

C3.5.1

PARTICULAR SPECIFICATIONS FOR CIVIL WORKS

TABLE OF CONTENTS

PA 1	SCOPE	PSC-3
PA 2	INTERPRETATIONS	PSC-3
PA 3	MATERIALS	PSC-3
PA 4	PLANT	PSC-3
PA 5	CONSTRUCTION	PSC-3
PA 6	TOLERANCES	PSC-5
PA 7	TESTING	PSC-5
PA 8	MEASUREMENT AND PAYMENT	PSC-5
PAF	FENCING	PSC-7
PGE	EROSION CONTROL MAT	PSC-10

PA 1 SCOPE

The Wastewater Treatment Works (WWTW) is to remain operational for the duration of the Contract. The Contractor's operations shall not in any way interfere with the flow through the WWTW unless specifically agreed in terms of the Contract.

This particular specification covers special provisions for dealing with and maintaining continuity of flow in waste water treatment works.

PA 2 INTERPRETATIONS**PA 2.1 APPLICATION**

This particular specification identifies specific portions of work which would require special attention and lays out the requirements for diverting flow and keeping the area where work is to be executed dry.

PA 2.2 SUPPORTING SPECIFICATIONS

This specification is specifically applicable to this contract and shall be read in conjunction with all other standardised and particular specifications referenced by the Contract Document.

PA 3 MATERIALS**PA 3.1 GENERAL**

Materials shall comply with the relevant SANS 1200 standardised specifications unless stated otherwise herein.

PA 4 PLANT**PA 4.1 PLANT FOR TEMPORARY WORKS**

The Contractor shall be responsible for sourcing, transporting to site, installing, operating, maintaining, and removing from site when no longer required, all the plant required to temporarily deviate flow.

PA 4.2 PUMPS

Where pumps are required to divert process flows around areas where work is to be executed, pumps shall be of the type and capacity stated in the specification. At least one standby pump of capacity equal to that of the largest duty pump shall be present for the full duration that diversion is maintained.

Where pumps are required for dewatering or pumping out of sumps, tanks etc, the capacity of the pump will not be specified and the contractor shall select an appropriately sized pump to suit his production rates and method of work.

PA 4.3 PIPEWORK

Temporary pipework shall be of a type and size selected by the Contractor to suit the required flow rates. Pipes sizes and pump capacities shall be designed as a system to provide the required flow rate at the static head concerned.

PA 4.4 POWER

No guarantee can be made of sufficient power being available on site for pumps. The Contractor shall make his own arrangements for generators or diesel pumps.

Where the Contractor chooses to use electric pumps for critical flow diversions, adequate standby generator capacity shall be provided to ensure that pumping is not interrupted in the event of power failure or load-shedding.

PA 5 CONSTRUCTION**PA 5.1 GENERAL**

Prior to undertaking any flow diversion operation, the Contractor shall, in consultation with the Plant Manager, confirm that all necessary handstops, valves and other equipment are present and serviceable.

If so instructed, the Contractor shall replace or repair any handstops, valves etc. found to be missing or ineffective. Such work shall be dealt with as a Variation Order if it could not reasonably have been foreseen by the Contractor at the time of tender.

PA 5.2 APPROVAL

The Contractor shall not shut or open any valves or handstops etc., stop, start or disconnect any equipment or otherwise interfere with the normal operation of the WWTW without the prior approval of the Plant Manager and the Engineer. The current average dry weather flow (ADWF) of the works is 27MI/d, diurnal peak factor of 1.5 therefore the peak design flow is 71.3MI/d.

The Contractor shall submit to the Engineer, for approval, the full details of the proposed diversion works (Method Statements), **21 days** prior to the start of the work concerned.

The Contractor's proposal shall include full details of the plant to be used including:

- a) Number, type and capacity of pumps;
- b) Length, type and diameter of pipes;
- c) Details of pipe couplings
- d) A sketch showing the point at which water is to be diverted, the route of pipework and the discharge point.

PA 5.3 CONSTRUCTION SEQUENCING

All sequencing of construction work where the maintaining of continuity of flow through the WWTW as set out in this Particular Specification is required, shall be in accordance with **clause 3.4.7 of Section C3.4**.

Clauses PA 5.4 to PA 5.6 of this Particular Specification describes particular construction activities and their respective sequencing requirements relative to one another. The Contractor shall adhere to these requirements and may only deviate therefrom should it be so instructed or approved in writing by the Engineer. Construction activities as listed in clauses PA 5.4 to PA 5.6 shall be sequenced in the same order in which they are mentioned in the respective clauses.

