

Section G Detailed Civil and Mechanical Specifications for Refurbishment

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PS C 001 – Security Fencing

SCOPE OF WORKS

The scope of works include the complete supply, refurbishment and repair, deliver, install, commission and maintaining during the operational and retention period, of the fencing of the facility (pump stations and waste water treatment works) as per the specified requirements below.

EXISTING SECURITY FENCING

Where the facilities have existing security fencing, the Contractor will ensure that the existing fencing will be refurbished to comply with the following;

The Inner Fencing

- The existing fence will feature as the inside fence.
- The existing fence will be refurbished and repaired to the original as-new condition, as per the supplier's specification, including the main posts, panel sections and existing access gates.
- Each panel section will have a vertical under-dig section, consisting of typically 500mm FLATWRAP.
- The existing panel will be cladded (properly secured) to the existing, total perimeter, bottom to top, on the inside, with minimum 50x50(2.0mm) Fence Diamond Mesh.
- The existing fence, along the total perimeter, must be fitted with minimum, 730mmØ RIPPER COIL, properly secured and supported between each post, on top of the panels.
- The existing access gates shall conform to the above mentioned specification.

The Outer Fencing

- The outer fencing will include all the posts, panels and access gates.
- The outer fence will be installed 1500mm, parallel to the existing fence, on the outside of the existing fence.
- Each panel section will have a vertical under-dig section, consisting of typically 500mm FLATWRAP.
- The panel sections will be minimum, 100mm x 100mm galvanized steel welded razor wire, over-laid (cladded & properly secured) with 75x75(2.0mm) Fence Diamond Mesh, for the total perimeter, from bottom to top.
- Minimum panel height, 2400mm.
- Minimum 730mmØ RIPPER COIL, fitted (properly secured and supported) on top of the panels and in-between the posts, for the total perimeter.
- The outer fence must be fitted with an alarm system to trigger, 1) any attempt to enter the outer fence or, 2) the cutting or damage to the outer fence. The alarm system must be remotely activated to activate a security response team to attend to the outer fence access or damage.

The Inner Barrier

- The inner barrier will be installed between the inner and outer fence.
- The inner barrier will be fixed and secured to the inner fence.
- The inner barrier will consist of minimum, four (4x) 730mmØ RIPPER COILS, stacked vertically on-top of each other, against the inner fence (properly secured and supported).
- This will allow inspection access width, in-between the inner and outer fence, of 750mm.

NEW SECURITY FENCING

Where the facilities have no existing security fencing, the Contractor will ensure that the security fencing comply with the following;

The Inner Fencing

- The inner fencing will include all the posts, panels and access gates.
- Each panel section will have a vertical under-dig section, consisting of typically 500mm FLATWRAP.
- The panel sections will be minimum, 100mm x 100mm galvanized steel welded razor wire, over-laid (cladded & properly secured) with 75x75(2.0mm) Fence Diamond Mesh, for the total perimeter, from bottom to top.
- Minimum panel height, 2400mm.
- Minimum 730mmΦ RIPPER COIL, fitted (properly secured and supported) on top of the panels and in-between the posts, for the total perimeter.

The Outer Fencing

- The outer fencing will include all the posts, panels and access gates.
- The outer fence will be installed 1500mm, parallel to the existing fence, on the outside of the existing fence.
- Each panel section will have a vertical under-dig section, consisting of typically 500mm FLATWRAP.
- The panel sections will be minimum, 100mm x 100mm galvanized steel welded razor wire, over-laid (cladded & properly secured) with 75x75(2.0mm) Fence Diamond Mesh, for the total perimeter, from bottom to top.
- Minimum panel height, 2400mm.
- Minimum 730mmΦ RIPPER COIL, fitted (properly secured and supported) on top of the panels and in-between the posts, for the total perimeter.
- The outer fence must be fitted with an alarm system to trigger, 1) any attempt to enter the outer fence or, 2) the cutting or damage to the outer fence. The alarm system must be remotely activated to activate a security response team to attend to the outer fence access or damage.

The Inner Barrier

- The inner barrier will be installed between the inner and outer fence.
- The inner barrier will be fixed and secured to the inner fence.
- The inner barrier will consist of minimum, four (4x) 730mmø RIPPER COILS, stacked vertically on-top of each other, against the inner fence (properly secured and supported).
- This will allow inspection access width, in-between the inner and outer fence, of 750mm.

PS C 002 – Drain, Cleaning & Dredging of Water Holding & Other Structures

SCOPE OF WORKS

The scope of works include the draining, cleaning and dredging of any civil water holding or other structure, part of the pump stations and waste water treatment works, as per the specified requirements below.

