery, painting and erection of each unit.

d) Additional Corrosion protection of Permanently Exposed Pipes and Fittings.....nit: m or m²

If separate items are scheduled for each diameter of exposed pipe (above and below ground) to be protected, the unit of measurement shall be in meters for the length of exposure. If not the unit of measurement will be square metres of completed wrapping and/or painting as specified.

Add the following new payment items:

PSL 8.2.16 : Pipeline Markers Unit : No

The unit of measurement will be the number of markers erected and accepted by the Engineer and the rate will include for all materials, manufacturing, delivery, painting and erection of each unit.

PSL 8.2.17 : Fill 5m³ tanker, transport to filling point, discharge into pipeline..... Unit : m3.km

The unit of measurement will be the volume of water transported and discharged into the nearest air valve tee multiplied by the distance in km from water source filling point to discharge point at air valve tee. The rate shall cover all costs associated with providing a 5m³ water tanker with driver plus equipment to pump water into tanker, pumping costs to fill tanker, transport to discharge point, equipment to transfer water into air valve tee on pipeline and reinstating air valve on tee on completion. Only the first fill of the pipeline shall be measured for payment. Any re-filling required following any unsuccessful pressure testing shall be to the Contractor's account.

PSL 8.2.18 : Empty tanker return to water source to collect next load.....Unit : km

The unit of measurement will be the distance the empty tanker travels (in km) to fetch another load. The rate shall cover all costs associated with the return journey to fetch another load. Only return trips required for the first fill of the pipeline shall be measured for payment. Any additional return trips required as a result of unsuccessful pressure testing shall be to the Contractor's account."

PSL 8.2.19: Connection to existing mains.....Unit : No

Connection to the existing mains shall be carried out by the Municipal Water Division after acceptance of the reticulation.

PSLB BEDDING (PIPES) (SANS 1200 LB)

PSLB 2.3 DEFINITIONS

Main fill:
Delete "150 mm" in second line and substitute "300 mm".

PSLB 3 MATERIALS

PSLB 3.1 Selected Granular Material

(For bedding material for steel pipes see PSLB 3.3 below)

In the second line delete "19 mm" and substitute "10 mm".

Add to the Sub-Clause:

The maximum compatibility factor shall be 0,4.

PSLB 3.2 Selected Fill Material

Not required. All material up to the underside of backfill shall be measured as selected granular. (for bedding material for steel, GRP and PVC pipes see PSLB 3.3)

PSLB 3.3 Bedding

All pipes except concrete stormwater pipes laid under this Contract will be considered as being flexible pipes. Bedding (selected granular and selected fill material) for steel, GRP, PVC, large-bore HDPE (>DN200) and concrete stormwater pipes along roads shall be (for the Mthatha area) G7 granular decomposed dolerite (known locally as "Sugar Dolerite" or "Sibunga"), carefully selected, with maximum particle size of 5 mm and which shall not cake nor form lumps when drying. Samples of bedding material shall be submitted by the Contractor to the Engineer for approval well in advance of construction. Only after the Contractor has received written approval from the Engineer, may he/she proceed with placing the approval material as selected granular material.

No sharp-edged stones shall be allowed to come into contact with the pipes or fittings. Joint holes (pockets) shall be provided in the trench bottom and bedding, at each pipe joint to facilitate welding, and no extra payment will be made for forming or filling the joint holes (pockets) with padding sand.

All bedding used for the cradle beneath and surrounding the coated steel pipes shall comply with the following requirements:

a. GRADING ANALYSIS RANGE	
SIEVE SIZE (mm)	b. PERCENTAGE PASSING
6,7	98 to 100
4,76	85 to 100
2,36	55 to 95
1,18	30 to 75
0,60	20 to 50
0,425	16 to 38
0,30	13 to 27
0,15	5 to 18
0,075	0 to 12

The material shall be free of organic matter and shall have a compatibility factor of not more than 0.4. The material should be classified as silty to fine sand having a stiffness ratio of not less than 5,0 MPa. Furthermore, the origin of the materials should, preferably, be river transported since it is preferable that the larger grains (3,0 to 4,8 mm in size) be rounded and not sharp and angular.

Depending on the actual material supplied by the Contractor, the moisture content may be critical to enable satisfactory placing and compaction and the Contractor will be deemed to have allowed in his tendered rate for any and all adjustments required to the moisture content of the bedding material at all times.

Items have been provided in the Bill of Quantities for the provision of approved bedding material from approved Commercial or other approved off-site sources.

No extra payment will be made for forming or filling joint holes (pockets).

Bedding for small-bore HDPE pipes (water reticulation) and concrete stormwater pipes traversing open ground areas (ie *not* along roads or under platforms) shall be material selected from local excavations or stockpiles.

PSLB 3.4 Selection

PSLB 3.4.1 Suitable Material Available from Trench Excavation

Delete the Sub-Clause and substitute the following:

The excavation of a pipe trench shall comply with the requirements of Sub-Clause 5.4 of SABS 1200 DB and the provisions of Sub-Clause 3.7 of SABS 1200 DB (in terms of which, for the purposes of providing bedding materials, the Contractor is not required to use selective methods of excavating) shall apply. Nevertheless the Contractor shall take every reasonable precaution to avoid burying or contaminating material that is suitable and is required for bedding or covering the pipeline. If, in the opinion of the Engineer, bedding material can be produced from the excavated material, the Contractor shall, if so ordered by the Engineer, screen or otherwise treat (as scheduled) the excavated material in order to produce material suitable for bedding (see also Sub-Clause PSLB 8.1.2).

PSLB 5 CONSTRUCTION

PLSB 5.1 GENERAL

PSLB 5.1.4 Compacting

Delete the second line and substitute: top of the pipeline) shall be 93% mod AASHTO.

Add to Sub-Clause 5.1.4:

Steps will have to be taken by the Contractor to ensure that flexible pipes do not deform excessively in cross-section during and after construction and backfilling operations. The maximum deflection which will be acceptable at any stage during or after construction is 2% of the pipe diameter horizontally or vertically. The Contractor will be required to provide the necessary apparatus and to monitor deflection during construction.

Pipe deformations will only be maintained within the specified tolerances by correct backfilling practice. No heavy compaction equipment will be permitted for compaction of any pipe bedding, only pneumatic or hand rammers being acceptable. To this end, and to achieve the 93% compaction specified it is required that the bedding material be brought up evenly on either side of the pipe. The use of complete saturation of the material as a method of achieving the specified compaction may, subject to the Engineer's approval, be used. However, in this regard, Tenderers are advised that the presence of excessive quantities of water in the pipe trench could lead to flotation of the pipe.

Prior to the commencement of pipe laying the Contractor will be required to submit, to the Engineer, for his approval, his proposed methods of placing, and compacting methods which he proposes to implement in order to ensure compliance with the specification.

PSLB 5.1.5 Testing

Flexible and flanged joints shall be left exposed with a minimum of 300 mm clearance around the bottom of the pipe during hydraulic pressure testing of the pipe to facilitate inspection.

PSLB 5.2.5 Stone Bedding

In areas where waterlogged conditions exist or where ordered by the Engineer, special drains consisting of a 150 mm thickness (See PSDB 5.5) of single sized stone with a geofabric filter surround ("Bidim" Grade A4 or similar approved) extending the full width of the trench shall be provided below the bedding to the pipes. The excavation for these drains will be measured in cubic metres at the contract rate applying to unsuitable excavation below the bottom of the trench. The stone filling will be paid for per cubic metre and the geofabric filter will be paid for per square metre. All measurements in this connection will be to a width equal to the base widths and depths ordered.

PSLB 5.3 Placing and Compacting Flexible Pipes

PSLB 5.3 (a) Bedding Cradle

Delete the sub-clause and substitute the following:

The pipes shall be bedded on a minimum 100 mm thick layer of compacted granular bedding material on which a 50 mm thick layer of uncompacted granular bedding material has been placed and spread. Loose granular bedding material lying next to the pipe shall be placed into the haunch area and compacted with suitable hand tools (covered with rubber to prevent

damage to the pipe coating), and additional selected granular material shall be added and compacted in 150 mm thick layers up to the mid point of the pipe diameter in the vertical plane. The remainder of the bedding i.e. the selected fill blanket, shall be placed in layers up the sides of the pipe, each layer being compacted until a level of 300 mm above the crown of the pipe is reached.

PSLB 5.3 (b) Selected Fill Blanket

Delete "200 mm" from title.

PSLB 6 TOLERANCES

PSLB 6.1 Moisture Content and Density

Add to the Sub-Clause:

The permissible deviations applicable are to be those for Degree of Accuracy II class of work.

PSLB 8 MEASUREMENT AND PAYMENT

PSLB 8.1.3 Volume of Bedding Materials

Add the following:

The volume of bedding materials will be computed from dimensions shown on the drawings. The volume occupied by the pipe (measured to the outer diameter) shall be excluded from the bedding volume and will not be measured. No additional payment will be made for bedding material placed in bell (fox) holes.

PSLB 8.1.6 Free-haul

Delete the words "of 0,5 km" in the first line of this Subclause.

Add the following:

PSLB 8.2.1 c) Permeable backfill material sub-surface drains..... Unit : m³

Backfill material to subsurface drains obtained from trench excavations shall comply with the requirements of Clause 3.1 of SANS 1200 LB.

PSLB 8.2.2.1 c) Permeable backfill material above sub-surface drains..... Unit : m³

Backfill material to subsurface drains obtained from other necessary site excavations or stockpiles on site shall comply with the requirements of Clause 3.1 of SANS 1200 LB.

PSLB 8.2.2.3 c) Permeable backfill material above sub-surface drains..... Unit : m³

Backfill material to subsurface drains obtained from commercial sources shall comply with the requirements of Clause 3.1 of SANS 1200 LB.

PSLB 8.2.3 Concrete Bedding Cradle

Add the following paragraph to the Sub-Clause:

All concrete bedding to pipes will require formwork. The rate for concrete bedding shall include for the supply, installation and stripping of all formwork.

PSLB 8.2.4 Encasing of Pipes in Concrete

Delete the fifth and sixth lines and substitute the following:

encasing the pipe in concrete 150mm thick each side of the pipe and to 150mm above the crown of the pipe including the cost of formwork, (if any), etc. and the cost of formwork to form stop ends on either side of collars, couplings, joints etc if instructed by the Engineer.

The rate for concrete encasing shall include for the supply, installation and stripping of all formwork.

PSLB 8.2.6 Drainage Layer (New Sub-Clause)

Add the new sub-clause:

Supply and place beneath pipe, 150mm crushed stone layer as ground water drainage layer. The excavation for these drains will be measured in cubic metres at the tendered rate applying to unsuitable excavation below the bottom of the trench (SABS 1200 DB 8.3.2 c).

- PSLB 8.2.6 a) The rate for stone filling shall be per cubic metre of stone fill, measured according to a width equal to the base widths and depths ordered.....

- PSLB 8.2.6 b) Supply and installation of geofabric filter material (BIDIM Grade A4 or similar) around stone. The rate shall be per square metre of geofabric to enclose the stone material, measured net according to a width equal to the base widths and depths ordered.....Unit : m²

PSLC CABLE DUCTS (SANS 1200 LC)

PSLC 3 MATERIALS

PSLC 3.2 Bedding

Delete Clauses 3.2.1 and 3.2.2 and replace with the following:

"Selected granular material shall be an aggregate, sand or granular material all of a non-cohesive nature, the grading analysis of which shows 100% passing a 13.2mm sieve and not more than 5% passing a 0,075mm sieve (Metric sizes). The Compactability Factor shall not exceed 0,4."

PSLC 5 CONSTRUCTION

PSLC 5.1.1 Excavation of Trenches

Material excavated other than hard rock, will not be separately classified for the purpose of measurement and payment. The unit rate for excavation shall cover excavation in soft and intermediate material.

PSLC 5.8 Road Crossings

Delete the last sentence and replace with:

"The duct(s) shall extend a distance of at least 0,5m beyond the backface of the kerb or the edge of the road, as applicable."

PSLC 5.10 Position to be Marked

Marking is required on both sides of the carriageway.

Delete in the second line: "... the letters "GPO or ESC", as applicable,." and replace with "..... the letters "T" and "E", as applicable."

Add: "The height of the letter shall be at least 100mm."

PSLC 8 MEASUREMENT AND PAYMENT

PSLC 8.2.2 Schedule Items

Delete payment clause 8.2.2(b) and add the following :

"8.2.2(b) **Extra over item (a) above for :**

Hard rock excavation.....Unit m³

PSLD SEWERS (SANS 1200 LD)

PSLD 1 SCOPE

Add to Clause 1.1 : "Drawings Numbered LD-2 to LD-8 are replaced by the PEM Standard Detail Drawings"

PSLD 3 MATERIALS

PSLD 3.1.3 A.C. Pipes - Now F.C.

3 ringed Triplex joints shall be used.

Add : "Pipes shall be bitumen dipped or coated externally with a bitumen or other approved material to give a black colour."

PSLD 3.5.1 Bricks

Delete in the first line "general purpose (Special) burnt" and replace by "facing (28 MPa min. strength)."

PSLD 3.5.2 Precast Concrete Sections

"Dolomitic aggregate shall be used in the manufacture of the chamber sections, levelling rings and roof slabs."

PSLD 3.5.3 Prefabricated A.C. Manholes

Delete the contents of Clause 3.5.3 and replace with the following :

"These will not be permitted."

PSLD 3.5.4 Concrete

Dolomitic aggregate is not required for cast in situ concrete.

PSLD 3.5.7 Step Irons

Delete the contents of Clause 3.5.7 and replace with the following :

"Step irons in manholes are not required."

PSLD 5 CONSTRUCTION

PSLD 5.2.6 Laying and Bedding of Vitro Clay Pipes

(New Clause) Add the following:

"For the purpose of constructing sewers using vitrified clay pipes and specials, it is required that the contractor thoroughly acquaint himself and his staff with the necessary installation and handling procedures. It is advised that the responsible persons undertake training courses offered by the manufacturers / suppliers, to ensure that compliance with the stringent approval/acceptance procedures can be achieved."

Add the following new clause:

PSLD 5.4.1 Connection into Existing Manholes

An appropriate item has been allowed in the Schedule of Quantities to cover all costs connected with the making of this connection.

PSLD 5.6.1 General

Delete in Clauses (a) and (b) the word "brick" and replace by "cast in situ concrete."

Delete in Clause (d) "Drawings LD....." and replace by "Municipal Standard Details Drawings".

PSLD 5.6.2.3 Benching

Delete "1:3 cement mortar" and replace by "concrete topping consisting of 1 part cement, 2 parts sand and 3 parts 7 mm concrete stone, by mass. The sand proportion may be varied between 1 1/2 and 2 1/2 to obtain ideal workability."

PSLD 5.6.7 Cast in Situ Concrete Manholes

Refer to Municipal Standard Detail Drawings for details.

20 MPa strength concrete shall be used. Aggregate size may be 19 mm or 13 mm to suite contractor. Dolomitic aggregates are not required.