The Contractor needs to ensure that at all times the raw sewage from the incoming 900mm diameter AC pipe. This is achieved by executing the works as detailed in sections PA 5.4 to 5.7 below. The flow will be managed by making use of the existing Pump station No.6, until the switch over to the new Pump station is installed, tested and approved by the all relevant parties. The Contractor shall liaise with the Plant Manager to organize for the operation of Pump station 7.

PA 5.4 DEALING WITH FLOW FOR CONSTRUCTION OF NEW CHAMBER A AND OVERFLOW BYPASS MANHOLE OVER EXISTING RAW 900 DIAMETER PIPE

The raw sewage enters the Hammarsdale WWTW along the southern boundary into the inlet works of the plant. The inlet works receives raw sewage via a 900mm nominal diameter A.C. pipe.

The chambers shall be constructed over the existing pipeline without disturbing the existing pipeline until the agreed time to make the connection and break through. The time and date shall be co-ordinated and agreed by the Contractor with the operations staff. The breaking through into the existing pipeline shall only take place after written approval from the Engineer. The breakthrough will take place at night during low flow conditions and the Contractor will have approximately 3 continuous hours per night to perform the breakthrough. If the Contractor requires more than 3 hours, the work will have to be undertaken over a number of nights.

Debris from the breakthrough work shall be contained not shall not enter into the inlet works or damage or part of the works. All debris shall be removed before the end of the 3 hour time period.

At no time shall the flow into the inlet works be disrupted or blocked off. If over-pumping is required, the Contractor shall supply all equipment, labour and materials, at their own cost, to accommodate all the flow for the duration of the over-pumping.

PA 5.5 CONNECTION OF NEW RISING MAIN TO EXISTING RISING MAIN

The new rising main from the new inlet works pumpstation shall be connected to the existing rising main, with a set of permanent valves on the new and existing rising main (downstream from the new T-connection) so that the existing rising main can continue to operate normally until the pumpstation is commissioned. The contractor shall therefore construct the new rising main up to the existing pipe completely ready for installing the T-piece prior to cutting in the existing pipe.

The contractor shall then cut into the existing rising main, completely install the T-piece and valves, close off the valve to the new rising main and bring the existing rising main back into commission to operate at full capacity. This shall all be done in one operation during the period described below.

The time and date for cutting into the pipe and installing the T-piece shall be co-ordinated and agreed by the Contractor with the operations staff. The cutting into the existing pipeline shall only take place after written approval from the Engineer. The cutting into the pipe and installation of the T-piece and valves can only take place at night during low flow conditions and the Contractor will have approximately one 3-hour period to complete the work described above. The work must be complete and the existing rising main brought back into commission before the end of the 3 hours period.

Over-pumping may be required, and the Contractor shall supply all the required equipment, labour, material and fuel for the period of over-pumping at their cost.

At no stage shall there be any spillage of sewage from the inlet works or pipes. The Contractor is to make all the necessary calculations to ensure there is sufficient storage or over-pumping capacity. The Contractor shall also agree with the operations staff and the Engineer where to discharge the over-pumping to.

PA 5.6 CONNECTION TO MISCELLANEOUS EXISTING PIPES

There will be various miscellaneous connections to existing pipes during the contract and these shall be done so as to not cause any disruption to the flow in those pipes. Method statements will be required to be submitted to the Engineer for approval for each of these connections as described in PA 5.2 for each connection.

PA 6 TOLERANCES

Not Applicable.

PA 7 TESTING

Not Applicable

PA 8 MEASUREMENT AND PAYMENT

PA 8.1 SCHEDULED ITEMS

A lump sum will be measured in respect of particular diversion operations that have been identified. The rate for these items shall include all necessary planning and coordination, submission of method statements, labour, material and plant to carry out the diversion operation.

The rate shall include for all necessary pumps and temporary pipework or channelling and power and fuel for pumps, for the duration of the diversion operation.

The rate shall include for security and overtime where pumping is to continue over non-working hours.

Where diversions or dewatering operations are required to enable scheduled construction work to take place, the Contractor shall determine the time required to carry out the work concerned and allow in his rates for all time related costs of operating and maintaining the diversion or dewatering until it is no longer required.

The rate shall include for the construction and removal of cofferdams or any other temporary hydraulic barriers where so specified.

