PART A: Works Specifications

PORTION 1: STANDARDISED SPECIFICATIONS

Standardised Specifications for Civil Engineering Construction

The following SANS Standardised Specifications prepared by the South African Bureau of Standards are applicable:

SANS 1200 A	General
SANS 1200 C	Site Clearance
SANS 1200 DB	Earthworks (Pipe Trenches)
SANS 1200 G	Concrete Works
SANS 1200 L	Medium-Pressure Pipelines
SANS 1200 LB	Bedding (Pipes)
SANS 1200 MJ	Segmented Paving
SANS 1200 MK	Kerbing and Channeling
SANS 1200 MM	Ancillary Roadworks

These standardised specifications are available from the South African Bureau of Standards. The Contractor shall obtain copies of these documents at his own cost.

The following Particular Project Specifications are applicable and are included in this document:

Particular Project Specification PB	Brickwork
Particular Project Specification PLL	Water Harvesting Works

PORTION 2: VARIATIONS AND ADDITIONS TO STANDARDISED SPECIFICATIONS

The term 'Project Specification' must be replaced by the term 'Scope of Work', and the term 'Schedule of Quantities' must be replaced by 'Bills of Quantities' wherever they appear in these standardized specifications

Interpretations of and variations to the standardized specifications listed in Portion 1 are as follows:

PSA **GENERAL**

PSA 2 INTERPRETATIONS

PSA 2.2 APPLICABLE EDITION OF STANDARDS

Add at the beginning of Sub-Clause 2.2: "Unless a specific edition is specified"

PSA 2.3 DEFINITIONS (Sub-Clause 2.3)

Add the following definition at the bottom of the list of definitions under the heading "a) General":

"Commercial source: A source for the supply of materials or services chosen by the Contractor and for which he assumes full responsibility for the quality and supply thereof.

Task: A quantified activity or operation.

Daily rate: The remuneration of a day's work, regardless of output and only applicable when unable to define tasks.

Task rate: The remuneration for a completed task.

Labour-intensive construction: The economically efficient employment of as great a portion of labour as is technically feasible to produce as high a standard of construction as demanded by the specifications and allowed by the funding available; thus the effective substitution of labour for equipment

PSA 2.8 ITEMS IN SCHEDULE OF QUANTITIES (Sub-Clause 2.8)

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 or particular specification or section or project specification ".

PSA 3 MATERIALS

PSA 3.1 QUALITY

Where there is a standardisation mark programme for any material, all such material supplied shall bear the official standardisation mark.

Alternative materials or equipment proposed by the Contractor shall be tested. The test, as well as the materials or equipment, shall be approved by the Employers Agent prior to any such materials or equipment being built into the works, and all costs involved in testing shall be deemed to be included in the rates tendered.

PSA 4 PLANT (CLAUSE 4)

PSA 4.2 CONTRACTOR'S OFFICES, STORES AND SERVICES

The Contractor's site establishment shall also comply with environmental management best practice.

In the ninth line of clause 4.2 after the word "surface", add "and subsurface".

PSA 4.3 RESTRICTION ON THE USE OF PLANT (New Sub-Clause)

The Contractor shall use only hand tools and hand-operated equipment in the construction of the portions of the Works, that are required in terms of the project specification to be constructed using labour-intensive methods.

PSA 5 CONSTRUCTION (CLAUSE 5)

PSA 5.1.1 Setting out of the Works

The setting out of the Works shall be carried out according to the existing boundary lines, roads and survey station pegs. All dimensions, levels and data necessary for the complete setting out of the Works will be provided on the Drawings. The Contractor shall not scale dimensions from the Drawings, but shall request from the Employers Agent any information which is not clearly stated on the Drawings.

Add the following to Sub-Clause 5.1.1:

Where labour-intensive work is specified, the Contractor shall also be responsible for the setting out of the daily tasks.

PSA 5.2 WATCHING, BARRICADING AND LIGHTING (Sub-Clause 5.2)

Add the following to Sub-Clause 5.2:

The contractor shall in addition to comply to the requirements specified in SABS Section D: Earthworks Sub-Clause 5.1.6 and the requirements of C3.4.

PSA 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

Add the following to Sub-Clause 5.4:

(i) Location and Protection

All available information relating to known existing services and structures has been included on the Drawings. Although this information is reflected as accurately as possible, all positions and levels must be taken as approximate only. At the commencement of the contract the Contractor shall verify the information on the plans.

At locations where there is a reasonable possibility of unknown underground services being present, the Contractor shall open trenches across such locations before commencing with excavations and, if services are found, these shall be plotted and thereafter be considered as 'known services'. Alternatively, the Contractor can employ a radio detection service in order to locate services. All such work is to be carried out only on the instruction of and under the direct control of the Employers Agent.

All known services shall be adequately protected from damage during construction operations. The requirements of the relevant service departments relating to limits of heavy plant usage, departmental supervision etc., shall be ascertained and adhered to.

Any damage to known services shall be made good at the Contractor's expense.

No pegs or stakes are to be driven into the ground in the vicinity of the underground services, particularly Electricity or Telkom services.

Any services or structures damaged during construction shall immediately be reported to the Employers Agent, and as soon as possible after such damage a written report stating the exact circumstances of the occurrence shall be submitted to the Employers Agent.

All practical measures shall be taken to effect immediate repairs, either by contacting the relevant authority or, where instructed by the Employers Agent, the Contractor shall perform temporary repairs himself.

PSA 5.5 SPECIAL WATER CONTROL (Clause 5.5)

Add the following:

Unless specified, the rates tendered and paid for excavation and the construction of any subsurface structure shall include for dewatering as may be necessary.

PSA 5.5.1 Temporary Drainage Works (New Sub-clause)

The Contractor shall construct the necessary temporary drainage works such as side drains, catchwater drains, mitre drains, culverts, etc. to deal adequately with any surface run-off.

Any suitable prefabricated culverts salvaged from an existing road or an abandoned temporary deviation may be re-used if in a good condition and approved by the Employers Agent.

No separate payment shall be made for the temporary drainage works and the costs shall be included in the tender, unless specifically allowed for in the Schedule of Quantities.

PSA 5.6 POLLUTION (Clause 5.6)

Add the following:

The Contractor is required to take all necessary precautions, watering where appropriate, to prevent dust blowing from construction material and spoil heaps and/ or ground stripped of vegetation cover, the cost of which must be included in the tendered rates.

PSA 5.7 SAFETY

Add the following:

The Contractor is to adhere to the requirements pertained in the Occupational Health and Safety Act, the Health and Safety specification and the Contractor's approved Health and Safety plan.

PSA 5.8 GROUND AND ACCESS TO THE WORKS

The Works are to be executed at the Kirstenbosch National Botanical Gardens (NBG), specifically at the Kirstenbosch Research Centre (KRC) and Centre for Biodiversity Conservation (CBC) which will remain operational for the duration of the Contract.

The Contractor shall liaise with Kirstenbosch Gardens management with regard to access to the site, time of arriving and leaving and deliveries of materials.

PSA 5.10 AS BUILT SURVEYS (New Clause)

The Contractor shall survey the final position of all buried pipework installed, prior to backfilling.

The pipework shall be surveyed and the information submitted to the Employers Agent as the work progresses. No bedding or backfill shall be placed to within 100 mm of the crown of the pipe before the survey information has been approved by the Employers Agent.

The pipelines shall be coordinated at centrelines of all bends, specials and fittings and intermediate points at intervals of not more than 20 m.

The survey data shall be presented in tabular format giving Y-Coordinate, X-Coordinate, chainage and level. All coordinates and levels shall be referenced to the WGS 84 system and Mean Sea Level (MSL). **No payment for installed services shall be made until the As-Built information has been provided as detailed above to the satisfaction of the Employers Agent.**

PSA 5.11 COMPLIANCE TO THE QUALITY CONTROL PROGRAMME (New Clause)

Prior to the commencing of the Works, the Contractor is to produce and submit a quality control programme (QCP), and the associated approval forms, to the Employers Agent for acceptance. The QCP is to consist of a list of items, which are to be signed off by both the Contractor and Employers Agent on Site, to ensure that the Works on Site comply with the specifications.

The QCP shall incorporate the requirements of all relevant SANS 1200, project specifications and other specifications referred to.

The accepted QCP will not relieve the Contractor of any quality control and/or testing responsibilities stated in the relevant specifications.

Work must be signed off by both the Contractor and the Employers Agent before it can be processed for payment.

PSA 8 MEASUREMENT AND PAYMENT

PSA 8.1 METHOD OF MEASUREMENT, ALL SECTIONS (Sub-Clause 8.1.1.)

In the second line of Sub-Clause 8.1.1, after the words "standardized specification or" add: "in the measurement and payment clause of the standard specification or".

PSA 8.2 PAYMENT (Clause 8.2)

In the third and fourth line of Sub-Clause 8.2.2, delete the words “number of months required” and replace with: “number of days required, as determined in the General Conditions of Contract 2010,”

Delete Clauses 8.2.1, 8.3 and 8.4 and replace with the following:

PSA 8.3.1 Fixed established costs

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

i) The establishment of his organisation and equipment on the site, the transfer of all personnel, equipment tools, office, ablution and storage facilities to the site, establishment of water, power and telephone facilities, and the removal of all the above mentioned items on completion of the Works.

ii) Effecting of all insurance’s, indemnities and guarantees required in terms of the Conditions of Contract or Tender where applicable.

iii) Compliance with all other general conditions and requirements that are not specifically measured elsewhere for payment in these Contract Documents.

Payment shall be effected as follows:

i) Seventy-five percent (75%) of the lump sum tendered shall be paid when the Contractor's stores, offices, etc. are substantially complete, provided that sufficient plant and labour to commence construction at the programmed rate has arrived at the site of the Contract and is in working order.

ii) Twenty-five percent (25%) in the final certificate of completion. The final certificate of completion will only be issued when the Contractor has cleared the entire site to the satisfaction of the Employers Agent and removed all the plant, offices and stores that might have been used for the duration of the Contract and has made available to the Employers Agent the “As-Built” drawings, as called for in the Scope of Work specifications.

Only the tendered amount shall be paid under this item, which in no way shall be affected by modifications of the Contract Amount.

The sum shall allow for fixed establishment on all the sites where work is required in terms of the scope of work.