When the concrete is mixed on site, an approved rotary mixer, suitable in size for a batch containing cement in increments of one sack of 50 kg, shall be used. The contractor's method of batching of the ingredients shall be to the approval of the Employer's Agent's Representative. Samples of the materials to be used shall be submitted for approval. The proportions of cement, coarse and fine aggregate and water necessary to produce the 20 MPa concrete shall be determined and submitted to the Employer's Agent's Representative together with the results of compressive strength tests, before the contractor will be allowed to use site mixed concrete in the construction of manholes.

The contractor shall bear the costs of determining the proportions of the mix and making and testing cubes for this purpose. If the contractor submits reliable test records of concrete made from the same materials and mix proportions which he

proposes to use, then the Employer's Agent may waive all or part of the strength tests required above to verify that the concrete mix design which the contractor proposes to use is satisfactory.

The contractor shall carry out his own testing during the construction of the Works to ensure that the concrete being used complies with the Specification. The Employer's Agent's Representative shall carry out such test check testing as he requires and the contractor shall render any assistance necessary in taking of samples and the carrying out of tests.

All concrete being placed shall be vibrated by means of approved vibrators. Curing shall be by means of the application of a natural resin based liquid curing compound complying with ASTM C309-74. When the surface to be cured is to receive further concrete it shall be cured with water only, by sprinkling, spraying or ponding such as to maintain it in a continuously wet condition.

If the concrete is found to be cracked, honeycombed, soft or defective in any way, or if cube test strength results do not comply with the requirements, then the concrete shall be rejected. Rectification shall be by removal of the defective portion and replacement with sound concrete.

If the manhole is constructed in more than one lift the construction joint formed shall in addition to being prepared as specified in sub-clause 5.4.5.4 of SANS 1200 GA, be reinforced with 8 No 12 mm diam. x 300 mm long mild steel dowel bars, cast in to a depth of 150 mm, placed centrally in the joint face and equally spaced about the circumference.

Add the following new clause:

PSLD 5.6.8 Finished Cover Levels

Unless otherwise ordered or dimensioned explicitly on the working drawings, the level of the top surface of the cover shall be

- flush with the final surface of a carriageway, footway or any paved areas
- 50 mm above the surface of a grassed or gravelled verge, or service lane
- 250 mm above the finished ground level for manholes situated at the midblock of private or municipal property.
- 500 mm above ground level in undeveloped open space.

PSLD 5.6.9 Rectification of Infiltration of Water

Any infiltration visible in the manhole channels, pipe ends or benching shall be rectified by demolishing the base and rebuilding. Rectification of infiltration through the walls and/or joints may be attempted only by externally applied measures, failing which the manhole shall be demolished and rebuilt.

PSLD 5.9 Connecting Sewers

PSLD 5.9.1 Location and Details

Delete the words "Drawing LD-7 or Drawing LD-8" as applicable and replace by :
"The relevant Municipal Standard Detail Drawings."

PSLD 5.9.2 Marker Posts

Marker posts are not required.

PSLD 5.9.3 Recording Location

Add: "The information required under this clause shall be shown on form PEM 3849(8/88) obtainable from the Employer's Agent's Representative.

Add the following new clause:

PSLD 5.9.4 Connection of New to Existing Reticulation

The contractor shall under no circumstances connect the new reticulation into the existing without the prior written instruction of the Employer's Agent. This instruction will only be given after acceptance, by the Employer's Agent, of the sewer lines and manholes of the new reticulation upstream of the connection point. Connections will usually be made just prior to the start of the Defects Liability Period.

PSLD 6 TOLERANCES

PSLD 6.2 Overall Centre-Line Control and Manhole Location

Delete in second line " ± 300 " and replace by " ± 100 ". Manhole positions, as shown on the drawings, are critical. Any required deviation by the contractor, in excess of the tolerance, must be authorized by the Employer's Agent.

PSLD 6.3 Manhole Invert Levels

Delete in second line " ± 50 mm" and replace by " ± 25 mm where vitro clay pipes are being used".

PSLD 6.4 Alignment and grade between manholes

Replace "5%" in 6.4(a)(1) with "3%, where vitro clay pipes are being used".

Add the following new clause:

PSLD 6.6 As-Built Information

The contractor shall submit "As-Built" levels, distances between manholes and the grades of pipelines for which he requires payment at the time he submits his monthly payment claim. A sample form is obtainable from the Employer's Agent.

PSLD 7 TESTING

PSLD 7.1 General

PSLD 7.1.6 Delete wording of Clause (c) and replace by : "A torch and mirror test shall be carried out on all pipe lengths, in both directions".

PSLD 7.2.1 Air Test

Delete the table of 7.2.1(a) and replace by :

"The air test shall comply with the requirements of NBRI-X/BOU of April 1976 also described in the Vitrified Clay Pipe Manual of 1978, page 29. For vitrified clay pipes the air test shall be carried out on saturated pipes and shall comply with the requirements of NBRI-X/BOU 2-34 also described in Vitrified Clay Pipe Manual of 1978, page 29, or else the contents of 7.2.1(a) and 7.2.1(b) apply".

PSLD 7.2.6 Water tightness of Manholes

Especially in areas where the water table is low a test, as detailed hereafter, to verify the water tightness of any manhole may be requested by the Employer's Agent's Representative.

Infiltration: The excavation surrounding the manhole shall be flooded to approximately the top of wall level and this depth of water maintained for at least 48 hours. The manhole will have satisfied the test requirements provided there is no sign of infiltration of water.

Exfiltration: The manhole shall be filled with water to the top of its wall level and this depth maintained for at least 24 hours. Water may be added to maintain this level.

At the end of the subsequent 24 hour period the drop in water level is to be measured. The manhole will have satisfied the test requirement provided the drop is less than 75 mm per metre in depth of the manhole measured from channel invert to the original height of the water. At the discretion of the Employer's Agent's Representative a shorter testing time, minimum 3 hours, will be allowed in which case a 'drop in level' pro rata to the time tested ,shall be used.

Add the following new clause:

PSLD 7.2.7 Torch and Mirror Test

For the pipeline to be acceptable the visibility of the plug/reflector shall be at least 50% of its area.

Add the following new clause:

PSLD 7.2.8 Acceptance Criteria

The acceptance of the pipe length or manhole shall depend upon whether it satisfies the criteria set out in SANS 1200 LD clauses 6, 7 and the PS clauses above.

Where pipes other than vitro clay pipes are laid, only tests carried out on the pipelines after completion of the backfilling to ground level (excluding surface restoration) and completion of the construction of manholes to roof height, including benching, will be considered for acceptance purposes.

In the case where vitro clay pipes are being laid, no pipelines are to be covered prior to inspection and approval by the Employer's Agent. Once the pipeline has been laid and bedded in the compacted bedding cradle (to half pipe) between control points, the Employer's Agent must be called out to inspect the installation. The contractor is to provide the necessary equipment in order for the Employer's Agent to adequately assess that the pipeline has been laid to the specified tolerances. Further, an air test, in accordance with the specifications, is to be conducted and witnessed by the Employer's Agent prior to the placing of the Fill Blanket.

PSLD 8 MEASUREMENT AND PAYMENT

PSLD 8.2.1 Supply, Lay, Joint, Bed and Test Pipeline

Add: "The measured quantity of completed pipe length will only be included in the payment certificate when the pipeline has satisfied the test after the completion of the backfill to ground level - See PSLD 7.2.8. Prior to this, payment will be made as materials on site."

PSLD 8.2.3 Manholes

Delete: "Separate items will of 0,5m" and replace by "Manholes and backdrops will be measured per number of each type of standard depth of 1,5m metres.

Extra over or extra under items will be included in the schedules for the cumulative sum of variations in depth from the standard depth.

Delete reference to "short pipes" - the full length of piping is to be measured under the item "Supply, lay and test piping"

The tendered rate shall also provide for the supply, laying, jointing of channels as for a 'through manhole'. An extra over item will be scheduled for additional channels and associated work in branch manhole.

PSLE STORMWATER DRAINAGE SANS 1200 LE)

PSLE 3 MATERIALS

PSLE 3.1 CULVERT UNITS AND PIPES

Pipes for stormwater drainage shall be reinforced concrete Type SC Class 100D, 75D or 50D as scheduled, with spigot and socket type joints.

Precast concrete culvert units and bases shall be Type RP / Class S complying with the requirements of SANS 986 installed as prescribed in clause 5.2.5 with the butt joints of the culverts units externally covered with two layers of geotextile 300mm wide centrally placed about the joint and secured with bitumen, all to the Engineer's satisfaction.

PSLE 3.4 MANHOLES, CATCHPITS AND ACCESSORIES

PSLE 3.4.1 Bricks

Delete the first sentence, and replace with the following:

"Bricks used in stormwater structures shall be:

Burnt clay engineering bricks having a nominal compressive strength of 28 MPa and complying with the requirements of SANS227.

Add the following new clause:

PSLE 3.5.1 Composite Drainage System

The fin drain system shall consist of a geonet drainage core and geopipe enclosed within geotextile filter jacket. The fin drain shall be supplied prefabricated with geopipe assembly on site. The fin drain shall have a minimum flow capacity of 0.19l/s per meter (hydraulic gradient of unity and a pressure of 10 kPa) and shall not decrease in thickness by more than 20% under confining pressure of 10 kPa.

1. Geonet Drainage Core

The core shall be non-corroding, rot-proof and manufactured from low density polyethylene with minimum characteristics as follows:-

Mass	:	822g/m ²
Thickness	:	5mm
Tensile Strength	:	2.4 kN/m
Discharge Capacity	:	3.0l/s under 100 kPa at a hydraulic gradient of unity

2. Drainage Pipe

The geopipe to be used in conjunction with the prefabricated fin drain shall be manufactured from high density polyethylene with not less than 60% of the surface perforated.

PSLE 3.5.2 Subsoil Drainage System

The Subsoil Drainage System shall be Bidim U24 and 19 mm stone around the perforated pipe.

PSLE 5 CONSTRUCTION

PSLE 5.2.2 Pipe Culverts

Add the following to the Clause:

"Pipes with ogee joints, where they pass under roads and also on curved pipelines in verges, shall be wrapped with two layers of hessian soaked in cementitious grout. The wrapping shall be 400mm wide and placed centrally over each joint.

Unless otherwise stated in the Bill of Quantities or indicated on drawings, pipe with ogee joints shall be used.

Butt ended pipes will not be permitted. Lifting holes should be suitably closed off to prevent the ingress of soil"

PSLE 5.5.6 Benching

Delete "granolithic plaster" and replace by "concrete topping consisting of a 1:2:3 cement, sand and 7mm stone mix by weight. The sand proportion may be varied between 1.5 and 2.5 to obtain ideal workability.

Add the following new clause:

PSLE 5.8 Installation of Composite Drainage System

The geopipe shall be placed at the bottom of the geo-net with the channel section of the geopipe as the invert of the drain. The geotextile filter jacket shall then be wrapped around the geopipe and stapled/joined at 300mm intervals. The complete system shall then be placed in the trench ensuring that during backfilling the fin remains vertical.

Add the following new clause:

PSLE 6.6 Pipes into Manholes/Catchpits

Pipes may protrude up to 300mm into a manhole/catchpit. The relaxation will only be permitted if the pipe does not have to be cut. The "dead space" formed at the end of the manhole is to be suitably benched off to prevent the collection of sand and rubbish.

Add the following new clause:

PSLE 6.7 "As-Built" Details

The contractor shall submit as-built levels, distances between manholes and the grades of pipelines for which he requires payment, at the time he submits his monthly payment claim. A sample form is obtained from the Engineer.

PSLE 8 MEASUREMENT AND PAYMENT

PSLE 8.2.8 Supply and Install Manholes, Catchpits, etc.

Insert after "brickwork (if any)", the words "step irons,"

Delete the words "but excluding excavation and backfilling, which will be measured separately" and replace with "including dealing with any excavation (in all materials including disposal of surplus) that is additional to that measured under the item for pipe trench excavation (see Sub-Clause 8.2.3 of SANS 1200 DB)".

Notwithstanding the provisions of Sub-Clause 8.2.8(c), manholes, drop inlets, catchpits, and the like will be scheduled by means of separate items for various categories of depth and/or type.

For measurement and payment purposes the depth of a manhole, drop inlet or catchpit is defined as the depth from the top of the cover to the invert level of the manhole.

Add the following new clauses:

PSLE 8.2.14 Composite Drainage SystemUnit: m

The composite drainage system will be measured linearly on slopes overall s laid. No deductions will be made for specials, but deductions will be made for the internal length of manholes. Separate items will be scheduled for different diameters of pipes, where relevant.

The rate shall cover the cost of providing the composite drain and the cost of laying, bedding, backfilling, jointing and making connections into manholes.

PSLE 8.2.15 Construct headwalls as per Engineer's detail drawing, for the following pipe sizes:

300mm to 600mm diameterUnit: No

The rate shall cover constructing the headwall complete, including dealing with any excavation (including disposal of surplus), which is additional to that measured under pipe excavation.

PSLE 8.2.16 Construct concrete cast in-situ channelUnit: m

The rate shall cover constructing the channel complete as per drawing PSLE 9/4 and PSLE 9/5, including dealing with any excavation (including disposal of surplus), which is additional to that measured under pipe excavation.

PSLE 8.2.17 A4 BidimUnit: m²

PSLE 8.2.18 Crushed stone in subsurface drainsUnit: m³

PSLE 8.2.19 Construct Subsoil Drainage Manhole complete, as per Engineer's dr...awingUnit: No

PSLE 8.2.20 Break into existing Stormwater Manhole and make goodUnit: No

PSM ROADS (GENERAL) (SANS 1200 M)

PSM 6 TOLERANCES

Add the following new clause:

PSM.6.4 Level Control of Road Layers

“The contractor shall submit at the time of requesting acceptance of a road layer a record of the surface levels of that section, taken at intervals to coincide with the level pegs. A sample form is obtainable from the Employer’s Agent.”

PSM 7 TESTING

PSM 7.1 General

Add: “The random sampling method of TMH 5, for the spotting of positions, for field density testing will not necessarily be applied by the Employer’s Agent’s Representative. Density testing shall be carried out where, in his opinion, the density of the compacted layer is suspect. The Contractor shall present the full width of the layer, between the stated linear stake values, for acceptance. Only in exceptional cases will partial widths of layer be accepted for testing.”

PSM 7.3 Routine Inspection and Testing

Add to Clause 7.3.2: “The request for acceptance of a layer shall be submitted in writing, specifying the exact location of the section and type of layer. On receipt of all these details the Employer’s Agent’s Representative will arrange for the necessary inspections and tests to satisfy himself that the road layer complies. Testing will be carried out as expeditiously as possible, and the results will be available within 48 hours of receipt of test request. The Contractor shall backfill the test holes left in the layer with a similar material to that of the layer tested and compact the material to a similar density. Concrete shall not be used.”

PSM 8 MEASUREMENT AND PAYMENT

PSM 8.2 Inspection and Testing of a Road Layer

Add the following new clause:

Should the layer submitted for acceptance control testing fail to comply with the specification, the Contractor shall, in the case where the tests arranged for by the Employer’s Agent were carried out by a designated laboratory (refer PSA 7.2), bear the invoiced cost of the tests. Conversely if the layer is found to comply with the specification, the cost of the acceptance control tests will be borne by the Employer. The cost of refilling and compacting the test holes shall be covered by the rate tendered for the construction of that layer.