Item

Unit

- a) Dealing with Flow for Construction of new Chamber A and B (as detailed in PA 5.4) Sum
- b) Dealing with Flow for Construction of Overflow Chamber (as detailed in PA 5.4) Sum
- c) Dealing with Flow for connection of new rising main to existing rising main (as detailed in PA 5.5) Sum

d) Dealing with Flow for connection of miscellaneous pipes (as detailed in PA 5.6)Sum

PAF FENCING**PAF 1 WORKS ON SITE****PAF 1.1 REPLACEMENT OF EXISTING**

Where an existing fence is to be replaced it shall be removed entirely, including grubbing up of posts and stays complete with concrete blocks and filling of holes with good, clean approved soil and well compacted. All old fencing material to be removed from site or stored neatly for reuse as specified.

Removal of existing fence and construction of new fence to progress concurrently such that not more than 100m is unfenced at any given time, unless otherwise approved by the Engineer.

PAF 1.2 LEVELING OF SURFACE BENEATH FENCE

A 2-meter-wide cleared strip (1m on either side of the fence) shall be graded to an even line. The gap below the fencing mesh later described shall be kept to an absolute minimum. Where fencing is installed along slopes it shall be stepped, such that the maximum gap is kept to 75mm or less. Allowance must therefore be made as required to excavate areas that are too high and to fill depressions with approved clean filling, carted on where necessary and well compacted to 90% AASHTO, prior to erection of posts.

On any site where it is found that the existing ground level on the fence line is higher than the adjacent finished walkway or street, the ground shall be excavated level with the finished walkway or street for a distance of one meter into the site and the two levels worked off to a neat and even finish for a further distance of one meter.

Topsoil shall be placed and lightly compacted on all excavated surfaces.

PAF 1.5 DAMAGE TO PROPERTY

Care must be exercised not to damage private or the local authority's property on the outside of the fence line. Any claim for such damage shall be for the Contractor's account.

The Contractor must arrange with the owner of such property for mutually acceptable construction before commencement of the work.

PAF 2 SECURITY MESH FENCING**PAF 2.1 GENERAL**

All steel material to be good commercial quality galvanized steel.

All mild steel posts shall be hot-dip galvanized, continuous lengths (no joints) in accordance with ISO 1461. Furnish moisture proof, corrosion resistant, end-caps to posts.

Where applicable, zinc coating shall be smooth, free of lumps, globs or points.

Concrete works to be in accordance with the provisions of SANS GA

Performance equal to PVC coated "Betafence 358 Doubleskin" mesh panel with "Betasecure" posts, or approved equivalent.

PAF 2.2 HEIGHT

2400mm above finished ground level.

PAF 2.3 POSTS

Mild steel hot-dip galvanized, then PVC coated "Betasecure" (or approved equivalent) post sealed with UV stabilized polymer cap to suit 3048mm wide "Betafence 358 Doubleskin" (or approved equivalent) panel.

PAF 2.4 FOUNDATIONS

To manufacture's specification.

PAF 4.5 LATERAL SUPPORT

To manufacture's specification.

- PAF 4.6 MESH PANELS**
- 2400mm high PVC coated "Betafence 358" (or approved equivalent) mesh panel. Panel aperture size (centre to centre) 12.7 x 12.7mm. Ø 4.3mm galvanized wire core diameter.
- Internal fixtures to be anti-vandal allowing for flush post & panel finish. All fixtures shall be to the inside of the fence line. Panel shall have a flush panel post finish with no climbing aid. Panel & fixtures to be galvanized then PVC coated.
- PAF 4.7 UNDERDIG PROTECTION (WHERE SPECIFIED)**
- Underdig / anti-burrow protection shall consist of a 300mm x 300mm concrete plinth extending between posts.
- PAF 4.8 ANTI-CLIMB OVER PREVENTION**
- Spikes shall be fixed using shear off nuts. Where the product is supplied with a different type of nut by the supplier, the contractor shall make allowance for a minimum of 3 shear off nuts per length of spikes.
- 100mm high 2mm thick toughened steel "Shark Tooth" spike. Spike shall be hot-dip galvanized then PVC coated.
- Each spike edge and center shall be affixed to panel using stainless-steel shear off nuts, anti-vandal cup-square bolts and 2x "fender" washers. The rest of the spike shall be affixed at 100mm intervals using Anti-vandal bolts, as per manufacturer's specification.
- PAF 4.9 CORROSION PROTECTION**
- Galvanized then PVC coated.
- PAF 4.12 DOCUMENTATION**
- The product guarantees shall cover all the fencing, gates and additions supplied and installed. 10 (ten) year anti-corrosion guarantee.
- Shop drawings for gates.
- Certificate of compliance for materials & coatings.
- PAF 6 MATERIALS**
- PAF 6.1 GENERAL**
- Even though certain trade names have been utilised in this specification, they may be substituted - with approval - with products that have performance equal to the original specification. The onus shall be on the tenderer to prove that the proposed products meet the original specification.
- PAF 6.2 FENCING AND GATES**
- High Security Mesh Fencing: Detailed drawings of fencing and gates must be provided.
- PAF 7 EXECUTION**
- PAF 7.1 GENERAL**
- Install all fencing and gates in accordance with the drawings, specification, instructions and as specified lines and grades indicated. Line post shall be placed at intervals to suit mesh panels. Terminal post shall be set at abrupt changes in vertical and horizontal alignment. Materials shall not be cut on site, but shall be manufactured to the correct size prior to galvanizing and coating and subsequently installed on site.
- PAF 7.2 FOUNDATIONS**
- Post holes shall be cleared of loose material. Waste material shall be spread where directed by an Engineer. The ground surface irregularities along fence line shall be removed.
- Posts shall be set plumb, and follow the indicated alignment. All posts shall be set to the depth indicated on the design documents. Concrete shall thoroughly consolidate around each post, free of voids and finished with a domed shaped surface, with the base of dome at grade elevation. Concrete shall be allowed to cure prior to installing any additional components.