Item **Unit**

Fixed establishment costs..... Lump Sum

PSA 8.3.5 Contractor’s Obligations with Respect to Health and Safety (New Clause)

The Contractor shall tender a lump sum in the Schedule of Quantities to cover his fixed costs for the proper compliance with the requirements of the Occupational Health and Safety Act, the

Construction Regulations 2014 issued in terms of Section 43 of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and the Health and Safety Specifications in Section C3.6, Annex 6, herein. The amount tendered and paid shall be full compensation for:

(i) The drawing up of a detailed Health and Safety Plan in respect of the Works for submission to the Employers Agent and Employer prior to the handing over of the Site to the Contractor.

(ii) The execution of all training, precautions, monitoring, liaison, consultation and review as detailed in the Health and Safety Plan.

(iii) Ensuring that all Sub-Contractors comply with the requirements of the Act and the Health and Safety Plan.

(iv) The preparation and maintenance of a Health and Safety File, which is to be submitted to the Employer upon completion of the Works.

(v) Compliance in all other respects with the relevant health and safety legislations

Payment shall be effected as follows:

(i) Seventy-five percent (75%) of the lump sum tendered shall be paid when the Contractor's Health and Safety Plan has been submitted to the Employers Agent and Employer, provided that the Plan is complete and acceptable in terms of the Regulations.

(ii) Twenty-five percent (25%) in the final certificate of completion, once the Health and Safety file has been handed over to the Employer.

Item	**Unit**
Fixed costs with respect to Health and Safety	**Lump Sum**

PSA 8.3.7 Producing and Submitting the Quality Control Programme (New Clause)

The Contractor shall tender a lump sum in the Schedule of Quantities to cover his costs for producing and submitting the Quality Control Programme, and associated approval forms, to the Employers Agent for approval prior to the handing over of the Site to the Contractor.

Payment will be made for this item only once the QCP has been approved by the Employers Agent.

Item	**Unit**
Producing and submitting the Quality Control Programme	**Sum**

PSA 8.4 TIME-RELATED ITEMS

Add the following:

Adjusted Payment for Time-Related Costs

The payment to the Contractor for time-related costs shall be adjusted in accordance with the following formula in the event of the Employers Agent granting an extension of time in terms of the provisions of the Contract:

$$\text{Sum of Tendered amounts for Time-related Items} \times \frac{\text{Extended contract period as authorised by Variation Order}}{\text{Tender contract period}}$$

The abovementioned adjustment of the payment for Time-Related Items shall be made in the Completion Payment Certificate and shall be the only payment for additional Time-Related costs irrespective of the actual period required to complete the Contract including its authorised extensions.

The unit of time for this calculation shall be "days" as defined in the General Conditions of Contract.

PSA 8.4.1 Time-Related Establishment

The Contractor shall tender a Lump Sum in the Schedule of Quantities to cover his time-related establishment costs. Other than the items which have been separately scheduled in PSA 8.4.2.2, 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 provision of security personnel if deemed necessary.

(iii) The maintenance of all insurances, indemnities and guarantees required in terms of the Conditions of Contract or Tender where applicable.

(iv) 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 method laid down in Sub-Clause 8.2.2 of SABS 1200:A.

The sum shall allow for time related establishment on all the sites where work is required in terms of the scope of work.

Item	**Unit**
Time related establishment costs	**Lump Sum**

PSA 8.4.2.2 Facilities for the Contractor

(a) Search for, record and protect all survey bench marks

The sum tendered shall be deemed to be full compensation for complying with the requirements of Clause 5.1.2 of SANS 1200 A.

(b) Provide Access for Authorised Personnel

The sum tendered shall be full compensation for providing access to authorised SANBI personnel to all parts of the Works and ensuring that the construction activities do not obstruct them in any way for the full duration of the Contract.

(c) Nightwatchmen and Security

The sum tendered shall be full compensation for providing sufficient nightwatchmen and security to all parts of the Works where necessary.

Item	**Unit**
(a) Search for, record and protect all survey bench marks	**sum**
(b) Provide access for authorised personnel	**sum**
(c) Nightwatchmen and Security	**sum**

PSA 8.4.6 Contractor's Obligations with Respect to Health and Safety (New Clause)

The Contractor shall tender a lump sum to cover his time related costs with respect to health and safety. The amount shall cover all of the Contractor's obligations as described in PSA 8.3.5 above.

Item	**Unit**
Time related costs with respect to health and safety	**Lump Sum**

PSA 8.4.8 Compliance with the Quality Control Programme

The Sum shall cover the Contractor's Time-Related costs of compliance with the Quality Control Programme (QCP). The amount tendered shall be paid monthly, in accordance with the method laid down in Sub-Clause 8.2.2 of SABS 1200A, to the Contractor in compensation for:

(i) The maintenance of the QCP and forms by the Contractor on Site for the duration of the contract.

(ii) Ensuring that all Sub-Contractors comply with the requirements of the QCP.

(iii) Ensuring that all necessary SABS and other specifications are available on site at all times.

The Contractor's attention is drawn to PSA 5.11 regarding payment for any Work that is to be signed off by both the Contractor and the Employers Agent.

Item	**Unit**
Compliance with the Quality Control Programme	**Sum**

PSA 8.5 PROVISIONAL SUMS (Clause 8.5)

PSA 8.5.1 Relocation cost of electrical services by local authority

The item shall cover the costs of relocating any existing electrical service.

The Contractor's tendered mark-up must allow for making the necessary arrangements, liaising with the relevant authority and/or plant manager, notifying the Employers Agent of any relocation of electrical services and for payment, if applicable, through the contract.

In addition, the final position of any electrical service that is to be relocated shall be recorded and conveyed to the Employers Agent and shall be deemed to be included in the tendered mark-up.

Item	**Unit**
(a) Cost of relocating existing electrical services by local authority	**PC Sum**
(b) Overheads, charges and profit on a) above	**%**

PSA 8.7 DAYWORKS

Certain amounts have been allowed under Dayworks for items of work which was not measurable at the time of tender. Depending on the overall contract price and budget constraints, some or all of these items may be omitted during the construction stage. Work for these items will be by written instruction only, and will be compensated for on a dayworks basis.

PSC SITE CLEARANCE

PSC 1 SCOPE

PSC 2.3 DEFINITIONS

Designated Site / Area

Add the following:

The designated site for clearing and grubbing (as defined in SABS 1200C clause 5.3 & 5.4) shall be defined as that falling within the Site boundary as indicated shown on Drawing No. 3195-C401.

Notwithstanding the above, the Contractor shall prior to any clearing and grubbing agree with the Employers Agent the areas to be cleared.

PSC 3.1 DISPOSAL OF MATERIAL

Where the material obtained from clearing and grubbing can be classified as topsoil, the relevant terms of clause 5.2.1.2 of SABS 1200 D and the project specification, as applicable, shall apply.

Unless otherwise indicated, material and rubble obtained from clearing and demolition shall be disposed of off-site at a landfill site selected by the Contractor and approved by the Employers Agent. Disposal certificates shall be provided for each load of material disposed.

Waste generated by demolition work shall be removed from site within 14 days of the completion of the demolition work concerned.

Burning of material on site will not be permitted.

PSC 3.2 RECOVERY OF MATERIAL FROM DEMOLITION

Where indicated, reusable materials obtained from demolition work shall remain the property of the Employer. Such materials shall be carefully dismantled and neatly stored at a location on the Site to be designated by the Employers Agent. The Contractor shall not dispose any material which could reasonably be construed to be re-usable without authority from the Employers Agent.

Where so indicated, certain materials obtained from demolition or dismantling shall be reused in the Works. Such materials shall be carefully dismantled, set aside and stored for later reuse. The Contractor shall take all necessary precautions to protect such materials from damage during demolition, transport and storage. Any such materials which are lost or damaged as a result of negligence on the part of the Contractor shall be replaced at the Contractor's own cost.

Unless specifically stated on the drawings or in the specification, no material shall be reused in the Works without the Employers Agent's written authority.

PSC 5 CONSTRUCTION

PSC 5.8 DEMOLITION OF STRUCTURES

PSC 5.8.1 Breaking out of concrete and brickwork

Breaking out of existing concrete and brickwork is required in a number of areas to effect alterations to existing structures or allow new pipework to pass through existing walls. The extent of the demolition work is indicated on the drawings, or may be directed by the Employers Agent on site.

Wherever a section of a plane surface such as a wall or slab is to be broken out, a saw cut of depth at least 50 mm shall be made on the perimeter of the area to be removed so as to present a clean edge to the broken out section. Where both faces of the panel are accessible, a saw cut shall be made on each face.

All edges exposed by demolition shall be made good as specified in Section PSG.

PSC 8 MEASUREMENT AND PAYMENT (CLAUSE 8)

PSC 8.1 PRINCIPLES

PSC 8.1.1 Demolition

Payment for demolition work shall only be made after all waste generated from the demolition work concerned has been cleared from site to the satisfaction of the Employers Agent.

For all bill items involving the disposal of demolition waste, the Contractor will be deemed to have made allowance in his rate for the salvage value, if any, of any re-usable materials.

Where indicated that materials recovered from demolition or dismantling of existing structures or plant are to be handed over to the Employer, the rate shall include all costs of removing, transporting and stacking the material at the designated location. No additional payment will be made for transport of material to any location within Kirstenbosch NBG.

Where indicated that materials are to be reused in the Works, the rate shall cover all costs associated with dismantling, setting aside and storing the materials and protecting them from damage, until they are reused.

The Contractor will be deemed to have inspected the site and familiarised himself with all conditions affecting demolition work such as access, working space, nature of materials to be demolished and temporary support required for existing structures. The rates for demolition work shall be deemed to include all necessary scaffolding, access ramps and plant or other provisions for the removal of waste.

PSC 8.2 SCHEDULED ITEMS

PSC 8.2.5 Take down and reinstate existing fences

Add the following:

The fences taken down during the clearing operation shall be reinstated in the position directed by the Employers Agent on site. The fences shall be reinstated using the original materials recovered from the existing fences and the contractor shall, at his own cost, replace any materials that have been lost or damaged during the construction period.

Measurement shall be the length of fence taken down.

Item	**Unit**
Take down and reinstate existing fences	**m**

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

Add the following:

The Employers Agent and Contractor are to agree upon a stockpile site for any topsoil that is to be removed and stockpiled. The costs for transporting, preparing the stockpile site and stockpiling, as per clause 5.6, shall be deemed to be included in the rates.