PSME SUBBASE (SANS 1200 ME)

PSME 3 MATERIALS

PSME 3.2.1 Subbase Material

With reference to Clause d(ii) and d(iii), the regional factor for the O. R. Tambo District shall be taken as 0,6.

PSME 5 CONSTRUCTION

PSME 5.4.1 Placing

The subbase layer shall be 150mm thick unless shown otherwise on the drawings.

PSME 5.7 TRANSPORT

Replace the contents of this subclause with the following:

"All movement of material will be considered as free-haul. No haulage cost will be paid."

PSME 6 TOLERANCES

PSME 6.1 Dimensions, Levels, etc.

PSME 6.1.1 General

Add the following to Clause 6.1.1:

"For layers, constructed of subbase quality material, on which the bituminous surface will be placed, the tolerance for dimensions and level shall be as set out in SANS 1200 MF Clauses 6.1.2 to 6.1.6 inclusive.

PSME 8 MEASUREMENT AND PAYMENT

PSME 8.3.1 Construct the subbase course with material excavated in all materials from borrow pits

Replace the content of Clause 8.3.1 with the following"

PSME 8.3.1 Construct the subbase with material supplied by the contractor

150 mm thick G5 material compacted to 95% of modified AASHTO density..... Unit: m³

The rate shall cover the cost of locating the material, excavation, selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances, and testing.

Add the following new Clause:

PSME 8.11 Treatment of subbase or base with:

(i) Weed-killer under brick paving.....Unit: m²

(ii) Insecticide under brick paving.....Unit: m²

PSMF BASE SANS 1200 MF)

PSMF 3 MATERIALS

PSMF 3.3.2 Graded Crushed Stone

Add the following to Clause 3.3.2 after the words "SANS 1083": "for 37,5mm stone".

PSMF 5 CONSTRUCTION

PSMF 5.4.4.2 Compaction

Delete 98% and replace with 100%.

PSMF 5.9 TRANSPORT

Replace the contents of this subclause with the following:

"All movement of material will be considered as free-haul. No haulage cost will be paid."

PSMF 6 TOLERANCES

PSMF 6.1.2 Grade

Delete the contents of Clauses (a) and (b) and replace by "The height of the edge of the channel above the top of the completed base is not less than the minimum thickness of asphalt surfacing, i.e. 5mm less than the specified thickness." (See SANS 1200 MH 6.3.4)

PSMF 6.1.5 Cross-section

Delete "25mm" from Clause 6.1.5 and replace by "15mm".

PSMF 7.3.2 Routine Inspection and Testing

Delete Clause 7.3.2 and replace with the following:

"The Density measured at all test holes shall be a minimum of 100% Mod. AASHTO density for the lot to be acceptable".

PSMF 8 MEASUREMENT AND PAYMENT

PSMF 8.3.1 Construct the base with gravel material from borrow pits

Replace the content of Clause 8.3.1 with the following"

PSMF 8.3.1 Construct the base with material supplied by the contractor

150 mm Thick C3 basecourse compacted to 95% of modified AASHTO density..... Unit: m³

The rate shall cover the cost of locating the material, excavation, selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances, and testing.

PSMJ SEGMENTED PAVING (SANS 1200)

PSMJ 8 MEASUREMENT AND PAYMENT

Add the following:

PSMJ 8.2.2 Construction of paving complete:

- (i) Type S-A blocks, 60mm thick.....Unit: m²

The rate to include a 30mm sand layer.

PSMJ 8.2.3 Cutting units to fit edge restraints

Delete the contents of Clause 8.2.3 and replace with the following:

Cutting of units to fit edge restraints will not be measured separately. The contractor shall allow for cutting of paving units in his rates tendered for the construction of paving.

Add the following new clause:

PSMJ 8.2.6 Application of weed killer similar or equal to HYVAR X at a rate of 4g/m².....Unit: m²

The rate to include compliance in terms of OH&S Construction Regulations when applying the weed killer prior to laying of paving.

PSMK KERBING AND CHANNELLING

PSMK 3 MATERIALS

PSMK 3.2.1 General

Delete the contents of Clause 3.2.1 and replace with the following:

“Refer to the Municipal Standard Detail Drawings for kerb and channel details.”

PSMK 3.8 Curing Compound

Add to Clause 3.8:

“and be a resin based white pigmented type.”

PSMK 3.9 Bedding Material

Delete the contents of Clause 3.9 and replace by the following:

“Either a 1:8 cement sand mix shall be used or if the layer is more than 30mm thick a strength concrete of Grade 20.”

PSMK 5 CONSTRUCTION

PSMK 5.1 Excavation and Bedding

Delete the first paragraph viz. “Trenches for grade.”

PSMK 5.2 Precast Concrete Kerbing and Channelling

Add in second line “10mm to” before “50mm”.

Delete in the last paragraph from “the kerbs shall” to “15 MPa and.”

PSMK 5.2.1 Precast Concrete Kerbing and Cast-in-situ Concrete Channelling

Add the following new clause:

After the precast kerbs have been laid the formwork for the channelling shall be set up. Expansion joints shall be allowed for at approximately 8 metres intervals, i.e. opposite the joint between the kerbs. The principles of Clause 5.4 shall apply to the construction of cast-in-situ channelling.

PSMK 5.8 Machine-Laid Cast-In-Situ (Extruded) Kerbing and Channelling

Before commencing kerb-laying on the site, the first 50m length of kerb and channel to be constructed shall be regarded as trial kerb and channel. The contractor shall demonstrate in the trial length the methods he proposes to use for the construction of the kerb and channel, including joints, texturing, the achievement of a smooth surface and dense fully compacted concrete. It may be constructed either in the recognised position in a road or elsewhere on the site in which case it shall be demolished, broken out and removed at the Contractor’s expense.

The trial kerb and channel shall be constructed with the plant and equipment to be used on the works and the equipment’s motion forwards and the handwork carried out on the extruded section shall be so controlled and used as to produce a kerb and channel to the shape, lines and levels specified.

The time taken to lay the test strip shall be recorded, which in the event of acceptance, shall be used to calculate a rate of extrusion which shall not be exceeded without the permission of the Employer’s Agent.

If the concrete in the trial strip fails to meet the test requirements, the contractor may, at his own cost, cut further cores from the kerb and or channel up to a maximum of one core per 100m length. The strengths obtained on such cores, together with those tested on the instruction of the Employer’s Agent, shall be used to test compliance with the strength requirements.

The contractor may, unless advised of any deficiencies in the trial kerb and channel, proceed with kerbing as soon as acceptable core test results are obtained.

In the event of deficiencies in the trial kerb and channel, the contractor shall, at his own expense, demolish the rejected sections and remove to the designated tip site and repeat the 50m long trial strip. This process shall be continued until the contractor has produced kerb and channel in accordance with this specification. He may then proceed with kerb and channel construction proper. Any unacceptable trial length shall be broken out and removed to spoil, at the contractor’s expense before any subsequent trial length is permitted to commence.

Core test holes shall be filled with 30 MPa concrete mixed with a suitable adhesive compound.

No other means of testing the concrete will be considered and any kerb or channel not complying with all the requirements of the specification shall be broken out, removed to spoil and replaced at the contractor’s own expense.

The contractor shall ensure that no change of circumstances or conditions is made to jeopardise the quality of the kerb and channel under construction. If, in the opinion of the Employer’s Agent, this does occur, he may order the construction of a further trial length of 50m of kerb and channel in accordance with the requirements of this specification. Work on the kerb and channel proper shall not proceed until a trial strip has been constructed in accordance with the requirements of this specification. No claims for delays will be considered by the Employer’s Agent on account of further trial lengths of kerbing being ordered.

PSMK 5.8.3 Subbase Preparation (Extruded Kerbing)

Delete in the first line from: "500mm beyond" to "as relevant" and replace by "150mm beyond the back face of the kerb."
Note this dimension applies to the compaction width required for the road layer.

PSMK 5.13 Junction with existing Kerb And Channel

Add the following new clause:

The Employer's Agent's Representative shall state in each case the length of existing kerb and channel to be removed. The exposed road layer surface shall be made good before proceeding.

PSMK 6 TOLERANCES

PSMK 6.1 Concrete Kerbing and Channelling

Delete in Clause (b)(1) the allowance of "0, - 10" and replace by " ± 10 " and add to wording "provided the layer thicknesses are not prejudiced."

PSMK 7 TESTING

PSMK 7.2.2.2 Alternative Test

Delete in Clause 7.2.2.2 all references to cubes and cube testing.

Add to second line of Clause 7.2.2.2 after "SANS Method 865" the following: "The numerical value of the compressive strength of the core used for adjudication shall be that value determined in accordance with Clause 6.3 of SANS Method 865."

Delete in fourth line of Clause 7.2.2.2: "22 MPa (i.e. less than 25 - 3 MPa)" and replace by: "20 MPa".

PSMK 8 MEASUREMENT AND PAYMENT

PSMK 8.1.1 Basic Principles

Delete the second sentence of Clause 8.1.1 and replace by: "Deduction from the linear length of the kerbing will be made for transition kerb and channel, catchpit structures and motor-slopes. These items will be measured separately."

PSMK 8.2.3 Variation of Tests on Extruded Kerbing

Add: "If the coring and testing is carried out via the Municipal Road Laboratory the Contractor will be debited with the cost of the test when the measured compressive strength is less than 20 MPa."

PSMK 8.2.6.1 Ancillaries

Add to Clause 8.2.6.1: "The unit of measurement of the 2 metre length of kerb and channel transition between mountable and barrier type kerb and channel and between mountable or barrier type and the precast support kerb at the catchpit shall be per number."

PSMK 8.2.16 Supply & erect formwork for kerbing.....Unit: m²

As indicate on Engineer's drawing notes

PSMK 8.2.17 25/19 Mpa Cast in-situ concrete kerbing.....Unit: m³

As indicate on Engineer's drawing and notes.

C3.8 Particular Specifications

PA SUB-LETTING OF THE WORKS

PA1 SCOPE

This Particular Specification covers the requirements to be met by the Contractor in respect of the sub-letting of Work to local Subcontractors.

PA2 DEFINITIONS

PA2.1 "Local Subcontractor" shall mean an individual person, group of persons in association, or firm (whether formally registered or otherwise) not being associated with the Contractor other than by way of an existing Subcontract Agreement of the nature as contemplated in this Particular Specification:

- (a) who shall have been resident in the area in which the Works are to be executed for a continuous period of not less than six months prior to the Closing Date for Bids; or
- (b) who shall have been economically active and conducting business in the area in which the Works are to be executed, for a continuous period of not less than six months prior to the Closing Date for Bids; or
- (c) whose "domicilium et executandi" shall have been within the area in which the Works are to be executed, for a continuous period of not less than six months prior to the Closing Date for Bids; and
- (d) whose presence on the Site and engagement on the Works is acceptable or tolerable to the local community; and
- (e) who shall be employed by the Contractor to undertake the execution of defined portions of the Works on a Subcontract and/or Task work basis.

PA2.2 The term "the area in which the Works are to be executed" shall for the purposes of this Particular Specification, be deemed to mean anywhere within the O. R. TAMBO District Municipality boundary.

PA2.3 "Sub-letting" shall mean the engagement of individual persons, groups of persons in association or firms or companies for the specific purpose of executing defined portions of the works, or of supplying specific materials or services necessary for the works, and who shall be remunerated for their services at pre-determined rates, which rates shall be directly related to the progress and/or extent of the work executed or service or materials supplied and not to the time expended thereon.

PA2.4 "Local Community" shall mean the community normally resident in the area in which the Works are to be executed.

PA3 MATERIALS

All materials incorporated in the Works undertaken by Subcontractors shall be in accordance with the requirements as set out in the drawings and in the relevant specifications.

PA4 PLANT

The Contractor shall provide all plant, tools and equipment as may be necessary for the execution and completion of the works undertaken by the Subcontractors, in all cases where the provision of such is not provided for in the Subcontract agreement.

PA5 THE SUBCONTRACT AGREEMENT

The Contractor shall be required to enter into a written Subcontract Agreement with each and every Subcontractor employed on the Works.

The Subcontract Agreement shall set out the scope of the works to be executed by the Subcontractor and the amounts which the Contractor will remunerate him for work satisfactorily executed.

The terms and conditions of the Subcontract Agreement between the Contractor and any Subcontractor employed by the Contractor in terms of this Clause shall, (subject to the provisions of the Conditions of Contract as well as this Particular Specification), be at the discretion of the Contractor and the Subcontractor, provided always that such Agreement shall be no more onerous on the Subcontractor than are the terms and provisions of this Contract on the Contractor.

Before entering into any Subcontract Agreement, the Contractor shall be responsible for ensuring that every Subcontractor fully understands his rights and liabilities under the Subcontract.

PA6 COPIES OF SUBCONTRACT AGREEMENT TO BE PROVIDED TO THE ENGINEER

The Contractor shall, on the request of the Engineer, provide the Engineer with full and complete copies of all Subcontract Agreements entered into in terms of this Contract.

PA7 REMUNERATION OF SUBCONTRACTORS

The method and units of measurement adopted by the Contractor for the purposes of remunerating Subcontractors for work satisfactorily executed, shall be appropriate to the nature and scope of the works executed by the Subcontractor and as agreed upon between the Contractor and the Subcontractor and recorded in the Subcontract Agreement.

In relation to the remuneration of Subcontractors the Contractor shall not be obligated in any way to adopt the units and method of measurement specified in this Contract for remuneration of the Contractor by the Employer.

The Contractor shall be fully liable for the payment of all amounts due to the Subcontractors in terms of their respective Subcontract Agreements.

PA8 CONTRACTOR TO INDEMNIFY THE EMPLOYER

In accordance with the provisions of Sub-clause 23(1) of the Conditions of Contract, all Subcontractors employed by the Contractor are deemed to be the agents, servants or workmen of the Contractor.

The Contractor shall indemnify the Employer in respect of all claims and liabilities of whatever nature arising from the acts, defaults and neglects of any Subcontractor, his agents, servants or workmen.

PA9 SERVICES TO BE PROVIDED DIRECTLY BY THE CONTRACTOR

The Contractor shall, in accordance with the provisions of Clause 4.4 of the Conditions of Contract, remain fully liable in all respects, for the execution and completion of all the Works included in the Contract, including inter-alia:

- (a) The timeous completion of the Works as specified in the Contract;
- (b) The identification and employment of the Subcontractors;
- (c) The provision of the Contract performance Surety Bond as required in terms of Clause 10 of the Conditions of Contract;
- (d) The provision of all insurances specified in the Contract;
- (e) The provision and maintenance of the Site Establishment;
- (f) The management and administration of the Contract;

- (g) The provision of all materials, transport, plant and hand-tools as may be necessary for the completion of the Works and which in terms of the Subcontract Agreements entered into, are not to be provided by the Subcontractors;
- (h) The provision of all training, supervision and all assistance of whatever nature arising as may be necessary for the completion of the Works in accordance with the provisions of the Contract;
- (i) The setting out of the Works;
- (j) The provision of all "bridging finance" to the Subcontractors, as may be necessary to ensure the successful conclusion of the Contract.
- (k) Training and developing the local Subcontractors in aspects pertaining to contract and site management, financial management, bidding etc, ensuring successful local entrepreneur development. Such training may be done by the Contractor, Engineer or a third party, but only on the express instruction of the Engineer in writing.