Concrete footing shall be carried down to at least the depth indicated on the design documents and shall not be smaller than dimensions shown. Where a rock layer is encountered within the required depth to which the post is to be erected, a hole of a diameter slightly larger than the post may be drilled into the rock and post grouted in. Then the regular concrete footing elevation shall be placed between the top of the rock and the top of the footing elevation as shown on the design documents. Post shall be approximately centered in their footings. All concrete shall be placed promptly and consolidated by tamping or other approved methods.

Where the ground is firm enough to permit excavation of the post hole to neat lines, the concrete may be placed without forms by completely filling the hole. Curing may be achieved by covering the concrete with not less than four inches of loose moist material immediately after placing concrete, or by using a curing compound. All excess material from footings, including loose material used for curing, shall be disposed of as directed by the Engineer.

Where the ground cannot be satisfactorily excavated to neat lines, forms shall be used to place concrete for footings. Under these conditions the earth and forms coming in contact with the concrete shall be moistened and all ponded water shall be removed from the hole prior to placing concrete. When forms are removed, the footing shall be backfilled with moistened material, and thoroughly tamped. The top of the concrete shall then be covered with not less than 100 mm of loose moistened material or use curing compound if the 7- days cure is not completed. All excess material from footings, including loose material used for curing, shall be disposed of as directed.

Where soil is especially soft, foundations may need to be enlarged in order to ensure that fencing can withstand reasonable lateral loads, including wind loading. The contractor shall be responsible for ensuring that all fence posts have adequate foundations.

PAF 8 MEASUREMENT AND PAYMENT

PAF 8.1 FENCING

PAF 8.1.1 Supply and install High Security Mesh fencing complete

The rate shall cover the cost of the supply and installation of the fence complete as specified, including posts, mesh panels, climb-over protection and all fixings and additional items required. It shall include all works on site and execution activities. The rate shall include all ground preparation and excavation required.

Anti-burrow protection and concrete for posts shall be measured elsewhere.

The item shall be measured by length of fence installed.

<u>Item</u>	<u>Unit</u>
Supply and Install High Security Mesh Fence Complete.....	m

PAF 8.2 FENCING ADDITIONS

PAF 8.2.2 Supply and install concrete plinth complete

The rate shall cover the cost of the supply and installation of the 300mm x 300mm concrete plinth for underdig anti-burrow protection, including all additional fixings, excavation, ground preparation, shuttering and wooden trowel finishing.

Each panel shall be tied into the plinth using 2 pieces of mesh. Each piece shall be a minimum of 150mm wide and 300mm vertical length, with three vertical strands. They shall be fixed at equal intervals and shall be cast into the plinth and tied onto the panel using 2x (stainless-steel shear-off nuts, anti-vandal cup-square bolts and 2x "fender" washers each).

The item shall be measured by length of concrete plinth installed.

<u>Item</u>	<u>Unit</u>
Supply and install concrete plinth complete	m

PAF 8.3 GATES

PAF 8.3.1 Supply and Install Gates Complete

The rate shall cover the cost of the supply and installation of the gates complete as indicated including all work and materials required. This rate shall include all ground preparation excavation and concrete works.

The item shall be measured by the type and size of gate specified.

ItemUnit

Supply and install gate complete No.

PGE EROSION CONTROL MAT

PGE-1 INTRODUCTION

This specification details the technical requirements for the manufacture, supply, transportation and installation of biodegradable jute netting or matting which will be used as a surface stabilizer for the dewatering facility embankment.