PSC 8.2.11 Saw cuts through existing surface (New Clause)

The item shall cover the costs of making saw cuts as specified in surfaces to provide a clean edge to broken out sections. Separate items will be scheduled for vertical and horizontal panels.

The quantity measured shall be the net length of cut specified.

Item	**Unit**
Saw cut through existing surface (type of surface and depth specified)	**m**

PSC 8.2.12 Break out concrete or brickwork and make good (New Clause)

Separate items will be scheduled for different materials and different areas with different working conditions.

The item shall cover all costs associated with breaking out concrete or brickwork in walls and slabs for the purpose of modifying the existing structures, forming new pipe penetrations or for laying pipes below walls or structures. The rate shall include removal from site and disposal of the waste material. It shall also cover for making good the broken edges with an approved epoxy mortar (Sika Monotop 620 or equally approved) with a steel float finish to the Employers Agents satisfaction or rebuilding the wall to a condition approved by the Employers Agent

The quantity measured shall be the net volume of concrete or brickwork required to be removed based on the actual average thickness of the sections to be broken out and the extent of the sections to be broken out shown on the drawings or directed by the Employers Agent. No payment will be made for overbreak.

Item	**Unit**
Break out concrete/brickwork, make good edges and dispose of waste	**m³**

PSD EARTHWORKS

PSD 1 SCOPE (CLAUSE 1)

PSD 3 MATERIALS (CLAUSE 3)

PSD 3.1 CLASSIFICATION FOR EXCAVATION PURPOSES (Sub-Clause 3.1)

PSD 3.1.1 Method of Classifying (Sub-Clause 3.1.1)

The Contractor may use any method he chooses to excavate any class of material but his chosen method of excavation shall not determine the classification of the excavation. The Employer's Agent or his Representative will decide on the classification of the materials. In the first instance the classification will be based on inspection of the material to be excavated and on the criteria given in PSD 3.1.2 below. **All material shall be considered to be soft material unless agreed and approved otherwise in writing with the Employer's Agent prior to excavation taking place.**

In the application of this classification, no differentiation shall be made between "bulk" or "restricted" excavations.

PSD 3.1.2 Classes of Excavation (Sub-Clause 3.1.2)

PSD 3.1.2.1 Classes of Excavation: Conventional Construction

All material encountered in any excavations for any purpose including restricted excavation will be classified as follows:

a. Hard rock excavation

Hard rock excavation shall be excavation in material (including undecomposed boulders exceeding 0,15 cubic metres in individual volume) that cannot be efficiently removed without blasting or without wedging and splitting.

b. Soft excavation

Soft excavation shall be all material not falling into the category of hard rock excavation.

PSD 5 CONSTRUCTION (CLAUSE 5)

PSD 5.1 PRECAUTIONS

PSD 5.1.1 Safety

PSD 5.1.1.2 Safeguarding of excavations

The Contractor shall be responsible for all lateral support and the safe-guarding of all excavations, and all costs involved with the proper safeguarding of the excavations shall be included in the tendered rates.

PSD 5.2 METHODS AND PROCEDURES

PSD 5.2.2. Excavation

PSD 5.2.2.1 Excavations for General Earthworks and for Structures (Sub-Clause 5.2.2.1)

Working space of 1,0 m wide adjacent to the walls of structures has been allowed for in the Quantities. Any additional working space required by the Contractor, or over-excavation, shall be excavated, backfilled and compacted by the Contractor at his own expense.

PSD 5.2.2.3 Disposal (Sub-Clause 5.2.2.3)

Unless otherwise ordered, surplus and unsuitable material shall be removed from site and disposed of by the Contractor who shall, at his own cost, make all necessary arrangements for locating a spoil site and haulage.

The Employer's Agent may authorise or instruct that surplus and unsuitable material from excavations be placed as compacted fill on the Site in accordance with the relevant clauses of SANS 1200 D, or loaded, tipped and spread at a suitable disposal site, within the free-haul distance, approved by the Employer's Agent.

Where excavated material is disposed of on site or at a location designated by the Employer's Agent, the topsoil shall be stripped to a depth of 150 mm or as directed, stockpiled and reinstated to its original depth over the spoil. The spoil site shall be graded to smooth, free-draining contours.

PSD 5.2.3 Placing and Compaction

PSD 5.2.3.2 Confined Backfilling and Compacting Around Structures

Backfill against structures, within 1,0 m of the structure, shall be approved clean non-cohesive material, either selected material from the excavations or imported material, and shall be compacted to a minimum of 93% Mod. AASHTO density (100% for sand). Payment for this item shall cover all costs involved in supplying, loading, transporting, placing, spreading and compacting the imported material. The volume of backfill will be calculated on a 1.0m wide area for workspace behind the structure walls, and the Contractor shall make provision in his rates for any additional material required for wider excavations.

PSD 5.2.4. Finishing

PSD 5.2.4.1 Final Grading (Sub-Clause 5.2.4.1)

Add the following to Sub-Clause 5.2.4.1:

After the excavation or filling has been completed final grading slopes shall consist of trimming the existing or previously shaped ground to an even surface and to tolerances given in Clause 6.1 (b)(4). Trimming shall be done with hand tools. Machine operations shall only be permitted upon written instruction by the Employer's Agent.

Trimmed surfaces shall be free of all stones exceeding 50mm in size and all excess material shall be removed. The surface shall be left slightly rough to facilitate a better blinding with topsoil.

PSD 5.2.4.3 Grassing

Grassing shall be carried out by hydro-seeding with an approved mix or grass plugs as directed by the Employer's Agent and specified in the Schedule of Quantities.

PSD 5.2.5 Transport for earthworks

All haulage within the boundaries of the site and within 1.0 km of the site boundary and disposal of waste to a licensed municipal landfill shall be regarded as free-haul.

All haulage for materials obtained from commercial sources selected by the Contractor or disposed of off-site by the Contractor shall be regarded as free-haul.

PSD 8 MEASUREMENT AND PAYMENT

PSD 8.1 BASIC PRINCIPLES

Add the following:

Excavations

The Contractor shall determine at tender stage the appropriate method of bulk and trench excavation (plant, labour etc) and tender rates accordingly.

Generally, the excavations will be measured in the categories set out hereunder, i.e.

(ii) Cut to Fill, where the unit rate tendered shall be inclusive of all work and costs required for the bulk excavation of all materials from platform and excavation areas, the transport and placement of the material in the required fill areas, and compaction in layers not exceeding 150 mm to 93% Modified AASHTO density.

(iii) Cut to Stockpile where the unit rate tendered shall be inclusive of all works and costs required for the bulk or restricted excavation of materials which are suitable for placement in fill, the loading and transport to the designated stockpile site, and the maintenance of the stockpiles, as directed by the Employer's Agent.

(iv) Cut to Spoil where the unit rate tendered shall be inclusive of all works and costs required for the bulk or restricted excavation of materials which are in excess or are not suitable for placement in fill, the loading and transport and disposal thereof in accordance with PSD 5.2.2.3.

(v) Hand Excavations. Hand excavation rates will only be paid if ordered by the Employer's Agent in writing where the unit rate tendered shall be an extra-over rate for restricted excavation, which shall include for all additional costs involved in providing labour and hand tools required for excavations by hand.

Backfilling

Except for the cut to fill operations described above where measurement and payment of the filling and compaction is included under these items, all other fill construction works and backfilling requires fill material from borrow pits and stockpiles on site or from commercial sources, where the following additional items shall apply;

(a) Construction of fill platform and embankments; where the unit rate tendered shall be inclusive of all works and costs required for the loading and transport of fill material from the stockpiles or borrow pits on site, the placement of the material in the required fill areas, and compaction in layers not exceeding 150 mm to 93% Modified AASHTO density, as directed by the Employer's Agent.

(b) Restricted backfilling against structures; where the unit rate tendered shall be inclusive of all works and costs required for the selection, loading and transport of fill material from the stockpiles or borrow pits on site, the placement of the material in the 1,0m working space against structures, and compaction in layers not exceeding 150 mm to 93% Modified AASHTO density (100% for sand), as directed by the Employer's Agent.

(c) An Extra-over item to item (a) above shall be measured for final shaping and trimming of embankment sides.

(d) An Extra-over item to item (b) above shall be measured for imported material from commercial sources.

PSD 8.1.3 Dimensions of Excavations

Excavations to structures will be measured as follows:

(a) Foundations: Nett plan dimensions of foundations except where the sides of foundations require formwork as ordered by the Employer's Agent, in writing, on site, where a further 1,0 m maximum working space will be added to the nett plan dimensions (measured from the outside of the vertical walls) and up to the bottom of blinding layer beneath the vertical walls. It is envisaged that generally all footings and bases will be cast against the earth faces of the excavations, in which case no working space will be measured or paid for.

(b) Structure above foundation level: A maximum space of 1,0 m working space where required, will be allowed for measurement purposes. It shall be measured up to the bottom of the blinding layer beneath the vertical wall. Any excavation exceeding 1,0 m to the finished vertical faces of any structure shall be excavated, backfilled and compacted as specified, to the cost of the Contractor.

PSD 8.3 SCHEDULED ITEMS

PSD 8.3.2 Bulk Excavation

The Contractor's attention is drawn to Clause PSA 5.5.

Unless an item has been specifically scheduled for dewatering, the cost of dewatering of excavations will be held to have been included in the tendered rates for excavation. Provision is made under item PSA 8.4.2.2(a) which shall cover all the Contractor's costs involved with the control of surface and subsurface water not included in the rates for excavation and trench excavations.

The Contractor shall provide adequate temporary drains in and around the excavations to control surface water. Such drains may be self-draining or lead to sumps equipped with pumps.

Should the Contractor allow saturated conditions to develop he shall take such steps to rectify the conditions as the Employer's Agent may order, entirely at his own cost, including dewatering.

The tendered price for excavation shall also include for trimming, levelling and compacting the floor of the excavation ready for the application of the blinding layer.

Where embankments are to be constructed with boulder material, embankments are to be laid and compacted in layers (specified by the Employer's Agent in writing) and boulders of diameter greater than the layer thickness are to be removed before compaction. The cost for this exercise is deemed to be included in the tendered rates.