PA10 MEASUREMENT AND PAYMENT

PA10 DEFAULT OF THE CONTRACTOR

The onus shall at all times rest entirely with the Contractor to prove to the Engineer, beyond reasonable doubt that:

- (a) the Works referred to in Sub-clause PS9.5 are being executed or have been executed by "Local Subcontractors" in accordance with the provisions of this Clause; and
- (b) all amounts due and payable to the Subcontractors have been paid, or that reasonable grounds exist for the withholding of payment.

PA11 MEASUREMENT AND PAYMENT

The rates, sums and prices tendered for the various work items listed in the Schedule of Quantities, shall include for full and final compensation to the Contractor as described in the respective measurement and payment clauses set out in the Specifications, including normal training as described in sub-clause PA9(h) but excluding all costs relating to the sub-letting of the works.

PB BUILDING WORK

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PB 01 SCOPE

This is a Particular Specification and covers the various construction activities associated with the erection of buildings which form part of this Contract.

Building work shall be carried out in accordance with the National Building Regulations, SANS 0400, the applicable clauses of the SANS Standardized Specifications and the information contained in this Specification.

Work appurtenant to the erection of buildings such as earthworks, concrete work, structural steelwork, etc shall be carried out as specified in the appropriate Standardized Specifications and will be measured and paid for under those Specifications.

PB 02 BRICKWORK, PLASTER WORK AND FLOOR SCREEDS

PB 02.1 MATERIALS

(a) Bricks

Bricks shall comply with SANS 227 and shall be as follow:

- (i) Masonry clay brick as shown on the drawings;
- (ii) 14 MPa compressive strength for 220 mm brickwall laid in stretcher bond;
- (iii) <7 % water absorption stockbrick (not plastered or painted);
- (iv) Class II masonry mortar of 5.1 MPa compressive strength and 10mm joint thickness.

Satisfactory proof of the load-bearing capacity of the bricks offered shall be submitted before deliveries are made to the Site.

Three samples of each type of brick shall be submitted to the Engineer for approval. All subsequent deliveries shall be of a standard equal to or better than that of the approved samples.

(b) Cement

Cement shall comply with the requirements of SANS 50197-1 and shall be stored under cover. The use of Portland blast-furnace cement (PBFC) which complies with the requirements of SANS 626 will only be allowed if approved by the Engineer.

(c) Aggregate

Fine aggregate shall consist of natural sand, or crushed rock or gravel, and shall be hard, clean and free from adherent coatings or other deleterious matter. Sand for plaster and mortar shall comply with the requirements of SANS 1090, whereas the aggregates for normal and granolithic floor screeds shall comply with the requirements of BS 1199 and BS 1201 respectively.

(d) Water

Water shall be clean and free from clay, silt, oil, acid, alkali, organic or other matter which would impair the required strength and durability of the mortar, plaster or floor screed.

(e) Wall ties

Wall ties shall be of the galvanized, crimped, single-wire type, 3,5 mm in diameter, and shall comply with the requirements of SANS 28.

(f) Damp-proof sheeting

Damp-proof sheeting shall comply with SANS 248, type FV for fibre felt, or SANS 952, type B for embossed polyethylene sheeting.

PB 02.2 **CONSTRUCTION OF BRICKWORK**

(a) Cement mortar

Cement mortar shall, unless otherwise specified, consist of one part Portland cement to four parts sand (1:4) by volume for normal brickwork and one part Portland cement to three parts sand (1:3) by volume for reinforced brickwork. The ingredients for cement mortar shall be measured in proper gauge boxes on a boarded platform and thoroughly mixed. Alternatively, mixing may be by means of an approved mechanical batch mixer. Only when the dry ingredients have been thoroughly mixed and a mixture of uniform colour has been obtained may the water be added in sufficient quantity to obtain mortar with the required consistency.

Cement mortar shall be used within two hours of adding water to the mix and shall not be used after two hours or if it has begun to set. Mortar shall be turned over frequently to prevent it from setting until it is used.

(b) Brickwork

Dimensions of all the brickwork shall be set out and built as shown on the Drawings. Bricks shall be kept wet before laying and the top of brickwork shall be wetted before any further bricks are laid. Bricks shall be well buttered with mortar before being laid and all joints shall be thoroughly flushed up as the work proceeds. All joints to face brickwork shall be neatly made and key-drawn with a 6 mm key.

Brickwork shall be carried up in a uniform manner with no portion being raised more than 1 m above an adjacent portion. All perpend, quoins, etc, shall be kept strictly true and square and the whole properly bonded together.

Brickwork shall be built in stretcher bond or english bond as shown on the Drawings, and bats shall not be used except where required for the bond. All joints shall be 10 mm wide and four courses shall measure 340 mm.

Brickwork for cavity walls and solid walls built in stretcher bond shall be tied with wall ties placed not more than one metre apart in every third course, and shall be staggered vertically. At openings, the ties shall be positioned not more than 300 mm apart along the periphery of the opening and 150 mm from the opening.

Face brickwork shall be kept perfectly clean and rubbing down of the brickwork shall not be allowed. Scaffold boards shall be turned back during heavy rain to avoid splashing. Soiled brickwork shall be cleaned at the Contractor's expense, and the cleaning method shall be approved by the Engineer.

(c) Reinforced brickwork

Brickwork over door and window openings shall be reinforced with steel rods, welded or expanded mesh, etc. Reinforcement shall be placed in each course of brickwork for a minimum of four (4) courses or as shown on the Drawings. Reinforced brickwork shall continue at least 300 mm on each side of the openings.

Brick lintels shall be built upon rigid temporary supports left in position for not less than seven (7) days after brick-laying. Prestressed concrete lintels may be used where approved by the Engineer.

(d) Key for plaster

Joints of all brickwork receiving plaster shall be raked out, or the brick surfaces shall otherwise be prepared with an acrylic slurry or any other approved bonding agent.

(e) Damp-proofing

A damp-proof course shall be laid over the full width of all the walls at a minimum height of 150 mm above the final ground level or wherever else it may be required, and it shall be lapped for at least 150 mm at angles and joints. A damp-proof course shall also be laid and stepped up under all external sills.

(f) General

Rough and fair cutting shall be performed as required, and the brickwork shall be fitted around any steel work. Face brickwork shall be carefully cut and fitted to suit fittings.

Chases shall be left or formed for edges of concrete floors, staircases, etc. Chases shall also be provided wherever they may be required for pipes, conduits, switch boxes, distribution boards, and the like. Joints shall be raked out for flashings.

PB 02.3 **PLASTER WORK**

(a) Plaster coats

A plastered finish shall consist of a single coat, comprising one application of a 1:6 cement sand mixture with a wood or steel-float finish.

(b) Thickness

The total thickness of the plaster finish shall be 13 mm minimum and 20 mm maximum.

(c) Workmanship

All plaster work shall be finished smooth and ready to receive paint. Plaster shall be flush with the faces of all switch and plug boxes, the interiors of which shall be kept free from plaster. Plastered surfaces shall be plumb and jambs and reveals shall be formed square.

The plasterer shall cut out and make good all cracks, blisters and other defects and leave the plaster work, on completion, in a state which is acceptable to the Engineer.

PB 02.4 **FLOOR SCREEDS**

Floor screeds shall have a mix proportion by mass consisting of one (1) part Portland cement and three (3) parts (1:3) fine aggregate. A minimum amount of water is to be used, but it shall be sufficient to allow adequate compaction.

Screeds shall be laid on clean hardened bases in panels not exceeding 14 m² and shall be steel-trowelled to a true and smooth finish. In monolithic construction, the panels shall not exceed 30 m². Joints in screeds shall coincide as nearly as possible with joints in the bases. The thickness of screeds shall be as shown on the drawings or as directed by the Engineer.

The entire screed surface shall be free from loose or raised particles of aggregate, trowel marks or any irregularities, humps or depressions exceeding 5 mm when measured from a 3 m long straight edge.

Screeds shall be cured for three (3) to seven (7) days as may be directed by the Engineer, and shall be protected from damage.

No moisture-sensitive floor finish shall be laid on screeds unless a reliable moisture test shows that the screed is sufficiently dry to receive the covering.

PB 03 **DOORS AND WINDOWS**

PB 03.1 **MATERIALS**

(a) General

All steel and iron work shall be delivered clean and free from rust, pitting or other defects. Shop primings shall be applied before delivery and shall consist of a coat of red oxide paint, or any other approved anti-rust paint on all surfaces.

Unless otherwise specified, all materials shall conform at least to the appropriate SANS or BS standards where such standards apply to ironmongery, or steel, cast iron and any other related materials.

(b) Pressed-steel door frames

Pressed-steel door frames shall comply with SANS 1129 and shall be manufactured from 1,6 mm thick mild-steel sheeting, pressed to the required shapes, properly mitred, welded and reinforced, with all welding neatly cleaned off.

Frames shall be of the widths required to suit the thickness of the walls into which they are built and shall be fitted with suitable tie bars and braces at the bottom. Three lugs to be built into the brickwork shall be provided on each jamb.

Rebates in frames and transoms for doors shall be of the widths required to suit the thicknesses of the doors and shall be fitted with a pair of approved steel butt hinges set flush into recesses in the frames. 4,5 mm thick reinforcing plates shall be welded to the backs of the frames at hinge positions.

Heads of frames over double doors shall be drilled where required to form keeps for bolts and shall be fitted with one rubber buffer for each leaf of the door.

Frames for single doors shall be fitted with approved chromium striking plates and an adjustable striking-plate keeper boxed in at the back of the frame by a welded-on sheet-metal box. The frames shall be fitted with a minimum of two rubber buffers.

Frames shall be protected against twisting and damage during transit and erection.

(c) Pressed-steel doors

Pressed-steel doors shall be manufactured from 1,6 mm thick steel plate. The doors shall be of standard design, pressed to shape with 40 mm reveals all round. The doors shall be strengthened with full-length vertical V-shaped or other approved sectional strengthening ribs projecting to the outer face. Two horizontal stiffening rails shall also be welded to the inner face of the doors.

A door shall be hung on a pair of 100 mm long steel butt hinges with loose pins. The leaves of the hinges shall be welded to both the door and the door frame, and a 1,6 mm thick steel plate shall be welded to the inner face of the door to protect the lock.

One leaf of double doors shall be fitted at the top and bottom with approved 150 mm cast brass barrel bolts in an approved manner and the other leaf shall be fitted with a lock, the striking plate of which shall be fixed to the first leaf.

Where indicated on the drawings, doors shall be fitted with louvred ventilation grills of approved design, backed with insect and vermin-proof gauze screening.

(d) Steel window frames

All steel window frames shall comply with SANS 727 and shall be of the types and sizes shown on the Drawings.

Standard industrial types of steel window frame shall be constructed from rolled mild-steel industrial sections, 35 mm wide by 3 mm thick, with opening sections constructed from standard residential sections, 25 mm wide by 3 mm thick, welded at angles and properly jointed at intersections.

Window frames shall be formed perfectly flat, truly square and properly jointed at all angles, and the opening portion shall fit properly on all faces and shall open and close freely.

Glazing bars shall be continuous with jointed intersections, the ends being neatly tenoned into the frame and securely welded in position.

Frames shall be fitted with standard fixing lugs.

Opening sections shall open as indicated on the drawings, and shall be fitted with steel hinges with brass pins. Pivots shall be fitted with bronze ring centres.

Side hung or top hung opening sections shall be fitted with brass handles and friction stays. Bottom hung sections shall be fitted with friction pivots and spring catches.

Weather bar drips shall be attached to the fixed frames for the complete width of the window at the head of outward opening sections.

Composite windows shall preferably be delivered to the Site fully assembled, complete with mullions and transoms.

(e) Door-locks and handles

All door-locks shall comply with the requirements of SANS 4 and shall be of approved manufacture and pattern. All locks shall be supplied with two keys. Keys shall be distinctly numbered with consecutive numbers and each key shall be stamped with the same number as that of the lock which it controls. No two locks in any one building may have the same key.

External doors shall be fitted with four-lever heavy-duty mortice locks, which shall be master-keyed.

All locks shall be properly installed and, after completion, striker plates shall be adjusted and the locks serviced.

Door-handles shall be of cast zinc of approved manufacture and pattern.

(f) Miscellaneous fittings

All retaining devices for doors and windows as well as fittings such as coat hooks, retaining hooks, etc shall be of solid brass. All fittings shall be secured by screws or set screws of the same material and finish as the fitting.

Fittings to be fixed to plastered walls, masonry or floors shall be fixed direct by means of patent plastic or fibre plugs fitted into drilled holes.

Door stops shall be provided at every door and shall be 40 mm diameter rubber stops.

PB 03.2 **INSTALLATION OF DOORS AND WINDOWS**

All built-in door and window frames shall be set straight, plumb and level, and shall operate to the satisfaction of the Engineer after fixing has been completed.

Fittings shall be either removed, or wrapped and protected from damage, until all rough trades have been completed.

PB 04 **GLAZING**

PB 04.1 **MATERIALS**

(a) Glass

Glass shall comply with the requirements of CKS 55. The quality of all window glass shall be such that surface deterioration will not develop after glazing.

All glass shall be free from bubbles, waviness, scratches, stains or other imperfections.

Unless otherwise specified, sheet glass for glazing shall be flat-drawn clear glass of ordinary glazing quality and of the thicknesses indicated below:

For panes not exceeding 0,75 m² in area 3 mm

For panes exceeding 0,75 m² but not exceeding 1,5 m² in area..... 4 mm

(b) Putty

All putty shall comply with the requirements of SANS 680.

Putty shall not be too hard or soft or caked when used, and shall dry evenly without crazing or cracking.

Defective putty shall be cut out and replaced by the Contractor at his own expense, and any broken glass shall also be so replaced and putty so repainted.

PB 04.2 **GLAZING**

Glass shall be cut in panes to suit all glazed openings with sufficient clearance all round to prevent cracking by expansion, contraction or vibration.

In all cases the glass shall be well bedded and back-puttied and installed as specified in SANS Code of Practice 0137.

All putty shall be carefully trimmed, cleaned off and neatly finished off straight with smooth surfaces and sharp mitres. A paint primer shall be applied as soon as the putty has dried out sufficiently to prevent shrinkage cracks from forming.

The entire glazing operation shall be cleaned before the premises are handed over for occupation.

PB 05 **CARPENTRY AND JOINERY**

PB 05.1 **GENERAL**

(a) Materials

All timber used for structural purposes shall be of merchantable grade and shall comply with the requirements of SANS 563 and SANS 1245. Structural timber shall be carefully selected and of the best quality, free from large or dead knots, shakes, waney edges or other defects. Purlins and branding shall comply with the requirements of SANS 653. Finger-jointed structural timber shall comply with the requirements of SANS 096 and laminated timber with the requirements of SANS 1089.