PGE-2 DEFINITIONS

Erosion Control Mat: a biodegradable netting/matting made from jute, sisal, coir or similar material. They are used for surface erosion control, to prevent or reduce the transport of soil by erosion agencies (water or wind). Some products may be intended to be permanent application while others may only be designed for a short-term life to prevent erosion until vegetation becomes established.

A 1m² sample shall be submitted for approval to the Engineer /Landscape Architect prior to procurement. The material offered should at least have the following properties:

Thickness	5 mm approximate / m ²	
Open Area	65% approximate	
Weight	g/m ²	292
Construction (plain open weave, single yarn)	Warp Threads/100 mm	10.8
	Weft Threads/100 mm	12.0

PGE-3 MANUFACTURING, TRANSPORT AND STORAGE

PGE-3.1 WORKMANSHIP AND APPEARANCE

The finished erosion control mat shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the erosion control mat, or its proper functioning. General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.

PGE-3.2 SHIPMENT AND STORAGE

erosion control mat labelling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

Each erosion control mat roll shall be wrapped with a material that will protect the erosion control mat, including the ends of the roll, from damage due to shipment, water, sunlight and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

During storage, erosion control mat rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet

radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 70°C, and any other environmental condition that may damage the property values of the erosion control mat.

PGE-3.3 CERTIFICATION

The contractor shall provide to the Engineer a certificate stating the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns, and other pertinent information to fully describe the erosion control mat.

The manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.

The manufacturer's certificate shall state that the finished erosion control mat meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. A person having legal authority to bind the manufacturer shall attest to the certificate.

Either mislabelling or misrepresentation of materials shall be reason to reject those erosion control mat products.

PGE-6 CONSTRUCTION

No orders for any erosion control mat materials may be placed on a manufacturer or supplier without the Engineer's prior formal approval.

The erosion control mat shall be delivered to site in rolls with the unique roll number, unit mass and product name clearly labelled on the surface of the roll. The roll shall be covered with an opaque plastic sheet to prevent damaged from sunlight. If the erosion control mat roll is exposed to sunlight, at the discretion of the Engineer, the outer layers of the roll shall be cut off and discarded. The rolls shall be stored on a secure dry, free draining surface and shall be stored on wooden beams to prevent water damage.

Make the soil surface stable, firm, and free of rocks and other obstructions. Install rolled erosion control products according to the manufacturer's published installation recommendations

The Contractor shall take all reasonable measures to limit erosion and sedimentation during the construction activities. Where erosion and / or sedimentation occur, rectification shall be carried out by the Contractor to the satisfaction of the Engineer.

Slope Installations: At the top of slope, anchor the rolled erosion control product with staples. Install the rolled erosion control product as per manufacturer's published installation recommendations.

PGE-8 MEASUREMENT AND PAYMENT

The basic principles of measurement and payment for the geosynthetic layers is that the rates tendered shall cover the cost for all work described in these Specifications including all the testing and QC/QA required

The quantity measured for payment for the geosynthetic layers shall be the net area placed and the cost of overlapping and wastage etc. shall be deemed to be covered by the tendered rates.

PGE-8.2 COMPUTATION OF QUANTITIES

The measured quantity for payment for the placement shall be the net area measured in place as indicated in PA-7.3.2 and the cost of overlapping and wastage, etc. shall be deemed to be covered by the tendered rates.

PGE-8.3 SCHEDULED ITEMSPGE-8.3.1 Supply of erosion control mat

The unit of measurement shall be the square metre of erosion control mat. The quantity measured for payment will be the net area placed as measured.

The Tendered Rate for the supply of the erosion control mat shall include full compensation for all materials, plant labour and other incidentals required to manufacture, purchase, transport, deliver, store the material on and/or off site, test or comply with all Manufacturing and Construction Quality Assurance and Control requirements, in full accordance with the relevant specifications, irrespective of the source or point of manufacture. Waste allowance overlap etc. shall be deemed to be included in the tendered rate.

Item

**Supply of erosion control mat as specified.....square metre (Unit
(m²))**

PGE-8.3.2 Installation of erosion control mat

The Tendered Rate for the installation of the erosion control mat shall include full compensation for all materials, plant labour and other incidentals required to install the erosion control mat in accordance with the Particular Specifications. No additional payment will be made for any transport, handling, cutting, waste, placing, joining, overlapping, temporary anchoring/securing, testing or compliance with all Quality Assurance and Control requirements, and Construction Quality Assurance Plans. This item includes for all the joining that is required.

The rate shall allow for the installation on embankment conditions and the pegging-down of the erosion control mat (where applicable).

Item

**Installation of erosion control mat as specified..... square metre (Unit
(m²))**