PSD 8.3.8 Existing Services

PSD 8.3.15 Final Grading (New Clause)

Measurement and payment for final grading shall distinguish between machine grading which can reasonably be done by bulldozer or motor grader, and hand trimming, including areas which cannot be done by machine on account of confined space, steep slopes or difficult shapes.

Measurement shall be based on the area, in hectares or square metres, graded to the satisfaction of the Employer's Agent. The rates for hand trimming shall distinguish between areas flatter than 1:4 and areas with slopes steeper than 1:4.

The tendered rates shall include full compensation for grading and trimming the areas to the specified finishing requirements, including the moving of a small quantity of material which would be inherent in this process and the removal of surplus material and stones. The rate shall cover the cost for all plant, labour, materials and all other incidentals necessary to complete the work to the satisfaction of the Employer's Agent.

Where embankments are to be constructed with boulder material, embankments are to be laid and compacted in layers (specified by the Employer's Agent in writing) and boulders of diameter greater than the layer thickness are to be removed before compaction. The cost for this exercise is deemed to be included in the tendered rates.

Item	**Unit**
Final grading	
(a) Machine grading	**m²**
(b) Hand Trimming	
(i) Flat areas with slopes less than 1:4	**m²**
(ii) Areas with slopes steeper than or equal to 1:4	**m²**

PSD 8.3.16 Level, prepare and compact site for storage tank plinth (New Clause)

The item shall cover all costs associated with levelling the site to agreed tolerances and levels with the Employers Agent and compaction of in-situ material to 95% MOD AASHTO. It shall also include for removal of all organic materials to the satisfaction of the Employers Agent. The final prepared surface shall be suitable for pouring and casting the plinth.

The quantity measured shall be the net surface area of the plinth as installed.

Item	Unit
Level, prepare and compact site for storage tank plinth	**m^2**

PSDB EARTHWORKS (PIPE TRENCHES)

PSDB 1 SCOPE (CLAUSE 1)

PSDB 3 MATERIALS (CLAUSE 3)

PSDB 3.1 CLASSES OF EXCAVATION (Sub-Clause 3.1)

The excavation of material will be classified as specified in Clause PSD 3.1. The method of excavation shall be determined at tender stage, and rates shall be tendered accordingly.

PSDB 5 CONSTRUCTION (CLAUSE 5)

PSDB 5.1 PRECAUTIONS (Sub-Clause 5.1)

PSDB 5.1.2 Stormwater, Seepage and Dewatering of Excavations (Sub-Clause 5.1.2)

In addition to the Contractor's responsibilities for dealing with water, which are deemed to be included in the rates tendered for the relevant payment items, the Employers Agent may order the Contractor to place a crushed stone bedding layer (minimum thickness 150 mm) on the trench bottom.

Should the trench bottom conditions remain unstable due to the nature of the soil and the degree of saturation, the Employers Agent may order the Contractor to install a on the trench bottom prior to the provision of the stone layer. After placing the stone bedding, the geotextile shall be folded over the stone with a minimum overlap of 300 mm to form an enclosed drain. The specified bedding material shall then be used to bed the pipe.

The Contractor shall only provide and lay the stone bedding layer and geotextile after receipt of the written order to do so from the Employers Agent.

PSDB 5.2 MINIMUM BASE WIDTHS SPECIFIED

Replace the side allowance table in Clause 5.2 with the following:

External diameter of pipe barrel, mm		Side allowance on each side, mm
Over	Up to and including	
-	125	300 (refer to sub-clause (b))
125	710	300
710	1050	400
1050	2020	500
2020	-	600

Add the following to sub-clause 5.2(b):

The minimum base width for subsurface drains shall be 500.

Trench Depths

All trenches are to be excavated to a depth sufficient to accommodate the pipes at the levels and cover as shown on the drawings. Unless otherwise stated, a minimum cover of 700 mm will generally be required. Allowance must also be made for the required depth of pipe bedding.

PSDB 5.6 BACKFILLING

PSDB 5.6.3 Disposal of Surplus Material

Surplus material shall be disposed of off-site or spoiled on site, as directed by the Employers Agent.

PSDB 5.7 COMPACTION OF TRENCH BACKFILL (Sub-Clause 5.7)

PSDB 5.7.1 Areas not Subject to Traffic Loads (Sub-Clause 5.7.1)

Sand backfilling shall be compacted to 100 percent modified AASHTO maximum density.

PSDB 5.7.2 Areas subject to Traffic Loads (Sub-Clause 5.7.2)

The provisions of Sub-Clause 5.7.2 with regard to compaction of trenches shall be applicable to all trenches in road reserves. Sand backfilling shall be compacted to 100 percent modified AASHTO maximum density.

PSDB 8 MEASUREMENT AND PAYMENT (CLAUSE 8)

PSDB 8.3.2(b) Extra-over item (a) above for :

Replace (1) and (2) with the following :

(a) Hard rock excavation
(b) Hand excavation

Hand excavation and hard rock excavation will only be paid when written permission is obtained from the Employers Agent **prior** to the excavation operation commencing.

PSDB 8.3.4(c) Excavate by hand in all materials to verify existing services and backfill (New Clause)

Measurement shall be the cubic metres actually excavated by hand to expose the services or hand excavations as directed by the Employers Agent.

The rate shall cover the additional cost of care in excavation necessitated by the presence of the service.

Excavations by hand will only be paid upon written order by the Employers Agent to perform excavations by hand.

Item	**Unit**
Excavate by hand in all materials to verify existing services, or as directed by the Employers Agent and backfill.....	**m^3**

PSDB 8.3.5 Existing Services that Intersect or Adjoin a Pipe Trench

The rate for an item scheduled in terms of (a) and (b) shall in addition to items i) to iv) cover any additional costs in adhering to the requirements stipulated in the wayleave conditions, including excavation by hand if required.

Replace the dimension “200 mm” in the last sentence of paragraph (a) with “500 mm”.

PSDB 8.3.6 Finishings (Sub-Clause 8.3.6)

PSDB 8.3.6.1 Reinstate road surfaces complete with all courses (Sub-Clause 8.3.6.1)
Add the following:

The rates tendered shall cover all costs associated with carefully removing, storing and reinstating the respective items to the satisfaction of the Employers Agent. Should any material be damaged or stolen, the costs of replacing the respective material shall be borne by the Contractor.

The reinstatement of any material shall comply with the applicable specifications, as laid down in both SABS 1200 and the project specifications, and shall be deemed to be included in the rates. Any material that has been reinstated or reconstructed and does not comply with the applicable specification shall be reworked at the Contractor’s expense.

The rate shall cover the cost of the reinstatement of the following items:

Item		Unit
(a)	**Gravel on shoulders**	**m²**
(b)	**Asphalt of thickness 30mm in roadway**	**m²**
(c)	**Basecourse material stabilised with 5% cement and compacted to 95% mod AASHTO density (2 layers 150mm thick)**	**m²**
(d)	**Subbase material compacted to 95% mod AASHTO density (2 layers 150mm thick)**	**m²**
(e)	**class 30MPa/19mm concrete 150mm thick with mesh reinforcement Ref 193**	**m²**

PSG CONCRETE (STRUCTURAL)

PSG 1 SCOPE

All concrete works are to be carried out in accordance with the requirements of SANS 1200 G. This includes the construction of all reinforced and plain concrete structures, foundations, chambers, thrust blocks, haunching and encasement to pipes.

PSG 3 MATERIALS

PSG 3.2 CEMENT

PSG 3.2.1 Applicable specifications

The Cement shall be OPC of strength class 42,5N or higher to SANS 50197-1.

All cement shall be to the Employers Agent's approval and have a guaranteed equivalent Na_2O content of less than 0,5%.

For each cement consignment the Contractor shall furnish a certificate stating that the cement has been tested and analysed by the manufacturer and complies with the above requirements.

A similar procedure should be followed when use is made of Ready Mixed concrete.

PSG 3.2.3 Storage of cement

Cement shall be stored in such a way that the oldest cement is used first. Cement shall not be kept in storage for longer than 8 weeks.

PSG 3.5 ADMIXTURES

PSG 3.5.1 Approval of admixtures

Admixtures shall comply with the requirements of ASTM C 494.

PSG 3.9 JOINTS (New Clause)

The jointing materials shall be approved and as shown on the drawings or as scheduled.

All jointing materials shall be carefully stored and protected to avoid damage, distortion or contamination by other materials prior to use. They shall be applied by trained applicators, strictly in accordance with the manufacturer's instructions and as approved.

PSG 3.9.1. Primer

An approved primer fully compatible with and/or manufactured for use with the specified jointing or sealing compound shall be applied to the appropriate joint surfaces where so required.

PSG 3.9.2 Elastomeric sealant

Elastomeric sealants shall be polyethylene cured polyurethane "pouring grade" for horizontal joints and "gun grade" for vertical joints, conforming to the physical test requirements of SANS 110.

PSG 3.9.3 Joint fillers

Joint fillers shall be closed-cell expanded polyethylene having a density not less than 35 kg/m3, a tensile strength not less than 215 kPa and a minimum tensile elongation at break of 92%.

Fillers shall have a tear our strip for forming the specified recess for sealant where appropriated.

PSG 3.9.4 Swellable joint sealing profiles

Swellable joint sealing profiles shall be 'SikaSwell-P' or equal approved hydrophilic sealing profiles which swell on contact with water. The profile shall be fixed to the substrate with

'SikaSwell S-2' adhesive or an equal approved adhesive, compatible with the sealing profile used.

PSG 5 CONSTRUCTION

PSG 5.1 REINFORCEMENT

PSG 5.1.2 Fixing

Welding of reinforcement as a means of securing it against displacement will not be permitted.

PSG 5.1.6 Cutting

Cutting of reinforcement shall be done cold. The use of cutting torches will not be permitted.

PSG 5.2 FORMWORK

PSG 5.2.6 Formwork to foundations (New clause)

The Employers Agent may at his discretion, and depending on the nature of the soil, determine on site that the vertical earth excavation sides may form the vertical formwork to footings, bases, etc. In this situation the Contractor shall not be paid for formwork, and the measurement of the dimensions of the concrete construction shall be determined by the Employers Agent on site.

PSG 5.5 CONCRETE

PSG 5.5.1 Quality

PSG 5.5.1.7 Strength concrete

All concrete to the structures shall be strength concrete to the specified strengths. Concrete in blinding layers and benching shall be strength concrete grade 10 MPa/19 mm, unless indicated otherwise.