Hardwoods and softwoods for joinery shall comply with SANS 1099 and SANS 1359 respectively and suitable species shall be used for the various purposes.

Unless otherwise specified, all materials shall conform to the appropriate SANS or BS Specification where such standards exist for nails, screws, bolts, adhesives, etc.

(b) Preservative treatment

All structural timber shall be given a preservative treatment suitable for the duty for which the timber is intended in accordance with SANS 05, and no untreated timber shall be used. The preservative treatment shall not impair the final finish. The timber shall be impregnated throughout. When surface coating is specified, the compounds applied on the surfaces of the timber shall form an unbroken film.

(c) Priming

The jointing surfaces of all joints exposed to the weather and built-in portions of frames shall be thickly primed except where adhesives are specified.

Carpentry and joinery items which are prepared for painting by the manufacturer, shall be knotted and primed before being dispatched to the Site.

Primed surfaces shall be touched up where necessary during the progress of the work or where site adjustments have been made.

PB 05.2 **CARPENTRY WORK**

(a) Scope of work

Carpentry work shall be carried out in a manner consistent with good workmanship and in compliance with the Drawings.

The carpenter shall perform all cutting away and making good in attendance upon all other trades and he shall provide and maintain temporary coverings required for the protection of any finished work that might be damaged if left unprotected during the progress of the work.

(b) Dimensions

Unwrought timber shall be as sawn and shall be to the dimensions and within the tolerances specified in the relevant SANS Standard Specifications mentioned in subclause PB 05.1(a).

(c) Jointing

Unless otherwise specified, all joints shall be secured by means of a suitable type and a sufficient number of approved connectors. All joints shall be carefully made in such a way that they will not impair the strength and stiffness of the beams or members.

(d) Timber roof construction

The plates, joists, rafters, purlins, bracing and other pieces used for the construction of the roof and trusses shall be of the dimensions, spacing and construction as shown on the Drawings.

Roof trusses shall be a design and supply item. Trusses and rafters shall be Grade 6 and joists and bracing Grade 4.

All the joints in the framework shall be of the most appropriate type, accurately formed and adequately secured with fasteners as specified.

PB 05.3 **JOINERY WORK**

(a) Scope of work

Joinery work shall consist of the manufacture, delivery to the Site, and fixing in the buildings, of all joinery shown on the Drawings.

Except where a special finish is specified, the Contractor shall have all stairs, landings, doors, shelves and other joinery work cleaned and scrubbed down and shall leave all his work in a good order to the satisfaction of the Engineer.

(b) Dimensions

All wrought timber shall be sawn, planed, drilled or otherwise machined or worked to the correct sizes and shapes shown on the Drawings.

Reasonable tolerances shall be provided at all connections between joinery works and the building structure to compensate adequately for any irregularities, settlements or any other movements.

(c) Manufacture

The joiner shall perform all the necessary mortising, tenoning, grooving, matching, tonguing, housing, rebating and all the other works necessary for correct jointing. He shall also provide all metal plates, screws, nails and other fixings that may be necessary for doing the specified joinery work properly.

(d) Joints

Where joints are not specifically indicated, they shall be the recognised forms of joints for each position. The joints shall be so made as to comply with Part 2 of BS 1186.

(e) Doors and frames

Door frames, linings, panel doors, framed, ledged and braced doors, flush doors, sliding doors, etc shall be supplied or made by the joiner and shall be installed, fitted or hung as detailed on the Drawings.

All timber shall be wrought and prepared for oiling, staining, varnishing or painting.

(f) Skirtings, cornices, etc

Skirtings, cornices, etc shall not be installed until after the wall coverings have been applied, the flooring laid and ceilings installed, unless otherwise specified.(g) In-situ joinery

In-situ joinery work shall not be executed until after all floor, wall and ceiling surfaces have been formed or constructed, unless otherwise instructed.

(h) Ceilings

Ceilings shall consist of plaster board or fibre-cement panels as shown on the Drawings and shall be nailed to the brandering or suspended from the roof structure. The panels shall be separated by exposed tees and insulated with a 50 mm thick fibreglass wool blanket where shown on the Drawings.

PB 06 ROOF SHEETING AND ACCESSORIES

Roof sheeting shall be 0.58 mm ISQ 300 galvanized Chromadek Z200 or similar approved with all accessories and shall comply with and will be measured and paid for under SANS 1200 HC.

PB 07 ELECTRICAL WORK

The electrical wiring of buildings shall be carried out by registered and licensed electricians in accordance with the requirements of SANS 0142-1 and the regulations of the Employer.

The electrician shall work in close co-operation with the Contractor to ensure that all conduits, switchboards, plug boxes and switch boxes are installed in their correct position.

The work shall be carried out in accordance with the Drawings and to the satisfaction of the Engineer and the local authority.

PB 08 PLUMBING

PB 08.1 MATERIALS

(a) General

All materials shall be of the best quality and shall be approved by the Engineer before installation. Cracked, chipped, dented or faulty items or materials shall be replaced at the Contractor's expense. Glazed ceramic sanitary ware shall comply with the requirements of SANS 497 and all other materials shall comply with the standards as specified, scheduled or shown on the Drawings.

(b) Water closet (WC) suites

WC suites shall consist of a white glazed vitreous china closet with an S or P trap and seat lugs, a 14 litre low-level matching flat-bottomed flushing cistern placed and fixed on the closet, or a suspended enamelled cast-iron cistern with the flush pipe connected to the flushing rim of the closet with rubber cone joints, and a solid heavy-duty plastic seat with cover, hinges and buffers.

(c) Urinals

Urinals shall be of the type detailed or scheduled, of white glazed vitreous china, wall mounted, with an automatic or a manual flushing system, and chromium-plated fittings.

(d) Wash-hand-basins

Wash-hand-basins shall be of white glazed vitreous china or enamelled cast iron, wall mounted on a pair of cast-iron brackets, and fitted with chromium-plated fittings consisting of two taps, outlet and chain, and supplied with a plug and an anti-siphon trap.

(e) Sinks

Sinks shall comply with the requirements of SANS 242 and shall be complete with cabinet, chromium-plated outlet, anti-siphon trap, plug, chain and two bib taps or one mixer tap, all as detailed or as scheduled.

(f) Pipes and tubing

Cast-iron and steel pipes used in plumbing work shall comply with the requirements of SANS 746 and SANS 62 respectively. Copper tubing shall comply with the requirements of SANS 460 and malleable cast-iron fittings with SANS 509.

PB 08.2 **CONSTRUCTION**

Plumbing shall be carried out strictly in accordance with the Drawings and with the National Building Regulations, with specific reference to Government Notice R1875 dated 31 August 1979.

Steel pipes and their malleable cast-iron fittings shall be joined with red lead and hemp, lead pipes shall have wiped soldered joints, and cast-iron pipes shall be joined by caulking with hemp and metallic lead.

Soil pipes from WCs shall have an internal diameter of at least 100 mm and shall be fitted with a pan connector and an access bend (or an access junction where a vent pipe is used), and carried through walls and into the ground for connection to the sewer. Vent pipes shall be fitted with approved balloon gratings.

Waste pipes from basins and sinks shall have an internal diameter of at least 32 mm and shall discharge into gulleys. Bends for waste pipes shall incorporate cleaning eyes.

Cisterns, basins and sinks shall be connected to the pipe system with 12 mm diameter copper service pipes, and chromium-plated stopcocks shall be installed for isolation and maintenance purposes.

PB 09 **PAINTING**

PB 09.1 **GENERAL**

No paint shall be applied to any surface containing traces of dust, grit, grease, oil, loose rust, millscale or corrosion products of any kind or to any surface that is not free from moisture. Where necessary, surfaces shall be thoroughly washed to remove all traces of soluble salts and/or corrosive air-borne contaminants prior to painting, and the surfaces shall be dried and painted immediately thereafter.

Welding shall be completed in so far as it is possible before painting commences, but in cases where welding can be done only at a later stage, no paint shall be applied to within 75 mm of the proposed weld position unless otherwise specified. Welds and adjacent parent metal shall be abrasive blasted and/or ground and all contaminants such as flux shall be removed prior to painting.

Surfaces of members which are to rest on concrete or other floors or which will be otherwise inaccessible after erection shall receive the full paint system prior to erection.

Damaged paint areas on metal surfaces shall be cleaned, rust spots removed where applicable and the surrounding paint which is still intact shall be feathered for a distance of 20 mm beyond the damaged area. Spot priming and repair shall consist of all the coats previously applied and shall overlap the damaged area.

Damaged galvanised areas shall be cleaned and any rust spots and any flakes of the coating surrounding the damaged area removed. The coating shall then be restored by zinc spraying or soldering, or painting with a zinc-rich paint, as may be approved by the Engineer.

Where the shop coat is allowed to age for a few months before the final painting is done, light sanding or rubbing with steel wool or scrubbing with clean water using a bristle brush shall be carried out.

Steel to be embedded in concrete shall not be painted below 50 mm from the final level of the concrete.

Each priming coat and each undercoat of paint shall be inspected and approved by the Engineer before any subsequent undercoat or finishing coat is applied.

All finishing colours shall be as shown on the Drawings, or as directed by the Engineer.

PB 09.2 **MATERIALS**

Paints shall comply with the requirements of the appropriate Specifications below:

(a) Primers

SANS 678	:	For wood
SANS 679	:	Zinc chromate for steel
SANS 723	:	Etch-wash primer for metals
SANS 912	:	Calcium plumbate for galvanized iron
SANS 926	:	Zinc-rich epoxy for steel

(b) Undercoats

SANS 681	:	For all undercoats
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(c) Finishing coats

SANS 515	:	For interior use, flat and egg-shell finish
SANS 630	:	For interior and exterior use, high-gloss enamel
SANS 631	:	For interior and exterior use, oil gloss paint
SANS 633	:	For interior use, emulsion paint
SANS 634	:	For exterior use, emulsion paint
SANS 684	:	For exterior use on structural steel
SANS 801	:	For interior and exterior use, epoxy-tar paint
SANS 802	:	For interior and exterior use, bituminous aluminium paint
SANS 887	:	For interior use, glossy and egg-shell varnish

The Contractor shall furnish the Engineer with the following information and details regarding the paints and decorative materials for the painting system he proposes to use, for written approval:

- (i) The name of the manufacturer and trade name
- (ii) The brand, type or grade of paint and the appropriate SANS Specification
- (iii) Manufacturer's data sheets, colour references, instructions for use, including surface preparation, sealers, primers, undercoats, finishing coats, coat thicknesses and curing periods, which shall all be considered as being part of these Specifications if approved by the Engineer
- (iv) Safeguards to protect the applied paint from damage until the work is accepted by the Engineer
- (v) The shelf or pot life of materials, if applicable
- (vi) An undertaking that the proposed paint system is suitable for its intended use and that the various coats of paint are compatible with one another

Where proprietary brands are used, the manufacturer's priming and all subsequent coats of paint suitable for that particular brand shall be employed in accordance with the manufacturer's instructions.

No other materials of a similar nature and quality or from another manufacturer may be used instead of those approved, unless written permission to do so has been obtained from the Engineer.

All materials shall be brought onto the Site in containers sealed by the manufacturer. Paints of a different quality, type, brand or colour shall not be mixed, or thinned and shall not be adulterated in any way, but shall be used as supplied by the manufacturer. Any mixing or tinting required shall be carried out by the manufacturer.

Tinting of paint on the Site by the Contractor will only be allowed with the written permission of the manufacturer and the Engineer.

PB 09.3 **INSPECTION AND PRELIMINARY WORK**

Before commencing paintwork, the Contractor shall carefully inspect the surfaces to be painted to satisfy himself that the surfaces are in a satisfactory or acceptable condition to receive the paint system specified.

All metal fittings and fastenings shall be removed where applicable before the preparatory processes are commenced. On completion, the metal fittings and fastenings shall be cleaned and refitted in position.

PB 09.4 WORKMANSHIP AND FINISHES

Paint may be applied by spray, brush or roller depending on the materials used, the surface to be painted, and the manufacturer's instructions.

Every coat of paint, irrespective of the method of application, shall be adequately and permanently keyed or bonded to the base material or previously applied coat, and shall be evenly distributed, continuous, free from sags, runs, brush marks, pin holes or other imperfections, and shall dry to a smooth finish.

An approved water trap and air-regulating valve shall be furnished and installed on all equipment used in spray painting.

Before painting the interiors of buildings they shall be cleaned and the floors shall be washed and kept free from dust during the progress of the interior work.

The Contractor shall protect all nearby surfaces against disfigurement by spatters, splashes and smirches of paint or paint materials. The Contractor shall be responsible for any damage by paint or dirt caused by his operations to vehicles or property or injury to persons and he will be required to provide protective measures to prevent any such damage or injury and make good, where required, at his own expense.

If passing traffic creates dust which may harm or spoil the appearance of external painted surfaces, the Contractor shall sprinkle the adjacent areas with water, at his own cost, for a sufficient distance on each side of the location where painting is being done.

Undercoats shall be tinted by the manufacturer to distinguish between successive coats.

The final coats or finishing coats of paint shall be applied after all the other work in the vicinity has been completed.

The painter shall keep some of the final paint in reserve in the event of his having to make good any patching which may be required as a result of damage or unforeseen circumstances.

Upon completion, the Contractor shall, in the case of buildings, clean all glass, remove all paint spots from walls, floors and fittings, and leave the premises clean and fit for occupation.

All inflammable materials, comprising solvents, thinners, wiping cloths, etc, shall be placed in tightly closed containers and properly disposed of.

PB 09.5 PAINING OF PLASTER, CONCRETE OR BRICK SURFACES

(a) Surface preparation

Surfaces for painting shall be prepared by sandpapering, scraping or wire-brushing to remove loose material, dust, laitance, scum or other deleterious materials or high spots. Defective areas shall be cut out where necessary and made good with an approved non-shrink filler. Cracks shall be cut out, suitably keyed, and given a coat of an approved bonding agent before the filler is applied. All patches shall be rubbed down to an even surface. Surfaces shall be washed and allowed to dry.

Surfaces shall be treated with neutralising liquid for walls, and if the surface is coarse or textured, either one full coat of pigmented wall sealer or one full filler coat shall be applied in addition to the neutralising liquid.

(b) Paint application

Prior to the emulsion paint being applied, the surface shall be sealed with an approved clear sealer and primed with an undercoat diluted to 50%. Emulsion paint (PVA or acrylic) shall then be applied in two finishing coats.

Egg-shell finish (alkyd oil-based), oil gloss paint or enamel gloss paint shall be applied as follows: one coat of universal undercoat shall be applied and it shall be followed by one coat of a mixture comprising 50% of the undercoat and 50% of the paint to be used for the finishing coat. A finishing coat of semi-gloss egg-shell, or oil gloss paint or enamel gloss paint shall then be applied.

PB 09.6 PAINTING OF WOODWORK

(a) Surface preparation

The surfaces shall be cleaned, sandpapered and rubbed down to a smooth, even face before painting. The moisture content of the timber shall not be more than 20% at the time when the first coat is applied. All cracks, shakes or scars shall be filled flush with a filler approved by the Engineer before painting. The surface shall then be washed with cleaner and allowed to dry.