DRAINING

Draining will typically entail the following actions;

- Isolating the structure. This entail stopping, preventing or by-passing any hydraulic flow (raw sewage, partially treated waste water or storm), entering into the structure being drained.
- Draining the structure. This entail removing, scooping or pumping out any liquids from the structure being drained.
- Removal and disposal of the drained liquid. This entail the collection, storage of the liquid, transporting to the WWTW and the disposal at the WWTW, or at an approved disposal point. **NO DISPOSAL, OR POLLUTION INTO THE ADJACENT OR ANY OTHER NATURAL OR ENVIRONMENT AREA WILL BE ALLOWED!**

CLEANING

Cleaning will typically entail the following actions;

- Remove foreign matter and settlement from the structure. This entail the removing, scooping, conveying, or any other means deemed necessary, to empty the structure completely, leaving it without any foreign matter or settlement. Foreign matter and settlement may consist of screenings, grit, sand or any other solid matter not supposed to gather or settle inside the structure.
- Remove and dispose of the foreign matter and settlement. This entail the collection, storage of the foreign matter and settlement, transporting to, and disposal at the WWTW, or at an approved disposal point. **NO DISPOSAL, OR POLLUTION INTO THE ADJACENT OR ANY OTHER NATURAL OR ENVIRONMENT AREA WILL BE ALLOWED!**
- Clean the inside surfaces of the structure. This entail the washing, jetting or scrubbing of the internal surfaces, to enable the thorough inspection for water tightness and structural integrity.

DREDGING

Dredging will typically entail the following;

- Dredging typically entail the removal of foreign matter and settlement from the structure, whilst the structure is hydraulically filled and in operation.
- The equipment used to dredge, must remove foreign matter and settlement from the structure. Dredging equipment can typically be a floating pump, a fixed pump, a submersible pump, bottom surface traveling suction, boom/jib controlled, etc.
- The removed foreign matter and settlement must also be collected, stored, transported and disposed at the WWTW, or at an approved disposal point. **NO DISPOSAL, OR POLLUTION INTO THE ADJACENT OR ANY OTHER NATURAL OR ENVIRONMENT AREA WILL BE ALLOWED!**
- The Contractor must prove, by means of a practical on site test, sample analysis or real-time instrument monitoring, that the structure are free of any foreign matter or settlement.

PS C 003 – Provisional Sum for Access and Safety Equipment

SCOPE OF WORKS

The scope of works include the complete supply, refurbishment and repair, deliver, install, commission and maintaining during for the Defects Notification Period, of the access and safety equipment for the particular structure and/or building, part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

Typical work entail the following;

- Refurbishment, entail mainly reusing the existing equipment, with acceptable repair work or partially replacement.
- Replacement, not using any of the existing equipment but full replacement, because of equipment being missing, very poor condition due to vandalism or wear and tear.

EQUIPMENT

Typical equipment forming part of this scope of works, entail the following;

- Steps, structural steel or concrete.
- Ladders.
- Walkways.
- Grating.
- Covers.
- Handrails.

REQUIREMENTS

Typical access and safety equipment requirements, entail the following;

- All existing access and safety equipment must be refurbished.
- Additional access and safety equipment, where necessary must be supplied and installed.
- Equipment and application must comply with the OHS Act 85 of 1993
- Equipment must structurally comply with all SANS regulations.
- As far as possible, all access and safety equipment must be refurbished, repaired or replaced with fibre, synthetic, or synthetic recycled materials.

PROVISIONAL SUM MANAGEMENT

The provisional sum to cover the cost for the refurbishment of the equipment and structures will be managed by the Engineer, in consultation with the Employer.

This is not a quantified sum, therefore the management of the provisional sum will be addressed as follows;

- The Contractor will prepare a quotation, covering the applicable equipment, after thoroughly inspecting and assessing the equipment and structures condition. The Contractor's quoted price will include for all equipment, supply, manufacturing, and the delivery, installation, commissioning and maintaining during the Defects Notification Period.
- The quotation will be evaluated and approved by the Engineer and the Employer, before the Contractor may continue to procure or install any equipment.
- The approved cost for the Contractor will be the quote plus mark-up.
- The mark-up will be pre-approved during the tender evaluation procedure.