All exposed concrete shall be of a uniform colour. No change in materials or processes shall be made without the Contractor first satisfying the Employers Agent that no change in colour will result.

NOTE: Due to the high exposure condition, all concrete specified to strength mix 35 MPa/19 mm shall incorporate Ordinary Portland Cement. The rates tendered in the Schedule of Quantities shall allow for all additional costs necessary for the incorporation of "Low Alkali" cement.

PSG 5.5.7 Construction joints

The position and details of all joints is shown on the drawings.

Should additional joints be required by the Contractor to suit his method of work these shall be to the Employers Agent's approval. No payment will be made for such additional joints.

All joints between slabs and bases of walls shall be formed with a kicker which shall be integrally cast with the slab.

PSG 5.5.7.3 Forming of joints

Unless specifically indicated on drawings or directed by the Employers Agent, no treatment of the surface with mortar, cement slurry, wet-to-dry adhesive etc. will be permitted.

The joint surface shall be thoroughly scabbled to a rough exposed aggregate finish by wire brushing within 24 hours of casting, in the case of new concrete, or chipping, in the case of existing concrete.

Concrete older than 3 days shall be thoroughly saturated with water by keeping the surface continuously wet for a period of at least 24 hours prior to casting the new concrete.

PSG 5.5.7.1 Primers

The concrete to which the primer is to be applied shall be dry and shall be cleaned of all dust and foreign matter by compressed air or other suitable means. The primer shall be applied in accordance with the manufacturer's instructions.

PSG 5.5.7.2 Joint filler

The filler strips shall be attached to the completed side of the straight or grooved concrete joint by means of epoxy glue or by other approved means.

PSD 5.5.7.3 Swellable joint sealing profiles

Where a swellable joint sealing profile is specified, the profile shall be fixed to the concrete face with the relevant adhesive, strictly in accordance with the manufacturer's instructions. The adhesive shall be applied to form a solid and continuous bed with full contact between the profile and the substrate.

As far as practical the sealing profile shall be placed centrally within the section, but under no circumstances shall the cover between the edge of the profile and the face of the concrete be less than 75 mm.

Where concrete is to be saturated in terms of the method for joint preparation, the sealing profile shall only be affixed after the concrete has been saturated. The substrate shall be surface dry, before the sealing profile is applied.

PSG 5.5.7.5 Reinforcing Bars Drilled into Concrete

Where specified, reinforcing bars shall be fixed into existing into existing concrete to form joints between old and new concrete. The bars shall be fixed with an approved epoxy adhesive into holes shall be drilled to the depth and diameter specified by the adhesive supplier.

The correct quantity of adhesive shall be injected into the hole using a suitable nozzle so that the adhesive is injected from the base of the hole.

The bars shall be inserted with a rotary motion to ensure that they are uniformly coated with adhesive. After being placed, the bars shall not be moved or loaded for the duration of the adhesive hardening time.

The Contractor shall comply with all other installation instructions of the adhesive manufacturer.

PSG 5.5.10 Concrete surfaces

PSG 5.5.10.1 Finish to unformed surfaces

All the weirs, tops of walls and chamfers shall receive a steel float finish, and unless specifically stated in the Drawings or in the Bills of Quantities, all other unformed surfaces shall be finished with a wood float.

PSG 5.5.10.4 Wood float finish

Where a wood float finish is specified or scheduled, the surface shall first be given a finish as specified and, after the concrete has hardened sufficiently, it shall be floated to a uniform surface free of trowel marks.

Measurement will be by the area so finished. The tendered rate shall cover the cost of producing the specified finish.

PSG 5.5.10.5 Steel float finish

Steel trowelling of surfaces shall be carried out when the moisture film has disappeared and the concrete has set sufficiently to prevent laitance from being worked to the surface. The concrete shall be steel trowelled and free of trowel marks. Further trowelling shall be carried out at intervals of two and four hours or such other intervals as the Employers Agent may direct.

Measurement will be by the area so finished. The tendered rate shall cover the cost of producing the specified finish.

PSG 5.5.10.6 Screeds

Where a screed is specified to the floor of a tank, sump or chamber, it shall be laid to the falls indicated on the drawings. The thickness of the screed shall nowhere be less than 25 mm. Feathered edges will not be permitted.

The screed shall be formed from granolithic concrete as specified.

PSG 5.6 CONCRETE REPAIRS (New Clause)

Concrete repairs shall be carried out where specified to reinstate sections of degraded concrete or to finish off rough edge exposed by demolition.

PSG 5.6.1 Surface preparation

The surface to which repair mortar is to be applied shall be thoroughly cleaned by high pressure water jetting or by wire brushing and compressed air. The surfaces shall be free of loose material, laitance, dirt, grease, oil, rust etc.

In addition, the surface preparation shall comply with any additional requirements of the manufacturer of repair mortar to be used.

PSG 5.6.2 Application

The repair mortar shall be applied strictly in accordance with the manufacturer's instructions by trained applicators.

PSG 6 TOLERANCES

The permitted tolerances in concrete work shall be as specified in Subclause 6.2 except as follows:

	Tolerance
a) Setting out distances between major units of work	± 25 mm
b) Concrete structures: Overall dimensions:	± 15 mm

PSG 7 TESTS

PSG 7.1 FREQUENCY OF SAMPLING

Add: "One sample shall comprise three test cubes of concrete".

The cost of taking and crushing the concrete cubes shall be to the Contractor's account, including where check tests undertaken by the Employers Agent have failed.

Payment for the cost of taking and crushing concrete cubes shall be deemed to be included in the Contractor's rates for concrete.

PSG 8 MEASUREMENT AND PAYMENT

PSG 8.7 GROUTING

PSG 8.7 Build in pipework for new pipe

Where new pipes are to be cast into new walls the Contractor shall form a box out hole of adequate size and grout the pipe in afterwards.

The surface of the box-out shall be roughened and saturated as described in PSG 5.5.7.3 before grouting the pipe in. The pipe shall be secured in its final position and grouted into the wall with Sika 'Sikacrete 214' or an equivalent free-flow repair concrete.

The tendered rate shall cover the costs for formwork around the pipe (including venting hole), casting the pipe into the wall, and making good the exposed surfaces with grout to form a neat finish to the satisfaction of the Employers Agent.

The Contractor may elect to cast the concrete around the pipe without a box out in which case the rate shall be deemed to cover all costs of cutting and fitting the formwork around the pipe and no payment will be made for the corresponding box-out formwork item.

Item	**Unit**
Build in pipework for new pipes (type and size stated)	**No**

PSL MEDIUM PRESSURE PIPELINES

PSL 1 SCOPE (CLAUSE 1)

PSL 2 INTERPRETATIONS (CLAUSE 2)

PSL 2.3 DEFINITIONS

Allowable Operating Pressure: Internal pressure, excluding water hammer, that a component can safely and continuously withstand under permanent hydraulic service.

Maximum Operating Pressure: Maximum internal pressure, including water hammer, that a component can safely withstand during service.

Allowable Test Pressure: Maximum hydrostatic pressure that can be applied on site to a newly installed component

PSL 2.4 ABBREVIATIONS

DI : Ductile Iron
DN : Nominal Diameter
GRP : Glass Fibre Reinforced Plastic
HDPE : High Density Polyethylene
SS : Stainless Steel

PSL 3 MATERIALS (CLAUSE 3)

PSL 3.1 GENERAL (Sub-Clause 3.1)

Unless otherwise scheduled or shown on the drawings, the pipes to be used on the contract are as follows:

(i) Pipes of 50mm diameter or less shall be High Density Polyethylene (HDPE);
(ii) Pipes of 63mm diameter or larger shall be High Density Polyethylene (HDPE);

Add to Sub-Clause 3.1

The Contractor shall provide adequate storage facilities for pipes, couplings and specials to conform with the following:

(a) Couplings and specials

Until required for use the rubber rings shall be stored in a cool dark place, away from grease, oil or harmful chemicals. If rubber rings have been tied they shall be separated a few days before they are required for use in order to eliminate minor impressions, which the ties may have caused.

Couplings, into which rubber rings have been fitted, ready for use, shall be stored under cover. All couplings and specials shall be stacked off the ground to ensure that the protective coatings are not damaged.

(b) Stacking of pipes.

Pipes may be placed off the ground alongside the pipe route. When stacking is necessary the Contractor shall make necessary arrangements for stacking areas and shall stack as recommended by the manufacturer.

(c) Valves.

Valves shall be stored under cover and shall be stacked off the ground in a manner which will prevent the ingress of dirt and ensure that the valve faces, spindles and coatings are not damaged.

PSL 3.4 STEEL PIPES, FITTING AND SPECIALS

PSL 3.4.1 General

Welding and visual examination of carbon steel pipework shall be carried out in accordance with BS 4871 Part 1 and BS 2633 or BS 2971 or an equivalent, except where otherwise indicated. Dye penetration examination to BS 6443 shall be undertaken on not less than 10% of all weld connections.

Plain ends of pipes and fittings shall be covered and protected against damage whilst being transported and stored.

PSL 3.4.2 Pipes of Nominal Bore up to 150 mm

Pipework, other than screwed and socketted of sizes up to and including 150 mm nominal bore, shall comply with the requirements of SANS 62 or ASTM A106 or API5L Grade A for seamless steel pipes. These pipes shall be heavy duty and with a minimum wall thickness of 5 mm.

PSL 3.4.3 Pipes of Nominal Bore over 150 mm

Carbon steel pipes and fittings, other than steam tubing and screwed and socketted pipes for general application, larger than 150 mm diameter, shall be electric resistance welded complying with the requirements of SANS 719 Grade A or ASTM A106 or API5L Grade A and shall have walls of thickness not less than 6 mm for pipe sizes up to 300 mm diameter inclusive and 8 mm for pipe sizes of 350 mm to 500 mm. Helical seam welded pipe will not be permitted unless specifically approved by the Employers Agent.

PSL 3.4.5 Screwed and Socketted Pipes

All screwed and socketted pipes and fittings shall comply with the requirements of SABS 62 Heavy class and shall be 'hot dip' galvanised. Unless otherwise specified, screwed and socketted pipes shall not be used for the conveyance of steam gas and compressed air, or liquids containing it.