(b) Primer application

One coat of an approved wood primer shall be applied.

After open-grained timber has been prepared and primed, the grain shall be stopped and filled with synthetic filler and rubbed down with water paper.

All new woodwork shall be properly primed on all surfaces and edges before being fixed in position. All woodwork not previously painted shall be given a prime coat, well brushed in.

(c) Paint application

One coat of universal undercoat shall be applied followed by one coat of a mixture of 50% of the undercoat and 50% of the paint to be used for the finishing coat. A finishing coat of oil gloss paint or enamel gloss paint or semi-gloss egg-shell (alkyd oil-based) paint shall then be applied.

(d) Varnish finish

Two coats of gloss varnish or egg-shell varnish shall be prepared, stopped and applied.

PB 09.7 PAINTING OF METAL SURFACES

(a) General

Wherever possible, all painting shall be done at the manufacturer's works, but where this is not feasible, the Engineer may permit the application of the undercoat and finishing coats to be carried out on the Site, in which case a prime coat shall be applied at the manufacturer's works prior to the members being despatched to the Works.

(b) Surface preparation

The preparation of metal surfaces shall comply with SANS Code of Practice 064 and shall receive the greatest care to ensure rust-free conditions prior to the paint system being applied.

All surfaces shall be prepared by removing loose paint, rust, plaster, scale, dust, dirt, grease, etc and by repairing or patching defective paint surfaces before painting or repainting. Damaged shop-primed surfaces shall be thoroughly cleaned of rust and patched with a prime coat.

(c) Paint application

(i) Iron and steel work

All iron and steel work shall be properly primed with a red-lead-based primer where steel work is likely to be exposed to the elements for longer than 30 days. Zinc-chromate primer may be used where overpainting will be completed within 30 days of priming. Metal-etch wash primers may be used under dry conditions where overpainting will be completed within 24 hours of priming. The dry-film thickness of the prime coat shall not be less than 0,300 mm.

After priming, one coat of universal undercoat shall be applied. If necessary, the undercoat shall be tinted to a shade just lighter than the desired finish with approved liquid stainers. The dry-film thickness shall not be less than 0,250 mm.

The two finishing coats shall either be of alkyd resin-based synthetic enamel, gloss or matt oil paint, or as specified elsewhere. The dry-film thickness shall not be less than 0,250 mm per coat.

When mating surfaces are brought together, both surfaces shall have been given the full treatment specified, but where this cannot be done, each surface shall be given a copious coating of primer and the surfaces drawn together while the paint is still wet.

The portion of structural steel members to be buried in soil, and all bases to a height of 500 mm shall be given two coats of an epoxy-tar primer instead of the zinc-chromate primer specified for other surfaces.

The surfaces of steel and cast-iron articles, such as floor gratings, grids and manhole covers, shall, after a thorough brushing to remove loose rust, be painted with two coats of epoxy-tar paint, each at least 0,230 mm thick.

(ii) Galvanized iron and steel

All traces of protective coating shall be removed with galvanized iron cleaner, and two coats of calcium plumbate primer shall be applied. One coat of tinted universal undercoat and two finishing coats of alkyd resin-based synthetic enamel gloss paint shall be applied.

(iii) Non-ferrous metals

Surfaces of aluminium, copper, etc shall be prepared and cleaned, and one coat of self-etch zinc-chromate wash primer shall be applied. One coat of universal tinted undercoat and two finishing coats of enamel gloss paint shall then be applied. Where non-ferrous metals are not to be painted, the surfaces shall be cleaned, polished and two coats of lacquer applied.

PB 09.8 PAINING OF FLOOR SCREEDS

Where chemicals could cause damage to floors, such floors shall be painted with an approved epoxy paint. The type of paint to be used will be shown on the Drawings and will depend on the types of chemical that are used.

The preparation of such floor screeds for painting and the subsequent application of paints shall be carried out strictly in accordance with the manufacturer's instructions.

PB 09.9 PAINT THICKNESS

Unless otherwise specified, all coats of paint, whether prime coat, undercoat or finishing coat, shall have a dry-film thickness of not less than 0,200 mm, irrespective of the method of application.

PB 09.10 INSPECTION

The Contractor shall provide the necessary equipment to establish whether the primers, undercoats and finishing coats have been applied to the correct thickness according to the correct applications. The Engineer may take samples of the paints during painting operations for testing and quality control.

PB 10 MEASUREMENT AND PAYMENT

PB.01 Brickwork:

- (a) (Thickness, type and class indicated)Unit: m²
- (b) Etc for other thicknesses, types and classes

The unit of measurement shall be the square metre of each type of brickwork built, calculated from the leading dimensions of the brickwork. Areas of pipes, etc built into brickwork shall not be included in the areas measured. At corners and intersections common to more than one brick wall, the areas shall be measured only once.

The tendered rates shall include full compensation for the construction of the brickwork complete as specified, including pointing, the building-in of conduits, beams, lintels, pipe sleeves, doors, windows, the raking-out of joints, damp-proof course, brickforce reinforced as specified, etc.

PB.02 Plaster work:

- (a) (Thickness of plaster and finish indicated).....Unit: m²
- (b) Etc for other thicknesses and finishes

The unit of measurement shall be the square metre of each type of coat completed as specified.

The tendered rates shall include full compensation for the construction of the plaster work, including supplying all materials, mixing, applying, finishing, forming reveals, joints, narrow widths, rounded angles, V-joints, etc complete as specified.

PB.03 **Floor screeds:**

- (a) (Description and thickness indicated)Unit: m²
- (b) Etc for other thicknesses

The unit of measurement shall be the square metre of floor screed laid, as specified, on floors, steps or areas shown on the Drawings or as designated by the Engineer.

The tendered rates shall include full compensation for constructing the floor screeds, including supplying all materials, mixing, laying, finishing, and forming nosings, reedings, skirtings, etc.

PB.04 **Doors and windows:**

- (a) (Type and size indicated)Unit: number
- (b) Etc for other types and sizes

The unit of measurement shall be the number of doors and windows installed complete as specified.

The tendered rates shall include full compensation for manufacturing and installing steel doors, windows, and frames complete with hinges, handles, locks, barrel bolts, retaining devices, door stops, stays and any other work necessary to complete the work as specified or as shown on the Drawings. The tendered rate for windows shall also include full compensation for glazing, window sills as specified, and damp-proof sheeting.

PB.05 **Structural timber:**

- (a) Plates (sizes indicated).....Unit: m
- (b) Beams (sizes indicated).....Unit: m
- (c) Joists (sizes indicated).....Unit: m
- (d) Rafters (sizes indicated)Unit: m
- (e) Purlins (sizes indicated)Unit: m
- (f) Roof trusses complete (drawing number indicated)...../Unit: number

The unit of measurement shall be the metre of individual types of timber element or the number of complete trusses installed.

The tendered rates shall include full compensation for supplying all materials and manufacturing, cutting, wasting, jointing and installing the timber as shown on the Drawings.

PB.06 **Ceilings:**

- (a) Plaster-board ceiling (type and thickness indicated):
 - (i) Fixed ceiling.....Unit: m²
 - (ii) Suspended ceiling.....Unit: m²
- (b) Fibre-cement ceiling (thickness indicated):
 - (i) Fixed ceiling.....Unit: m²
 - (ii) Suspended ceiling.....Unit: m²

The unit of measurement shall be the square metre of fixed or suspended ceiling installed complete as scheduled.

The tendered rates shall also include full compensation for the construction of the ceilings, including the exposed tees, insulation blanket and bracing as specified, as well as the suspension system where applicable.

PB.07 **Joinery:**

- (a) Items measured by number:
 - (i) Doors (type and size indicated)Unit: number

(ii) Etc for other items measured by number

(b) Items measured by length:

(i) Skirtings (type and size indicated).....Unit: m

(ii) Etc for other items measured by length

The units of measurement shall be the metre of each type and/or size of joinery item specified.

The tendered rates shall include full compensation for supplying all materials, and manufacturing, cutting, wasting, fixing and installing the joinery items.

PB.08 Miscellaneous work:

(c) Paintwork.....Unit: sum, m² or m

(d)

(b) Plumbing.....Unit: sum, m², m or number

(c) Tiling Unit: sum, m² or m

The tendered sums shall include full compensation for the supply of all materials, for transport, storage, all equipment and labour, all temporary work and safety precautions, replacement of defective work, protection of completed work and clean-up after completion.

PB.09 Miscellaneous items:

(a) Stormwater drainage around buildings

(i) Construct rainwater inlet at building complete as per detail drawing including cast iron grid inlet cover and frame).....Unit: number (No)

(ii) Lay 300mm wide x 50mm deep 35 MPa precast concrete rainwater channel on 50mm concrete screed around buildings as indicated on detail drawings:Unit: metre (m)

(iii) Lay 100mm steel reinforced (mesh ref 314) 25/19 Mpa cast in-situ concrete apron 1,5m wide around building as indicated on drawings. Concrete panels 2,5m long cast alternately with wood floated and broom finish.....Unit: m²

(iv) 19mm softboard expansion joints with sealant (refer to detail drawing) at 9m intervals to precast concrete rainwater channel concrete apron.....Unit: metre (m)

The tendered rates for item (a) (i) to (iv) shall include full compensation for all labour, plant, equipment, transport, etc, manufacturing or providing and installing each item complete as scheduled and shown on the Drawings, and shall include all corrosion protection where applicable.

PB.10 MEASUREMENT AND PAYMENT

PB.08 Miscellaneous Work:

PB.08.02 Plumbing:

(b) Rainwater goods, galvanized Chromadek Z200 sheet steel to match roofing finish:

(i) 200mm x 200mm deep gutter complete with purpose made brackets.....Unit: m

(ii) Extra over gutter for stopped ends.....Unit: No

(iii) Extra over gutter for 160mm diameter outlet with grating in top.....Unit: No

(iv) 160mm Diameter rainwater pipe complete with purpose made brackets.....Unit: m

(v) Extra over rainwater pipe for shoe.....Unit: No

PB.10 Miscellaneous items:

- (a) Items measured by number:
 - (i) (Description of item) Unit: number
 - (ii) Etc
- (b) Items measured by length:
 - (i) (Description of item) Unit: metre (m)
 - (ii) Etc
- (c) Items measured by area:
 - (i) (Description of item) Unit: square metre (m²)
 - (ii) Etc

The unit of measurement shall be the number, linear metre and square metre as applicable to each item.

The tendered rates shall include full compensation for all labour, plant, equipment, transport, etc, manufacturing or providing and installing each item complete as scheduled and shown on the Drawings, and shall include all corrosion protection where applicable.

PC: FENCING

MATERIALS

All fencing materials shall be SABS approved, galvanised, and obtained from SABS accredited suppliers. Contractor to provide proof of manufactures accreditation.

PC 01 Welded mesh panel fencing and security posts.

Welded mesh fencing panels:

Medium security invisible type cut resistant strengthened welded mesh panel fencing system comprising 2,4m high approximately 3m wide panels in minimum 3mm dia vertical and horizontal wires with approximately 76,2 x 25mm aperture size and four anti-climb V- or similar shaped panel horizontal bends.

Spike rails with ribbed/flared spikes shall be securely fixed along top of fencing.

Fence posts:

Standard security type posts complete with post caps, brackets, clips, nuts, bolts etc. Posts shall be minimum 3m long and spaced at 3m centres

Fence post bases

400 x 400 x 600mm deep class 15 MPa reinforced concrete post bases/footings in ground.

Fence gates

Sliding gate 6m wide x 2,4m high to match medium security fencing system with approximately 76,2 x 25mm aperture size welded mesh panels complete with steel framing, bracing, mesh panel covering, posts, rails, guide posts, rollers, guides and guide wheels, locking system, 15 MPa concrete foundation or footing for rails etc, fully galvanized.

Spike rails with ribbed/flared spikes shall be securely fixed along top of gates.

Remote control to fence gate

Remote controlled electrical motor for 6m wide sliding gate complete with back-up battery pack, electrical connection, gear rail, installation, base/foundation etc

INSTALLATION

Fencing shall be installed as per manufactures specifications and instructions.

MEASUREMENT AND PAYMENT

PC.01 Supply and erection of new fencing

PC.01.01 Medium security fencing.....Unit: m

Medium security fencing shall be invisible type cut resistant strengthened welded mesh panel fencing system comprising 2,4m high x approximately 3m wide panels in minimum 3mm dia vertical and horizontal wires with approximately 76,2 x 25mm aperture size and four anti-climb V- or similar shaped panel horizontal bends, standard security type posts minimum 3m long at 3m centres complete with 400 x 400 x 600mm deep class 15 MPa reinforced concrete post bases in ground with all components fully galvanized.

PC.01.02 Extra over for cutting standard width panel to exact width to suit boundary dimensions.....Unit : No

PC.01.03 Extra over 2,4m high medium security fence panels with approximately 76,2 x 25mm size for high security panels with approximately 76,2 x 12,7mm aperture size.....Unit: m

PC.01.04 Extra over medium security fence panels 2,4m high including posts, etc for alu-galvanized coating for extra corrosion protection (measured per meter length of 2,4m high fencing and gates).....Unit: m

PC.01.05 Extra over high security fence panels 2,4m high including posts, etc for alu-galvanized coating for extra corrosion protection (measured per meter length of 2,4m high fencing and gates).....Unit: m

PC.01.06 Additional medium security invisible type cut resistant strengthened welded mesh panel fencing system with approximately 76,2 x 25mm aperture size in irregular shapes/sizes in stream or donga crossings including all cutting, waste, longer posts etc to match fencing and securely fixed in position with all components fully galvanized.....Unit: m²

PC.01.07 Extra over additional medium security fencing with approximately 76,2 x 25mm aperture size in stream and donga crossings for high security fencing with approximately 76,2 x 12,7mm aperture size.....Unit: m²

PC.01.08 Spike rails with ribbed/flared spikes securely fixed along top of fencing and gates, fully galvanized..... Unit: m

PC 02: Supply and erection of new gates:

PC.02.01 Sliding gate 6m wide x 2,4m high to match medium security fencing system with approximately 76,2 x 25mm aperture size welded mesh panels complete with steel framing, bracing, mesh panel covering, posts, rails, guide posts, rollers, guides and guide wheels, locking system, concrete foundation or footing for rails etc, fully galvanized.....Unit: No

PC.02.02 Extra over 6m wide x 2,4m high medium security fence sliding gate with approximately 76,2 x 25mm aperture size welded mesh panels for high security sliding gate with approximately 76,2 x 12,7mm aperture size panels, fully galvanized..... Unit: No

PC.02.03 Remote controlled electrical motor for 6m wide sliding gate complete with back-up battery pack, electrical connection, gear rail, installation, base/foundation etc (to be approved by Electrical Engineer).....Unit: No.