PS C 004 – Provisional Sum for Interconnecting Pipe Work

SCOPE OF WORKS

The scope of works include the complete draining, cleaning, dredging, un-blocking, refurbishment and repair, commission and maintaining during for the Defects Notification Period, of all “sub-soil” pipe lines, connecting main structures for the handling of the hydraulic flow, part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

Typical work entail the following;

- Draining, cleaning and dredging of the interconnecting pipe work. The Contractor must ensure that the pipe line is clear and open for a thorough investigation, to determine the condition of the pipe line and if the pipe line is damaged. The inspection will determine the scope of refurbishment, repair or replacement work required.
- Refurbishment, entail mainly reusing the existing equipment, with acceptable repair work or partially replacement.
- Replacement, not using any of the existing equipment but full replacement, because of equipment being missing, very poor condition due to vandalism or wear and tear.

EQUIPMENT

Typical equipment forming part of this scope of works, entail the following;

- Gravity pipe lines.
- Hydraulic pressure pipe lines.
- Pressure pump lines.
- Pipe material expected, AC, Concrete, PVC, Mild Steel or Stainless Steel.

REQUIREMENTS

Typical interconnecting pipe line equipment requirements, entail the following;

- All pipe lines receiving and conveying flow away from the particular structure, must be drained, cleaned and dredged.
- All pipe lines receiving and conveying flow away from the particular structure, must be thoroughly inspected. From the inspection, the condition and the proposed scope of works for the refurbishment, repair and replacement must be submitted to the Engineer for review and approval.
- The Contractor will provide a quote for the required refurbishment, repair and replacement scope of works identified. The Engineer and Employer must approve and accept the quote, before the Contractor may commence with the work.
- All work on the pipe lines must comply with the applicable sections of the OHS Act 85 of 1993 and the SANS 1200 standard.

PROVISIONAL SUM MANAGEMENT

The provisional sum to cover the cost for the refurbishment of the equipment and structures will be managed by the Engineer, in consultation with the Employer.

This is not a quantified sum, therefore the management of the provisional sum will be addressed as follows;

- The Contractor will prepare a quotation, covering the applicable equipment, after thoroughly inspecting and assessing the equipment and structures condition. The Contractors quoted price will include for all equipment, supply, manufacturing, and the delivery, installation, commissioning and maintaining during the Defects Notification Period.
- The quotation will be evaluated and approved by the Engineer and the Employer, before the Contractor may continue to procure or install any equipment.
- The approved cost for the Contractor will be the quote plus mark-up.
- The mark-up will be pre-approved during the tender evaluation procedure.

PS C 005 – Provisional Sum for Repairs to Civil Structures

SCOPE OF WORKS

The scope of works include the refurbishment, repair, replacement, commission and maintaining during for the Defects Notification Period, of the civil structures, handling or treating the hydraulic flow, part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

The Contractor must price the drain, clean and dredging of the structures under the bill of quantities. This will enable the inspection and determining the refurbishment, repair and/or replacement scope of works for the particular structure. The typical scope of works can entail the following;

- Minor repair work to the structure which does not include work to ensure the water tightness or the structural integrity of the structure.
- Sealing of the structure which will ensure the structure will be water tight.
- Repair work to ensure the structural integrity of the particular structure.
- Replacement, thus de-commissioning or demolishing the existing structure and replacing it with a new structure.

EQUIPMENT (STRUCTURES)

Typical equipment forming part of this scope of works, entail the following;

- Hydraulic conveyance channels.
- Hydraulic collection and division chambers.
- Process structures, for example settling tanks, biological reactors and contact structures.
- Storage structures, for example pump station storage sumps, ponds etc.
- Manholes, valve and meter chambers.
- Structural steel installations.
- Any other reinforced concrete or steel structure part of the pump stations and the waste water treatment works.

REQUIREMENTS

Typical structure requirements, entail the following;

- Any particular structure must perform their original intended design function.
- Any particular structure must be structurally sound.
- Any particular structure must be water tight.
- Any structure must contain their hydraulic liquid, house their mechanical equipment or any other feature required by the pump station or treatment process.
- The structure must comply with all applicable SANS 1200 requirements.
- The structure must comply with the OHS Act.
- Special requirements by the Engineer and/or the Employer will be specified during the inspection and the determination of the scope or works for the particular structure.

PROVISIONAL SUM MANAGEMENT

The provisional sum to cover the cost for the refurbishment of the equipment and structures will be managed by the Engineer, in consultation with the Employer.

This is not a quantified sum, therefore the management of the provisional sum will be addressed as follows;

- The Contractor will prepare a quotation, covering the applicable equipment, after thoroughly inspecting and assessing the equipment and structures condition. The Contractors quoted price will include for all equipment, supply, manufacturing, and the delivery, installation, commissioning and maintaining during the Defects Notification Period.
- The quotation will be evaluated and approved by the Engineer and the Employer, before the Contractor may continue to procure or install any equipment.
- The approved cost for the Contractor will be the quote plus mark-up.
- The mark-up will be pre-approved during the tender evaluation procedure.