PSL 3.4.6 Stainless and Steel Alloy Pipework and Fittings

Stainless steel pipes shall be Grade TP304 L or TP316 L, as indicated, complying with the requirements of ASTM A312 for seamless pipe.

Stainless steel butt weld fittings shall comply with the requirements of ASTM A403 class WPS and be of the same material as the pipes with which they connect. Dimensions shall comply with ANSI B.16.9 and B.16.28.

Flanged fittings for stainless steel and alloy pipes shall be manufactured from butt weld fittings as specified above provided with short straight pipe extensions suitable for insertion in slip on or socket weld flanges.

Unless otherwise indicated the material thickness for all stainless steel pipes and fittings shall be equivalent to Schedule 40 for Pipes up to and including 150 mm diameter and Schedule 20 for pipes exceeding 150 mm diameter.

Welding and visual examination of stainless steel pipework shall be carried out in accordance with BS 4871 Part 1 and BS 2633 except where stated in the Detailed Specification. Dye penetration examination to BS 6443 shall be undertaken on not less than 10% of all weld connections.

PSL 3.7 OTHER TYPES OF PIPES (Sub-Clause 3.7)

PSL 3.7.1 uPVC Pipes

The uPVC pipes shall be Class 12 spigot and socket complying with SABS 966.

Welded joints of uPVC pipes will only be allowed where pipes are built into structures. Only the welding cement supplied and recommended by the manufacturer of the pipes used on site shall be permitted. All other long pipe routes shall be spigot and socket joints with rubber ring seals.

PSL 3.7.2 Polyethylene Pipes (Sub-Clause 3.7.2)

High Density Polyethylene (HDPE) pipes shall comply with SANS ISO 4427 using compression fittings and joints. The class of material shall be PE 100. The pressure class shall be as specified on the drawings or in the Bill of Quantities.

The fittings shall be injection moulded from recognised high quality polypropylene (PP) and must conform to relevant internationally accepted performance requirements.

The bodies shall have moulded-in manufacturer identification, material and series information and shown the dimensions of the pipe outside diameter and, if necessary, of the threads. Samples of the fittings shall be issued to the Employers Agent for approval prior to use.

Unless otherwise indicated, all bends shall be long radius bends and all branches shall be 45 degree branches.

PSL 3.8 JOINTING MATERIALS (Sub-Clause 3.8)

PSL 3.8.3 Flanges and Accessories (Sub-Clause 3.8.3)

Where new pipework is to be joined onto existing pipework, the Contractor shall measure the existing flanges and report the dimensions to the Employers Agent. The drilling of new flanges shall match the existing flanges.

In new installations, where pipes are not coupled onto existing pipework, the flanges shall be in accordance with SANS 1123.

Flanges shall be machined flat and without a raised joint face.

Flanges for low-pressure applications (less than 10 bar) shall be of the slip on type. Flanges for high-pressure applications (greater than 10 bar) shall be of the socket weld type, unless otherwise agreed with the Employers Agent.

Flanges shall be manufactured from materials equal to or better than the pipes to which they are connected.

Where pipes pass through and will be built into walls they will be provided with puddle flanges, which shall have the same diameter and thickness as the standard flanges but be undrilled.

PSL 3.8.6 Spigot and socket Pipes (Sub-Clause 3.8.6)

Add the following:

The shortest length of pipe which may be used in the pipeline is 0,5m, thus the shortening of an adjacent pipe may be necessary so as to ensure compliance with the position of specials. When pipes of 1m or less in length are used or where specials are laid within 1m of each other, they shall be jointed by means of V.J. type coupling, or equally approved.

PSL 3.8.8 Jointing Gaskets (New Clause)

Jointing gaskets for flanged joints shall comply with the requirements of BS 4865 and be cut to the full width of the flange. The materials shall be suitable for and compatible with the required pressure and temperature duties, and characteristics of the material conveyed.

PSL 3.8.9 Fasteners (New Clause)

Bolts and nuts shall be hexagon head type complying with SANS 1700 with threads of the coarse pitch series.

Washers of the same material to the bolts shall be provided under each nut and bolt head. Multiple washers or shims shall not be used. Spring washers or other approved locking arrangement shall be used, together with flat washers on all fasteners subject to vibration.

All fasteners M12 and smaller shall be manufactured of grade 316 stainless steel.

All fasteners in corrosive areas shall be manufactured of grade 316 stainless steel. Corrosive areas shall be taken to include any moist or wet area such as in and above settling tanks, in or in the vicinity of open channels, where a continuous spray can be expected and all internal and

external areas in the vicinity of the inlet works of a wastewater treatment works. All fasteners embedded in brick, concrete or soil shall also be of grade 316 stainless steel.

Fasteners larger than M12 which are in non corrosive areas shall, except when specified otherwise, be hot dip galvanized. Electro-plating and electro-galvanising will not be acceptable.

Fastener material shall always be of equal or better corrosion resistance than the items being fastened, e.g. 316 stainless steel bolts must be used to fasten together 316 stainless steel fabrications or flanges.

PSL 3.8.10 Anti-seize Compound (New Clause)

Before assembly, threads shall be treated with a nickel based, anti seize/corrosion protection compound such as Chesterton 725: Nickel Anti Seize Compound, or equivalent and approved.

Copper based compounds are not acceptable and, if used, shall be cleaned off before the correct compound is applied.

If it is found during inspection that compound has not been applied, the Contractor shall disassemble all fasteners and comply with this requirement.

A small amount of compound shall be applied along the full length of the thread before the nut is applied. Excessive compound visible on the thread after the nut has been applied shall be cleaned off.

PSL 3.8.11 Pipe Supports (New Clause)

Pipe support brackets/holderbats for mounting pipes against walls shall be stainless steel of an approved design and adequate strength to suit the pipe to be supported.

Holderbats shall be fixed to wall by means of stainless steel chemical anchors.

PSL 3.8.12 Repair Couplings (New Clause)

Unless otherwise shown, all couplings shall be Viking Johnson (V.J.) type or equally approved couplings capable of connecting uPVC and AC/FC pipes.

PSL 3.9 CORROSION PROTECTION (Sub-Clause 3.9)

PSL 3.9.6 Corrosive Soil (Sub-Clause 3.9.6)

Saddles, cast iron detachable and flanged joints together with their bolts, shall be protected by means of either an approved protective petrolatum based primer, then wrapped with three layers of an approved petrolatum impregnated tape, or other means of inhibiting corrosion approved by the Employers Agent. This protection shall also be applied to the bolts and flanges used by the manufacturer in the construction of valves and hydrants.

PSL 5 CONSTRUCTION (CLAUSE 5)

PSL 5.1 LAYING (Sub-Clause 5.1)

Add the following :

Separation of Pipes

Where the proposed pipelines cross existing services in the form of watermains, sewer pipes or stormwater pipes the distance separating the two shall wherever possible not be less than 150 mm. Where circumstances make this impossible and where the gap is less than 75 mm a layer of a bitumen impregnated compressible filler material (to be approved by the Employers Agent) shall be inserted between the two pipes. The minimum thickness of such a layer shall be 25 mm.

The layer shall consist of 12 mm thick sheets of the required material glued together to make up the required thickness.

Accommodation of Thermal Movement

In laying of pipelines with welded joints, provision shall be made for the thermal expansion and contraction of the pipe.

All measure for accommodation of thermal movement shall be subject to the approval of the Employers Agent.

PSL 5.1.3 Keeping Pipelines Clean (Sub-Clause 5.1.3)

All pipes and specials strung out above ground along the line of the trench shall have both ends closed by means of an adequately fixed plastic cap or other approved material, supplied by the Contractor, in order to prevent the ingress of foreign material.

PSL 5.1.5 Pipes laid in common trench (New Sub-Clause)

Where two pipes are laid side by side in the same trench, the clear distance between the pipes shall not be less than 300 mm.

PSL 5.1.6 Changes in Direction (New Sub-Clause)

Vertical and horizontal direction changes less than 11¼º shall be achieved by deflecting the pipes at the joints. The deflection at each joint shall not exceed the value recommended by the pipe manufacturer and if necessary, the specified change in direction shall be achieved over a number of pipe lengths.

PSL 5.2 JOINTING METHODS (Sub-Clause 5.2)

PSL 5.2.1 Detachable Couplings (AC and uPVC Pipelines) (Sub-Clause 5.2.1)

Add the following to Sub-Clause 5.2.1 :

Unless otherwise specifically detailed on the drawings, uPVC water pipes, specials and fittings shall be coupled with spigot and socket joints fitted with rubber sealing rings. In the following cases, V.J. couplings (or equally approved) shall be used:

(a) on one end of each valve and hydrant;
(b) where pipes have to be cut to fit specials in designated positions, refer to PSL 3.8.6.

PSL 5.2.5 Welding HDPE Pipelines (New Clause)

Unless otherwise indicated, field joints in HDPE pipes shall be formed by heated tool butt-welding.

Welding of HDPE pipes shall be in accordance with SANS 10268, and shall only be carried out by thermoplastic welders who are certified by the Plastics Federation of South Africa (PFSA).

PSL 5.2.6 Joints between HDPE and Other Materials (New Clause)

Joints between HDPE and pipes, valves or fittings of other materials shall be flanged. Flanges shall be loose steel flanges in accordance with SANS 1123.

PSL 5.11 FLEXIBLE JOINTS AT STRUCTURES (New Clause)

All pipelines connected to structures shall be connected with a flexible joint comprising a 1m length of pipe and two rubber ring jointed couplings to match the type of pipe.

PSL 5.12 CONNECT TO EXISTING MAINS (New Clause)

Where connections have to be made to the existing water mains, the following procedure has to be followed:

(a) Liaise with the Kirstenbosch NBG management and/or the Local Authority to arrange a suitable time period for the proposed connection.
(b) Ensure all tools and fittings of the correct size and type are on site prior to requesting the shutdown of the mains.
(c) Advise the Kirstenbosch NBG management and/or the Local Authority at least 3 days in advance of the intention to commence work, in order for them to shut down the mains.

(d) Arrange with the Kirstenbosch NBG management and/or Local Authority to have an official present on site when the work commences.
(e) Advise the Kirstenbosch NBG management and/or the Local Authority when work is complete and thrust block in place and sufficiently cured, for the system to be recharged. Work to be completed to minimise the disruption to the supply to a maximum of 12 hours.