PC.02.04 Extra over 2,4m high medium security fence panels with approximately 76,2 x 25mm aperture size for high security panels with approximately 76,2 x 12,7mm aperture size..... Unit: m

PC.02.05 Extra over medium security fence panels 2,4m high including posts, etc for alu-galvanized coating for extra corrosion protection (measured per meter length of 2,4m high fencing and gates).....Unit: m

PC.02.06 Extra over high security fence panels 2,4m high including posts, etc for alu-galvanized coating for extra corrosion protection (measured per meter length of 2,4m high fencing and gates)..... Unit: m

PC.02.07 Additional medium security invisible type cut resistant strengthened welded mesh panel fencing system with approximately 76,2 x 25mm aperture size in irregular shapes/sizes in stream or donga crossings including all cutting, waste, longer posts etc to match fencing and securely fixed in position with all components fully galvanized..... Unit: m²

PC.02.08 Extra over additional medium security fencing with approximately 76,2 x 25mm aperture size in stream and donga crossings for high security fencing with approximately 76,2 x 12,7mm aperture size..... Unit: m²

PC.02.09 Spike rails with ribbed/flared spikes securely fixed along top of fencing and gates, fully galvanized..... Unit: m

PD NO-FINES CONCRETE CONTENTS

PD 01	SCOPE
PD 02	MATERIALS
PD 03	CLASSES OF NO-FINES CONCRETE
PD 04	BATCHING AND MIXING
PD 05	PLACING
PD 06	PROTECTION
PD 07	MEASUREMENT AND PAYMENT

PD 01 SCOPE

This is a Particular Specification and covers the manufacture and placing of no-fines concrete used in the Works.

PD 02 MATERIALS

Cement, aggregate and water shall comply with the requirements of SABS 1200 G. Each size of aggregate shall be a single size aggregate graded in accordance with SABS 1083.

PD 04 BATCHING AND MIXING

Cement shall be measured by mass or in full pockets of 50 kg each and aggregate shall be measured by volume in approved measuring boxes or barrows.

The aggregate shall be moist or wetted before the cement is added. Where drum mixers are used, about 20% of the water shall be poured into the drum before the aggregate and cement are loaded. The mixing time in the drum shall be about 45 to 50 seconds.

The quantity of water added shall be just sufficient to form a smooth grout which will adhere to and completely coat each and every particle of aggregate, and which is just wet enough to ensure that, at points of contact of aggregate, the grout will run together to form a small fillet to bond the aggregate together. The mix shall contain no more than 20 litres of water for every 50 kg of cement.

Mixing shall be done in an approved batch-type mechanical mixer, but small quantities may be hand-mixed.

PD 05 PLACING

No-fines concrete shall be placed in accordance with the procedure approved by the Engineer. It shall be placed in its final position within 15 minutes of having been mixed.

The concrete shall be worked sufficiently to ensure that it will completely fill the space to be concreted and that adjacent aggregate particles are in contact with one another. Excessive tamping or ramming shall be avoided and under no circumstances shall the concrete be vibrated.

PD 06 PROTECTION

All no-fines concrete shall be protected from the elements and loss of moisture. Protection against loss of moisture shall be accomplished by one or more of the following methods:

- (a) Retaining formwork in place
- (b) Covering exposed surfaces with sacking or other approved material kept continuously wet
- (c) Covering exposed surfaces with plastic sheeting

No-fines concrete placed during cold weather shall be adequately protected against frost for at least 3 days.

PD 07 MEASUREMENT AND PAYMENT

PD.01 Cast-in-situ no-fines concrete (state class).....Unit: m³

The provisions of subclause 8.1.3 of SABS 1200 G shall apply *mutatis mutandis*.

ST PREFABRICATED GALVANISED STEEL WATER RESERVOIR

ST 1 SCOPE

This specification covers the supply and installation of a galvanised steel tank potable water reservoir and all accessories excluding reservoir platform excavations and foundation specified elsewhere in this tender document.

ST 3 MATERIALS

ST 2.1 The reservoir shall be manufactured from standard panels 1220 x 1220 mm with stays, rubber gaskets, sealants, bolts and nuts required to assemble a watertight tank to supplier specifications and shall include the following:

- (i) Cover plates to form a roof over the tank that shall include one lockable access manhole 450mm x450mm with built-in screened vent.
- (ii) One internal ladder one external ladder.
- (iii) One level indicator.
- (iv) Pipe connection points welded to the tank plates in positions as indicated on the drawing.
- (v) Four connection points up to 150 mm.
- (vi) All reservoir steel components shall be hot dipped galvanising in accordance with SANS 121(ISO 1461).
- (vii) Surface preparation shall be manual wire brush.

ST 5 CONSTRUCTION

The reservoir shall be erected the supplier. A provisional sum and the main contractor's handling cost have been included in the Schedule of Quantities for the tender.

ST 7 TESTING AND COMMISSIONING

The contractor shall provide clean potable water free of charge to the supplier for testing purposes. Should water not be available at the time of completion of the reservoir installation, an extra trip to site will be charged by the supplier at the contractor's cost.

ST 8 MEASUREMENT AND PAYMENT

- ST 8.1** Supply and install 1525,312m3 vol prefabricated galvanised steel potable water storage reservoir.....Unit: Provisional Sum
- ST 8.2** Accessories to prefabricated galvanised steel potable water storage reservoir.....Unit: Provisional Sum
- ST 8.3** Overhead charges and profit etc on ST 8.1, ST 8.2 and ST 8.3.....Unit: Percentage (%)

G SUPPLEMENTARY SPECIFICATIONS

GENERAL NOTES

- G1. THESE NOTES ARE COMPLIMENTARY TO THE SPECIFICATIONS AND WILL GOVERN IN CASE OF ANY CONFLICTS.
- G2. ALL CONSTRUCTION SHALL BE DONE IN ACCORDANCE WITH SANS-1200
- G3. THESE STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL, CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT.
- G4. THE CONTRACTOR IS TO CHECK ALL DIMENSIONS PRIOR TO COMMENCING WORK AND ANY ERRORS OR OMISSIONS ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
- G5. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS.
- G6. DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE STRUCTURE IN A STABLE CONDITION AND ENSURING THAT NO PART IS OVERSTRESSED UNDER CONSTRUCTION ACTIVITIES.
- G7. SERVICE HOLES AND CAST-IN ITEMS: THE CONTRACTOR IS TO REFER TO ALL CONSULTANTS AND SUB-CONTRACTOR'S DRAWINGS TO CONFIRM THE SIZE AND POSITION OF ALL HOLES, CHASES AND CAST-IN ITEMS. WHERE THESE DETAILS VARY FROM THOSE SHOWN ON THE STRUCTURAL DRAWINGS, THE ENGINEER'S APPROVAL IN WRITING MUST BE OBTAINED BEFORE CASTING. NO BREAKING OUT OF CONCRETE TO PROVIDE ADDITIONAL HOLES WILL BE PERMITTED.
- G8. THE POSITIONS OF ALL CONSTRUCTION JOINTS WHICH ARE NOT SHOWN ON THE DRAWINGS ARE TO BE DISCUSSED WITH AND APPROVED BY THE ENGINEER.
- G9. ALL PROPS AND FORMWORK FOR BEAMS AND SLABS SHALL BE REMOVED BEFORE CONSTRUCTION OF ANY MASONRY WALLS OR PARTITIONS ON THE FLOOR.
- G10. LEVELS ARE IN METRES RELATED TO MEAN SEA LEVEL (MSL)
- G11. THE CO-ORDINATE SYSTEM USED IN BASED ON WGS 84 LO 29
- G12. THE STRUCTURAL WORK SHOWN ON THESE DRAWINGS HAS BEEN DESIGNED FOR THE FOLLOWING LIVE LOADING:

AREA	LIVE LOAD

LEGEND:

- CJ = CONSTRUCTION JOINT
 FGL = FINISHED GROUND LEVEL
 IL = INVERT LEVEL
 ND = NOMINAL DIAMETER
 NGL = NATURAL GROUND LEVEL
 TOC = TOP OF CONCRETE
 TWL = TYPICAL WATER LEVEL
 UF = UNDERSIDE OF FOOTING
 NTS = NOT TO SCALE
 SFL = STRUCTURAL FLOOR LEVEL
 FFL = FINISHED FLOOR LEVEL

FOUNDATION NOTES

- F1. THE FOUNDING LEVELS GIVEN ON THE DRAWINGS ARE ANTICIPATED LEVELS. FOUNDING LEVELS ARE TO BE CONFIRMED BY THE ENGINEER PRIOR TO POURING CONCRETE.
- F2. PRIOR TO PLACEMENT OF CONCRETE, AREAS OF LOOSE OR SOFT MATERIAL IN THE BOTTOM OF EXCAVATIONS SHALL BE REMOVED OR COMPACTED AS DIRECTED BY THE ENGINEER.
- F3. FILL LAYERS TO BE CONSTRUCTED NOT THICKER THAN 150MM AND TO A COMPACTION OF 95% OF MOD AASHTO DENSITY. CEMENT STABILIZATION TO BE SPECIFIED BY THE STRUCTURAL ENGINEER AS PER DESIGN REQUIREMENTS AND SUITABILITY OF IN-SITU MATERIAL.
- F4. ALL EXCAVATED AREAS TO FORM A LOAD BEARING SURFACE MUST BE COMPACTED TO 93% OF MOD AASHTO DENSITY. CEMENT STABILIZATION TO BE SPECIFIED BY THE STRUCTURAL ENGINEER.
- F5. THE EXCAVATIONS FOR FOUNDATIONS SHALL BE KEPT FREE OF WATER AT ALL TIMES.
- F6. THE ENGINEER IS TO APPROVE ALL EXCAVATIONS BEFORE BLINDING CONCRETE IS LAID.
- F7. BLINDING CONCRETE SHALL BE PLACED BELOW ALL REINFORCED STRIP FOOTINGS, PAD FOUNDATIONS, AND GROUND BEAMS, AND SHALL BE A MINIMUM OF 75MM THICK.
- F8. ALLOWABLE BEARING PRESSURE = 200 KPA

CONCRETE NOTES

- C1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- C2. CONCRETE SHALL BE “STRENGTH GRADE CONCRETE (MPA)” / “MAXIMUM STONE SIZE (MM)” AS SPECIFIED BELOW UNLESS OTHERWISE STATED:
REINFORCED CONCRETE - 40/20
MASS CONCRETE - 15/32
BLINDING CONCRETE - 15/20.
- C3. REINFORCED CONCRETE SHALL HAVE A MINIMUM CEMENT/WATER RATIO OF 1.7 AND A MINIMUM CEMENT CONTENT OF 340 KG/M³.
- C4. THE ENVIRONMENTAL TYPE IS XC4 (SEVERE) AND THE MINIMUM CONCRETE COVER TO ALL REINFORCEMENT, UNLESS SHOWN OTHERWISE, SHALL BE 50 MM.
- C5. CONCRETE DIMENSIONS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES OR THICKNESS OF BLINDING CONCRETE. BEAM DIMENSIONS ARE WRITTEN AS WIDTH X DEPTH, AND DEPTH INCLUDES SLAB THICKNESS.
- C6. ALL CORNERS TO HAVE A 25 MM X 25 MM CHAMFER UNLESS NOTED OTHERWISE.
- C7. NO CONCRETE SHALL BE PLACED PRIOR TO THE APPROVAL OF THE RESIDENT ENGINEER.
- C8. ALL CONCRETE SHALL BE MECHANICALLY COMPACTED THROUGH THE USE OF VIBRATORS.
- C9. EXPANSION AND CONSTRUCTION JOINTS MAY ONLY BE PROVIDED IN LOCATIONS AS SHOWN ON THE DRAWINGS. FOR JOINT DETAILS SEE DRAWING EC0012-SMEC-01-STR-DRG-0002-XXXX.
- C10. CONCRETE SHALL BE CAST CONTINUOUSLY. IF STOPPAGES OF MORE THAN 40 MINUTES ARE UNAVOIDABLE, CONSTRUCTION JOINTS SHALL BE FORMED IN THE POSITIONS AND ACCORDING TO THE DETAILS AS PER THE PROJECT SPECIFICATION.
- C11. OPENINGS IN THE CONCRETE WALLS TO BE GROUTED CLOSED WITH ANTI-CORROSION PRODUCT AS PER PROJECT SPECIFICATION AFTER THE INSTALLATION OF THE PIPEWORK TO FORM WATERTIGHT SEAL.
- C12. THE CONCRETE FINISH SHALL BE OF HIGH QUALITY DEVOID OF ANY PROJECTIONS AND IRREGULARITIES AND SHALL HAVE A SMOOTH FINISH OF UNIFORM TEXTURE, APPEARANCE AND COLOUR
- C12. SURFACE FINISH CLASSES SHALL BE AS FOLLOWS:

FOUNDATIONS AND SURFACES TO RECEIVE BACKFILL	ROUGH (F1)
SIDES AND SOFFITS OF BEAMS AND SLABS	SMOOTH (F3)
EXPOSED COLUMNS AND WALLS	SMOOTH (F3)
UNFORMED SURFACES TO RECEIVE SCREEDS	SCRATCHED
UNFORMED SURFACES WITHOUT APPLIED FINISHES	STEEL FLOATED (U3)
TOP OF WALL/CORBEL SURFACES SUPPORTING MECHANICAL EQUIPMENT	STEEL FLOATED (U3) WITHIN 2 MM OF LEVEL

- C13. HOLES FOR FORMWORK TIES TO ALL VISIBLE FACES OF THE COMPLETED STRUCTURE SHALL BE ARRANGED IN A REGULAR PATTERN AND RECESSED AS AGREED BY THE ENGINEER
- C14. WHERE A FORMED FINISH IS PARTIALLY BURIED, THE FINISH REQUIRED ON THE EXPOSED AREA SHALL CONTINUE TO NOT LESS THAN 300MM BELOW FINISHED GROUND LEVEL.

ON CASCADE AERATOR, PAC CONTACT TANK, COMPACT UNIT, CLEAR WATER RESERVOIR AND PRIMARY FLOW DIVISION ONLY:
- C15. STRUCTURE TO BE TESTED FOR WATERTIGHTNESS AS PER PROJECT SPECIFICATION. RATE OF FILLING NOT TO EXCEED 2M IN 24 HOURS. FOR 0.2MM CRACK WIDTH, STABILIZING PERIOD TO BE 21 DAYS. AFTER ALLOWING FOR EVAPORATION AND RAINFALL, DROPS IN LEVEL NOT TO EXCEED 1/500TH OF AVERAGE DEPTH OF FULL TANK.

STEEL NOTES

S1. MATERIALS, FABRICATION, ERECTION, CORROSION PROTECTION AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATION.

S2. STEELWORK GRADES SHALL BE AS FOLLOWS:

HOT ROLLED AND COLD FORMED OPEN SECTIONS	GRADE S355JR TO EN 10025
HOT FORMED HOLLOW SECTIONS	GRADE 43C TO BS 4360: PART 2
COLD FORMED OPEN SECTIONS	"COMMERCIAL" QUALITY

S3. UNLESS NOTED OTHERWISE HIGH STRENGTH FRICTION GRIP BOLTS, NUTS AND WASHERS (GRADE 8.8) TO SANS 135, SANS 1143 AND SANS 1282 SHALL BE USED. FRICTION TO BE OBTAINED BY TURNING THE NUT. FRICTION GRIP SURFACES TO BE PRE-PAINTED WITH INORGANIC ZINC ONLY.