All arrangements and planning must be made in close collaboration and with the approval of the Employers Agent's Representative on site. Names and contact personnel at Kirstenbosch NBG management and/or the Local Authority will be provided at the required time.

PSL 7 TESTING (CLAUSE 7)

PSL 7.3 STANDARD HYDRAULIC PIPE TEST (Clause 7.3)

PSL 7.3.1 Test Pressure and Time of Test (Sub-Clause 7.3.1)

Testing shall be carried out as detailed in Clause 7 of the latest SANS 1200 L, except that the test shall not be less than 1.3 or more than 1.5 times the working pressure for the class of pipe under test.

Payment for field-testing of pipelines shall be included in the rate for supply, lay and bed pipes as described in SABS 1200:L Clause 8.2.1.

The Contractor shall give the Employers Agent 24 hours' notice of his intention to have water admitted to any length of new pipeline for any purpose whatever.

PSL 7.5 COMMISSIONING TEST (New Clause)

Prior to the handling over to the client of a particular area or zone, it shall be subjected to a commissioning test.

The section to be tested shall be isolated by closing sluice valves in the line and brought up to a pressure equivalent to the working pressure of 12 bar being applied at the lowest point in the installation.

The duration of the test and the permissible leakage rates shall be in accordance with SABS 1200:L Clause 7.3.3.

Payment for commissioning tests of pipelines shall be included in the rate for supply, lay and bed pipes as described in SABS 1200: L Clause 8.2.1.

PSL 8 MEASUREMENT AND PAYMENT (CLAUSE 8)

PSL 8.1 GENERAL (Sub-Clause 8.1)

Add the following to Sub-Clause 8.1 :

The tendered rates for the supply of materials shall cover the cost of all protective coatings and linings, including denso petrolatum tape and priming solution (or equally approved) where required.

No extra payment will be made for testing which will be held to be included in the price for laying of pipes, valves and specials.

The cost of conforming to the requirement to install repair couplings as specified in PSL 3.8.12 and PSL 5.2.1 must be allowed for in the cost of the pipes and fittings.

Notwithstanding instructions for backfilling the Contractor shall bear the cost of finding and repairing leaks.

<u>Jointing of Pipes</u>

The rates tendered for all pipes, specials and valves shall include provision for all cutting of pipes, flanges, nuts, bolts, short collar joints and insertion jointing pieces.

No additional payment shall be made for cutting lengths of pipe, laying or bedding for short lengths for pipework between structures and the costs of all additional cutting of pipes, including wasteage of pipe material, in order to construct the pipework to the lengths as shown on the drawings shall be deemed to be included in the tendered rates.

PSL 8.2 SCHEDULED ITEMS

PSL 8.2.1 Supply, lay, bed, joint and test pipes with compression couplings

The costs of carrying out as-built surveys of pipelines as specified in PSA 5.10 shall be included in the rate for laying of the pipelines.

No payment will be made for laying of pipes unless the as-built survey data has been submitted to and approved by the Employers Agent.

No additional payment will be made for small changes of direction achieved by deflections at pipe joints as specified in PSL 5.1.6.

No payment will be made under this sub-clause until acceptable as-built survey data has been submitted to the Employers Agent in respect of the length of pipeline concerned.

PSL 8.2.2 Extra-over 8.2.1 for the Supplying, Laying, and Bedding of Specials Complete with Couplings

Must comply with a material clause or construction clause or will payment be for the fitting complete with additional fittings to complete the task.

PSL 8.2.16 Connect to existing pipelines (New Clause)

Connection to existing mains shall be measured by number for each diameter of existing pipe.

The tendered rate shall cover the cost for excavating to expose the existing main, cutting the existing pipeline and reaming if required to suit the new fittings, dealing with water, supplying and fitting appropriate fittings and special adaptor pieces to suit the old and new pipes, completing the connection, backfilling, disposal of spoil and making good.

Item	**Unit**
Connect to existing pipeline (diameter stated)	**No.**

PSL 8.2.17 Extra Over for dealing with existing flow (New Clause)

The unit of measurement shall be the number of connections made (No.)

The tendered rate shall cover all the extra over costs for dealing with the existing flow in the municipal pipe for the water supply system and in the existing supply pipe from the reservoir, including plant, labour, materials, pumping, delays or any diversions works that may be required. The method of dealing with the existing flow as well as the direct and indirect consequences, spillages, repairs or cleanup thereof is entirely the Contractors responsibility.

Item	**Unit**
Extra-over Item PSL 8.2.16 for dealing with existing flow	**No.**

PSLB BEDDING (PIPES)

PSLB 1 SCOPE (CLAUSE 1)

PSLB 3 MATERIALS (CLAUSE 3)

PSLB 3.1 SELECTED GRANULAR MATERIAL (BEDDING CRADLE)

Selected granular material shall comply with the provisions of Clause 3.1 of SABS 1200 LB and in addition, the PI shall not exceed 2.

PSLB 3.2 SELECTED FILL MATERIAL (FILL BLANKET)

Selected fill material shall comply with the provisions of clause 3.2 of SABS 1200 LB.

PSLB 3.3 BEDDING (Sub-Clause 3.3)

Add :

The only pipelines to be regarded as flexible are those using High Density Polyethylene (HDPE) and Polypropylene pipes.

All other pipes are to be regarded as rigid for the purposes of bedding, and are to be laid on a Class B bedding unless otherwise instructed by the Employers Agent.

There are not designated borrow pits and the Contractor will be expected to make his own arrangements regarding importing bedding and blanket material.

PSLB 5 CONSTRUCTION

PSLB 5.1 GENERAL

PSLB 5.1.4 Compaction

The degree of compaction required will be 93% Mod. AASHTO density (or 100% for sand).

PSLB 8 MEASUREMENT AND PAYMENT (CLAUSE 8)

PSLB 8.1.3 Volume of Bedding Material (Sub-Clause 8.1.3)

Add the following to Sub-Clause 8.1.3

The volume of bedding material will be measured net, excluding the volume occupied by the pipe.

PSLB 8.2.1 Provision of Bedding from Trench Excavations: (Sub-Clause 8.2.1)

Add the following:

Generally the material excavated from the trenches is suitable for use as selected granular and selected fill material. No separate payment shall be made under item 8.2.1, unless the material was approved by the Employers Agent as unsuitable, and all bedding costs shall be deemed to be included in the tendered rates for the supply, lay and bed of various services.

PSMJ SEGMENTED PAVING

PSMJ 1 SCOPE (CLAUSE 1)

PSMJ 3 MATERIALS

PSMJ 3.1 UNITS

Add the following:

The Contractor shall obtain the necessary certificates from the supplier of concrete block paving units to ensure compliance with the latest SANS Specification (SANS 1058).

Paving units shall be 80mm interlocking concrete blocks Type S-A Class 40/2.6 SANS 1058 (colour grey).

PSMJ 5 CONSTRUCTION

PSMJ 5.4 LAYING OF UNITS

Unless otherwise specified, paving blocks shall be laid in a herringbone arrangement.

PSMJ 5.5 FILLING GAPS IN UNIT PATTERN

Add the following:

A header course shall be used on perimeters and adjacent to edge restraints. Concrete infill shall be avoided on perimeters and adjacent to edge restraints.

PSMJ 5.6 COMPACTION OF UNITS

PSMJ 5.6.1 General

Add the following:

The compaction process shall be repeated after placement of jointing sand.

PSMJ 5.7 JOINT FILLING

Add the following:

Each day's production shall be completed up to the stage of placement of the jointing sand.

In cases of a loss of jointing sand after the initial jointing sand application, the Employers Agent may instruct the Contractor to carry out a re-application of jointing sanding.

PSMJ 8.2.6 Lift and reinstate existing block paving (New Clause)

The unit of measurement shall be the area in square meters of block paving lifted

The tendered rate shall cover all the costs associated with carefully breaking/cutting out and lifting existing block paving intact, storing and maintaining the block pavers and replacing them in the same position with backing to the original lines and levels.

The reinstatement of existing block pavers shall be to the satisfaction of the Employers Agent and must conform to the requirements of SABS 1200MJ and PSMJ.

If any breakage of the block pavers occur, or if they are damaged or stolen, the block pavers shall be replaced at a cost to the Contractor.

Item	**Unit**
Lift and reinstate existing block paving	**m^2**

PSMK KERBING AND CHANNELLING

PSMK1 SCOPE (CLAUSE 1)

PSMK 3 MATERIALS

PSMK 3.9 BEDDING MATERIAL

Delete Subclause 3.9 and replace with the following:

Bedding material upon which kerbs and channels are bedded shall consist of Class 15 / 6.7 concrete of minimum thickness 60 mm.

PSMK 5 CONSTRUCTION

PSMK 5.1 EXCAVATION AND BEDDING

Replace "90%" wherever it occurs with "93% (100% for sand)".

PSMK 5.2 PRECAST CONCRETE KERBING AND CHANNELLING (Subclause 5.2)

Provision shall be made for expansion joints of width 10 mm at intervals not exceeding 10 m.

Unless specified, joints shall be filled with expanded polyethylene jointex and sealed with a 20mm thick dyrakol G HM or equally approved two part polysulphide sealant.

Add to subclause 5.2 the following:

Notwithstanding the fact that vertical curves may not have been specified where changes of grade of up to 2% occur, the kerbs and channels shall be laid to levels based on a minimum vertical curve length of 20 m. The same shall not apply at intersections.

PSMK 8 MEASUREMENT AND PAYMENT

PSMK 8.2 SCHEDULED ITEMS

PSMK 8.2.14 Lift and reinstate existing kerbs and channels (New Clause)

The unit of measurement shall be the number of kerbs or channels lifted

The tendered rate shall cover all the costs associated with carefully breaking/cutting out and lifting existing kerbs or channel fully intact, storing and maintaining the kerbs and channels and replacing them in the same position with benching and backing to the original lines and levels.

The reinstatement of existing kerbs and channels shall be to the satisfaction of the Employers Agent and must conform to the requirements of SABS 1200MK and PSMK.

If any breakage of the kerbs and channels occur, or if they are damage or stolen, the kerb or channel shall be replaced with new kerb or channel at the Contractors cost.

Item	**Unit**
Lift and reinstate existing kerbs and channels (type of kerb or channel stated)	**No**

PLL PARTICULAR SPECIFICATION PLL: WATER HARVESTING WORKS

PLL 1 SCOPE AND DEFINITION

PLL1.1 SCOPE

This specification details the technical requirements of the water harvesting activities to be carried out as specified and as shown on the drawings. It covers the supply and installation of pipelines, storage tanks, header tanks and pumps.

Excavations (where applicable) shall be done in accordance with SABS 1200 DB.

Pipe laying (where applicable) shall be done in accordance with SABS 1200 L.

PLL 2 INTERPRETATIONS

PLL 2.1 REFERENCES

The references as specified in SABS 1200L shall apply.

PLL 2.2 DEFINITIONS

The definitions as specified in SABS 1200L shall apply.

The following definitions shall also apply:

Downpipe

The pipe running vertically from the gutter until it reaches the level of the first wall/cladding penetration.

Collector pipe

The length of pipe from the bend immediately before the first wall/cladding penetration to the connection point in the collection tanks.

Horizontal pipe

A pipe installed below a concrete slab, above or below a ceiling or on top of a floor slab. The pipe is not necessarily horizontal and may contain a slight fall as specified in Clause PLL 4.3.

PLL 2.3 ABBREVIATIONS

The definitions as specified in SABS 1200L shall apply.

PLL 3 MATERIALS

PLL 3.1 GENERAL

The various specifications for materials shall be as described in this Project Specification, Schedule of Quantities, or as shown on the drawings. In the case of any omissions, errors, doubts or obscurity the Contractor shall request a written clarification from the Employers Agent before proceeding any further with the work.

Deviations from the specifications shall not be permitted.

All pipes shall be supplied complete with couplings and jointing materials. Pipes shall be able to withstand the pressures as specified in SABS 1200L (Clause 3.1 and 7.3.1). All pipeline materials shall be so transported, stored and handled that pipes, joints or fittings are not overstressed at any time or damaged in anyway. Pipes damaged or cracked shall be removed from site and replaced at the Contractors expense.

Pipe materials shall conform to the specifications of SABS 1200L.

PLL 4 CONSTRUCTION

PLL 4.1 KEEPING PIPES CLEAN

All pipes and specials strung out above ground along the line of the trench, on the floor of the building or elsewhere shall have both ends closed by means of an adequately fixed plastic cap or other approved material, supplied by the Contractor, in order to prevent the ingress of foreign material.

PLL 4.2 FIXING PIPES TO ROOFS AND WALLS

Collector pipes are to be fixed on the underside of concrete slabs or to walls by means of plastic coated steel holding brackets secured with bolted mechanical anchor bolts. The brackets shall be spaced at the following maximum distances between brackets:

Nominal Pipe Diameter	Maximum distance between holding brackets for non-vertical pipes	Maximum distance between holding brackets for vertical pipes
<110mm	1350mm	2700mm
>=110mm to <=160mm	1500mm	3000mm
>160mm to <=300mm	1800mm	3000mm

Fixing brackets shall also be placed immediately before and after each joint on a fitting.

PLL 4.3 MINIMUM GRADES ON HORIZONTAL PIPES

Horizontal pipes shall be laid with a slight fall (minimum 0.3%) in the direction of the storage tanks.

PLL 4.4 DAMAGE

SABS 1200 L, Clause 5.1.2 shall apply.

PLL 4.5 JOINTING METHODS

The jointing methods, as specified in SABS 1200 L shall apply.

PLL 4.6 STORAGE TANKS

The storage tanks will be positioned on a level platform with a bund wall surround to contain spillage. The collecting pipes will discharge in the top of the tanks. The tanks will be connected along the invert with 50mm diameter pipes (unless otherwise indicated), so that water will pass through both tanks where it will be drawn off for utilisation.

The tanks must be fitted with an overflow pipe, and connected to the external underground stormwater discharge system by means of a pipe. Spillage collecting in the bunded platform must similarly be directed to the stormwater system.

Pipes shall be connected to the polyethylene tanks by means of watertight compression fittings suitable for the pipe diameter.

PLL 4.7 SUPPLEMENTARY SUPPLIES

The settings to adjust the starting or stopping level of the inflow controls must be readily adjustable by uncomplicated means on site, without having to call in highly trained personnel or removal of fittings for setting elsewhere. The Contractor is to make available to the Employers Agent, prior to ordering material, the control mechanisms for such switches and controls.

PLL 5 TOLERENCES

PLL 5.1 HORIZONTAL ALLIGNMENT

The maximum permissible deviation in horizontal alignment of pipes, when measured on the bottom centre line of the pipes shall be 10mm.

The maximum permissible deviation in vertical alignment of pipes, when measured on the outside centre line of the pipes shall be 5mm.

PLL 5.2 CONCRETE TOLERANCES

Concrete plinths shall be to degree of Accuracy I as per SANS 1200G.

PLL 6 TESTING

PLL 6.1 GENERAL

All clauses regarding testing in SABS 1200 L shall apply unless otherwise stated in this particular specification, in which case this particular specification shall override SABS 1200 L.

PLL 6.2 STANDARD HYDRAULIC PIPE TEST

The hydraulic test for the collector and overflow pipes shall commence once all the pipes and fittings have been installed and secured by means of the fixing brackets .

The test pressure for the collector pipes shall be 1.5 times the head from top of the gutters to the top water level in the storage tanks (i.e. the invert level of the overflow pipes).

The collector pipes shall be tested from the connection with the gutter downpipe until the bend into the storage tanks.

PLL 6.3 LEAKS IN PIPES

The specified test pressure shall be maintained for a period of at least 3 hours (or longer as is necessary for inspection of the pipeline) by means of a suitable pump, during which period all pipes, specials, joints and fittings shall be carefully inspected for leaks. All leaks shall be made good and any pipe, special, or fitting found to be defective shall be removed and replaced at the expense of the Contractor and such replacement material shall, after installation, be tested at the expense of the Contractor.

The test period shall <u>not</u> be reduced for pipes of less than 50mm diameter.

The test pressure shall be maintained for a further period of 1 hour after the completion for the first test period, during which time the volume of water required to be pumped into the pipeline for maintenance of the pressure shall be measured. No additional water shall be required in the case of the collector pipes.

A test pressure of 500 kPa shall be used.

PLL 6.4 LEAKS AT TANKS

The connection of the pipes to the polyethylene tanks shall be tested by filling the tank to manhole opening level with clean water and maintaining that level for 3 hours by topping up the water supply in the tank. All leaks shall be made good and any pipe, special, or fitting found to be defective shall be removed and replaced at the expense of the Contractor and such replacement material shall, after installation, be tested at the expense of the Contractor.

PLL 7 MEASUREMENT AND PAYMENT

PLL 7.1 SCHEDULED ITEMS

All payment items are provisional.

PLL 7.1.1 <u>Supply, Install, Joint and Test Pipework, complete with couplings and fixing brackets</u>

Measurement shall be by length over all lengths laid. Measurement up to and between tanks shall be from the outside edge of the tank. No deduction will be made for specials. Separate items will be scheduled for each diameter, each type and each class of pipe laid.

The tendered rate shall make allowance for the pipes to be finally installed in a blue colour denoting a "water" pipe.

The rates shall cover all costs for supplying pipes complete with couplings and mounting/fixing brackets, and the costs of the handling, inspecting, transporting, stringing, installing the fixing brackets, fixing the pipe onto the fixing bracket, jointing, cutting, testing as well as all plant, labour for the laying the pipe for various specified pipe types and diameters. The rate shall also cover the costs of the fixing/mounting brackets.

The trench excavation and bedding of discharge pipework is measured under SABS 1200DB. Saddles and adaptors for pipes (for hoses) is measured under PLL 7.1.2.

A provisional sum has been allowed for items of work not measurable at the time of tender. Work for these items will be by written instruction from the Employer's Agent during construction.

PLL 7.1.2 Extra over 7.1.1 for the Supply, Install, Joint and Testing of pipe specials and fittings, complete with couplings and fixing brackets (specify)

The rates shall cover all costs for supplying materials, plant, labour, and installing the pipe fittings and specials and fixing brackets for various specified pipe types and diameters. The rate shall also cover the costs of the fixing/mounting brackets as specified in Clause PLL 4.2.

A provisional sum has been allowed for items of work not measurable at the time of tender. Work for these items will be by written instruction from the Employer's Agent during construction.

PLL 7.1.3 Connect and Test pipes and fittings, complete with couplings, into polyethylene tanks for various diameters (specify)

The rates shall cover all costs for supplying materials, plant, labour, and cutting tanks to suite the pipe, connecting pipe/fitting into the tanks with suitable compression fittings and adhesive and testing the connection as per Clause PLL6.3

A provisional sum has been allowed for items of work not measurable at the time of tender. Work for these items will be by written instruction from the Employer's Agent during construction.

PLL 7.1.4 Polyethylene Water Tanks

All polyethylene tanks must have the following properties: (1) rust resistant, (2) UV-treated on the outside to minimise the damage of irradiation from the Sun, and (3) have a carbon black food accredited lining on the inside that prevents the build-up of algae.

The rate shall cover all costs for supplying, hoisting and installing polyethylene tanks, complete with lids, holes and couplings to relevant pipework, as indicated on the drawings.

All polyethylene tanks must be a khaki colour, and the Contractor's selected colour must be approved by the Employers Agent before the Contractor places a purchase order.

Item	**Unit**
(a) 10.0 kL vertical standing configuration	**No**
(b) 10.0 kL low-profile configuration	**No**

PLL 7.1.5 Training of site staff in operation and maintenance

The tendered rate shall make full allowance for the training of up to five site staff members in the operation of the pumps, tanks, switched, boards, etc. The Contractor shall provide the necessary training material, staff and train the site staff for one full day and then be available to staff for two weeks thereafter answering any queries and spending at least three hours a week thereafter with the necessary staff members.

Item	Unit
Training of site staff in operation and maintenance	**Sum**

PLL 7.1.6 Construct new structure complete

The tendered rate shall include for all costs associated with constructing the new structure complete as shown on the drawings including, excavation, foundations, slabs, walls, roof, windows, doors, steel access hatches, pipe penetrations, vents and any other item identified on the drawings.

Payment will only be made upon completion of the structure to the satisfaction of the Employers Agent.

Item	Unit
Construct structure complete (specify)	**Sum**