S4. ALL DIMENSIONS TO BE CHECKED ON SITE PRIOR TO FABRICATION

S5. THE DESIGN DRAWINGS DO NOT NORMALLY SHOW CONNECTION DETAILS. ALL CONNECTIONS ARE TO BE FULLY DETAILED ON THE WORKSHOP DRAWINGS AND SUFFICIENT TIME SHOULD BE ALLOWED FOR THE ENGINEER TO APPROVE SUCH CONNECTION DETAILS. CONNECTION DETAILS TO BE APPROVED BY THE ENGINEER BEFORE THE SHOP DRAWINGS ARE SUBMITTED FOR APPROVAL.

S6. SHOP DRAWINGS AND AN ERECTION METHOD STATEMENT TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO THE FABRICATION OF ANY STEEL WORK,

S7. ON RECEIVING THE DESIGN DRAWINGS, THE CONTRACTOR MUST ARRANGE A MEETING/WORKSHOP WITH THE ENGINEER TO DISCUSS THE DESIGN, ERECTION METHODS AND CONNECTION DETAILS AS WELL AS A QUALITY CONTROL METHOD.

S8. MINIMUM EDGE DISTANCE TO BOLTS TO BE 1.75 TIMES THE BOLT DIAMETER

S9. MINIMUM BOLT SPACING TO BE 2.5 TIMES THE BOLT DIAMETER

S10. ALL BOLT HOLES TO BE DRILLED, NOT PUNCHED.

S11. THE CONTRACTOR SHALL PROVIDE AND LEAVE IN PLACE UNTIL PERMANENT BRACING ELEMENTS ARE CONSTRUCTED, SUCH TEMPORARY BRACING AS IS NECESSARY TO STABILISE THE STRUCTURE DURING ERECTION.

S12. THE ENDS OF ALL TUBULAR AND HOLLOW MEMBERS ARE TO BE SEALED WITH NOMINAL THICKNESS PLATES AND CONTINUOUS FILLET WELD UNLESS SHOWN OTHERWISE.

S13. EXPOSED ENDS OF HOLDING DOWN BOLTS SHALL BE PROTECTED FROM DAMAGE DURING AND AFTER PLACEMENT OF CONCRETE.

S14. UNLESS OTHERWISE INDICATED PURLINS AND GIRTS SHALL BE CONTINUOUS OVER AT LEAST TWO SPANS.

S15. WELDING TO BE PERFORMED BY A CERTIFIED WELDER IN ACCORDANCE WITH SANS 10044-4

S16. ALL WELDS TO BE 6 MM CONTINUOUS FILLET WELDS UNLESS OTHERWISE STATED.

S17. WELDS SHALL NOT BE PAINTED UNTIL THEY HAVE BEEN APPROVED BY THE ENGINEER

S18. ALL STEELWORK DELIVERED TO THE SITE SHALL BE STACKED ON TIMBER SUPPORTS AT LEAST 300 MM FROM GROUND LEVEL. TRUSSES SHALL BE STACKED VERTICALLY.

S19. ALL STEELWORK EDGES TO BE "BROKEN" PRIOR TO APPLICATION OF CORROSION PROTECTION SYSTEM

S20. ALL STEELWORK TO BE HOT DIPPED GALVANIZED AND PAINTED IN ACCORDANCE TO THE BELOW PROJECT SPECIFICATIONS AND TO THE ARCHITECT'S COLOUR. STEELWORK TO BE COMPLETELY DRY BEFORE PAINTING COMMENCES. THE DFT OF THE TOTAL PAINT SYSTEM SHALL NOT BE LESS THAN 425 UM.

- **SURFACE PREPARATION:**
BLAST CLEAN STEELWORK TO SA 2.5 OR SIS 05-59-00 OR ALTERNATIVE TO BE APPROVED BY THE ENGINEER.

- **HOT DIP GALVANIZE:**
- **1ST COAT SHOP:**
1 COAT ZINC PHOSPHATE HB QD EPOXY (2 PACK) BLST PRIMER. MIN DFT: 75 UM
- **2ND COAT SHOP:**
MIO HB QD EPOXY (2 PACK) UNDERCOAT. MIN DFT: 125 UM
- **3RD COAT SHOP:**
MIO HB QD EPOXY (2 PACK) UNDERCOAT. MIN DFT: 125 UM
- **4TH COAT SHOP:**
ACRYLIC POLYURETHANE (2 PACK) SEMI GLOSS FINISH. COLOUR TBC. MIN DFT: 50 UM

STRIPE COAT 2ND COAT ON 1ST COAT BY BRUSH 75 MICRONS MDFT.

- **AESTHETIC TOP COAT ON SITE:**
ACRYLIC POLYURETHANE (2 PACK) SEMI GLOSS FINISH. COLOUR TBC. MIN DFT:
50 UM

ALLOW 24 HOURS BETWEEN COATS FOR DRYING.

- S21. ALL STRUCTURAL STEEL (INCLUDING NUTS, BOLTS AND WASHERS) TO BE HOT DIP GALVANIZED. NO CUTTING, WELDING, DRILLING TO BE ALLOWED AFTER GALVANIZING.
- S22. DAMAGES TO COATINGS DURING TRANSIT, SITE WELDING AND/OR ERECTION MUST BE WIRE BRUSHED TO BARE METAL AND FOLLOWED BY THE APPLICABLE SPECIFICATION.
- S23. NO SITE CUTTING OR WELDING WILL BE ALLOWED UNLESS PRIOR ARRANGEMENT WITH THE ENGINEER.
- S24. ALL WATERPROOFING, DRAINAGE DETAILS AND ROOF SHEETING CONNECTIONS TO BE IN ACCORDANCE WITH THE ARCHITECT AND ROOFING SPECIALIST DETAILS.

MASONRY NOTES

- M1. BRICKS ARE TO BE IMPERIAL FORMAT CLAY UNITS AND SHALL COMPLY WITH THE REQUIREMENTS OF SANS 227. THEY SHALL BE TYPE NFX AND HAVE AN AVERAGE COMPRESSIVE STRENGTH OF 14 MPA AND NO SINGLE UNIT SHALL HAVE A COMPRESSIVE STRENGTH OF LESS THAN 10.5 MPA.
- M2. MORTAR SHALL BE CLASS II (5MPA)
- M3. CLAY BRICKS SHALL BE WELL SATURATED WITH WATER 2 HOURS BEFORE USE, BUT BE FREE OF SURFACE WATER WHEN LAID.
- M4. WATER ABSORPTION OF BRICKS TO BE LESS THAN 7%
- M5. WHERE CONCRETE BEARS ON MASONRY WALLS THE SURFACE OF THE WALLS SHALL BE FINISHED SMOOTH AND LEVEL, WITH ALL DEPRESSIONS FILLED WITH MORTAR. REFER TO THE DRAWINGS FOR DETAILS OF SLIP JOINTS.
- M6. ALL NON-LOAD BEARING WALLS SHALL BE KEPT 20MM CLEAR OF THE UNDERSIDE OF SLABS AND BEAMS, UNLESS SHOWN OTHERWISE.
- M7. CLASS II MORTAR PROPORTIONS SHALL BE AS FOLLOWS:
- | | | |
|------------------|---|-------------------|
| CEMENT | = | 50 KGS |
| LIME | = | 0 TO 40 LITRES |
| LOOSE, DAMP SAND | = | 200 LITRES (MAX.) |
- M8. UNLESS OTHERWISE NOTED, ALL WALL TIES SHALL BE OF THE GALVANIZED BUTTERFLY TYPE. CRIMP WIRE TIES ARE NOT ALLOWED. TIES SHALL BE AT 900 C/C HORIZONTALLY AND 425 C/C VERTICALLY IN A STAGGERED PATTERN.
- M9. PROVIDE GALVANIZED BRICKFORCE IN THE THREE COURSES IMMEDIATELY ABOVE FOUNDATIONS AND LIKEWISE AT EAVES.

ON CHLORINE ROOM ONLY:

- M10. BACKFILL TO SURFACE BEDS SHALL BE A MINIMUM OF 150 MM OF CLEAN SAND COMPACTED TO 100% OF MOD AASHTO
- M11. ALL SURFACE BEDS TO BE CAST ON A 250 MICRON POLYETHYLENE DMP (TO SABS 952). ALL LAPS IN THE MEMBRANE ARE TO BE TAPED WITH A PRESSURE SENSITIVE TAPE OBTAINED FROM THE MANUFACTURER OF THE MEMBRANE.
- M12. A 12 MM EXPANDED POLYETHYLENE SEPARATION JOINT SHALL BE PROVIDED BETWEEN ALL SURFACE BEDS AND THE WALLS.

REINFORCEMENT NOTES

- R1. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY SHOWN IN TRUE PROJECTION.
- R2. THE CONTRACTOR SHALL ENSURE THAT ALL REINFORCEMENT IS PROPERLY HELD IN POSITION AND SHALL ALSO MAINTAIN THE CORRECT CONCRETE COVER UTILIZING APPROVED PATENT SPACERS (NOT STONES, OFFCUT REINFORCEMENT, BRICKS, ETC) AT ALL TIMES.
- R3. THE REINFORCEMENT NOTATION IS AS FOLLOWS:

R	-	TYPE A, PLAIN ROUND BARS (MILD STEEL GRADE 250) TO SABS 920.
Y	-	TYPE C, HOT-ROLLED DEFORMED BARS (HIGH YIELD STEEL GRADE 450) TO SABS 920.
FS	-	HARD DRAWN STEEL WIRE STANDARD REINFORCING FABRIC TO SABS 1024.
FD	-	HARD DRAWN STEEL WIRE DESIGN REINFORCING FABRIC TO SABS 1024.

NUMBER FOLLOWING THE BAR SYMBOL IS THE NOMINAL BAR DIAMETER IN MILLIMETERS:

EW	=	EACH WAY
ABR	=	ALTERNATE BARS REVERSED
EF	=	EACH FACE
ALT	=	ALTERNATE
STG	=	STAGGERED
TOG	=	TOGETHER
T	=	TOP
B	=	BOTTOM
T1	=	HIGHEST OF THE TOP LAYERS
T2	=	SECOND HIGHEST OF THE TOP LAYERS
B1	=	LOWEST OF THE BOTTOM LAYERS
B2	=	SECOND LOWEST OF THE BOTTOM LAYERS
FF	=	FAR FACE
NF	=	NEAR FACE
HOR	=	HORIZONTAL
VERT	=	VERTICAL
NTS	=	NOT TO SCALE
HC	=	HIGH CHAIR
CHC	=	CONTINUOUS HIGH CHAIR

- R4. WELDING OF REINFORCEMENT WILL NOT BE PERMITTED WITHOUT THE APPROVAL OF THE ENGINEER.
- R5. UNLESS OTHERWISE SHOWN BARS SHALL BE LAPPED A MINIMUM OF 45 X BAR DIAMETER.
- R6. REINFORCEMENT BARS, INCLUDING HELICAL REINFORCEMENT AND DOWELS BUT NOT FABRIC REINFORCEMENT, ARE CALLED UP ON THE DRAWINGS IN THE FOLLOWING MANNER:
- NO OFF : BAR TYPE : BAR DIA - BAR MARK - PITCH : POSITION AND /OR COMMENT
- E.G. 7Y20-09-125 B
9R25-37-900 DOWELS
- R7. BENDING AND SCHEDULING OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH SANS 82 AND 0144.
- R8. SPACINGS GIVEN FOR ALL REINFORCEMENT ARE PERPENDICULAR TO BARS, UNLESS OTHERWISE INDICATED.

TIMBER NOTES

- T1. TIMBER TRUSSES TO BE DESIGNED IN ACCORDANCE WITH SABS 0160 AND 0163. CALCULATIONS AND FULL STRUCTURAL DETAILS TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION.
- T2. PERMANENT AND TEMPORARY BRACING TO BE PROVIDED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE TPASA. FULL STRUCTURAL DETAILS TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO ERECTION.
- T3. WHERE THE CONTRACTOR OFFERS A PREFABRICATED ROOFING SYSTEM AS AN ALTERNATIVE TO THE BOLTED SYSTEM SHOWN, FULL CALCULATIONS AND STRUCTURAL DETAILS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
- T4. ALL TIMBER SHALL BE PROTECTED FROM ROT AND ATTACK BY FUNGI AND INSECTS BY HAVING BEEN TREATED IN ACCORDANCE WITH SABS 05.
- T5. TIMBER SHALL BE S.A. PINE TO SABS 563 AND OF THE FOLLOWING STRESS GRADES:
- | | | | |
|----|---------|---|---------|
| A) | TRUSSES | – | GRADE 6 |
| B) | RAFTERS | – | GRADE 6 |
| C) | JOISTS | – | GRADE 4 |
| D) | BRACING | – | GRADE 4 |
- T6. BOLTS SHALL BE GRADE 4, 6 TO SABS 135.
- T7. BOLT HOLES TO BE CLOSE FITTING.
- T8. CUT ENDS OF TIMBER SHALL BE TREATED WITH PRESERVATIVE AS DEFINED IN THE SPECIFICATION.
- T9. THE SIZES OF TIMBER SPECIFIED ARE “NOMINAL”. THE MINIMUM ACTUAL DIMENSIONS SHALL COMPLY WITH THE SPECIFICATION.
- T10. ALL FIXINGS, INCLUDING BOLTS, NUTS, WASHERS, CONNECTORS, BRACKETS, ANGLES, STRAPS, ETC. SHALL BE HOT DIP GALVANIZED TO SABS 763.

Part C4: Site Information

C4.1 Geotechnical Investigations

Geotechnical investigations were conducted at the proposed Ntsonyini WTW site by Delta Geotech. The site information described in their report is as follows:

Description of the site

The proposed site is located approximately 31 km from the R61 between Mthatha and Port St Johns. Access from the R61 is along gravel roads which traverse a number of valleys and mountain ridges. The site is undeveloped and covered by grassland and sparse woody vegetation.

Topographically the site has a general fall to the east towards the Kuzele River and to the north the Mzimvubu River.

Geology and groundwater conditions

General geology:

The general geology of the area comprises sedimentary rocks of the Ecca Group, Karoo sequence. The Ecca comprise dark grey shale with mudstone and sandstone.

Jurassic Age Hypabyssal igneous dolerite is intruded as dykes and sills within the sedimentary rock.

Colluvial and alluvial soils occur to depths of 4.4m metres to 12.2 metres below ground level, where sedimentary siltstone, mudstone and igneous dolerite are intercepted below these depths.

Groundwater:

Perched groundwater was recorded at depths of 4.8 metres to 7.1 metres below ground level. Water levels will fluctuate depending on the season and could possibly be linked to adjacent streams water levels.

Part C5: Tender Drawings

DRAWING NO

DRAWING TITLE

Part C6: Annexures

The following Annexures form part of this contract.

- C6.1 OHS Particular Specification
- C6.2 Baseline Risk Assessment
- C6.3 Construction Environmental Management Plan
- C6.4 Geotechnical Investigation Report
- C6.5 Geotechnical Borrow Pit Assessment Report
- C6.6 Quality Management Specification
- C6.7 HIV Specification
- C6.8 Labour Specification