PS C 006 – Provisional Sum for Building Maintenance and Repairs

SCOPE OF WORKS

The scope of works include the supply, deliver, repair maintenance and maintaining during for the Defects Notification Period, of the buildings (Top Structures), part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

The Contractor must thoroughly inspect the buildings, determine the scope of maintenance repair work and quote for the work. The maintenance repair work will entail the following;

- The work will include for the supply, deliver and install of all the material and labour required as per the requirement.
- The repair of the complete roof, including the covering (sheeting and/or tiles), support structure (Trusses, beams and purlins), gutters and down pipes, or any other accessories to ensure the 100% function-ability of the roof.
- The repair of the walls, including the main structure, doors (including proper security gates where necessary), windows (including proper burglar bars), vents, paint, plastering or any other accessories to ensure the 100% function-ability of the walls.
- The repair of the floors, including the slab, floor finishing, covers, steps or any other accessories to ensure the 100% function-ability of the floor.
- The repair of the access and safety equipment might overlap with some requirements specified under PS_C_003.

EQUIPMENT (BUILDING STRUCTURES)

Typical equipment forming part of this scope of works, entail the following;

- Main Office Building.
- Under-cover roof structures for infrastructure protection and operational purposes.
- Pump Station buildings.
- MCC Buildings.
- Storage and Staff Buildings.
- Chlorination Buildings.
- Any other civil infrastructure, not part of the Civil Concrete structures or as mentioned above.

REQUIREMENTS

Typical building structure requirements, entail the following;

- Any particular building structure must perform their original intended design function.
- Any particular building structure must be structurally sound.
- Any particular building must comply with the National Building Regulation.
- Any particular building must comply with all applicable SANS 1200 requirements
- The structure must comply with the OHS Act 85 of 1993 and Construction Regulation of 2014
- Special requirements by the Engineer and/or the Employer will be specified during the inspection and the determination of the scope or works for the particular building structure.

PROVISIONAL SUM MANAGEMENT

The provisional sum to cover the cost for the refurbishment of the equipment and structures will be managed by the Engineer, in consultation with the Employer..

This is not a quantified sum, therefore the management of the provisional sum will be addressed as follows;

- The Contractor will prepare a quotation, covering the applicable equipment, after thoroughly inspecting and assessing the equipment and structures condition. The Contractors quoted price will include for all equipment, supply, manufacturing, and the delivery, installation, commissioning and maintaining during the Defects Notification Period.
- The quotation will be evaluated and approved by the Engineer and the Employer, before the Contractor may continue to procure or install any equipment.
- The approved cost for the Contractor will be the quote plus mark-up.
- The mark-up will be pre-approved during the tender evaluation procedure.

PS C 007 – General OHS Act Compliance

SCOPE OF WORKS

The scope of works include the supply, deliver, install, implementation and maintaining during for the Defects Notification Period, of the equipment and facilities required to comply with the latest Occupational Health and Safety Act, as well as the Employer's Health and Safety Specification, with regards to the execution of the scope of works specified under this contract, part of the pump stations and waste water treatment works, as per the specified requirements below.

EQUIPMENT

Typical equipment forming part of this scope of works, entail the following;

- PPE, specialized safety equipment and facilities, consumables etc., required for the equipment supplied under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the delivery, on and off-loading and transportation of equipment under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the installation and construction work executed under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the commissioning of equipment and infrastructure under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the operation and maintenance services under the scope of works.

REQUIREMENTS

The requirements for the General OHS Act Compliance entails the following;

- All the work executed under this contract, must comply with the latest Occupational Health and Safety Act, as well as the Employer's Health and Safety Specification.
- The Contractor must provide all equipment and facilities to comply with the above mentioned specified requirements.

PS C 008 – Temporary Office Facility

SCOPE OF WORKS

The scope of works include the supply, deliver, install and maintaining during for the Defects Notification Period, of the temporary office facility for the particular pump stations.

EQUIPMENT (OFFICE FACILITY)

The equipment forming part of this scope of works, entail the following;

- A pre-fabricated, self-contained, office facility, transported to site, and off-loaded in the approved allocated position.
- The office must be installed onto elevated supports, minimum 300mm above the provided terrace area.
- The office must be minimum 3m x 6m in size, open plan, manufactured from SANS approved and certified materials.
- The facility must have adequate access, natural lighting and ventilation, as per the National Building Regulation requirements.
- The office facility must be equipped with small power equipment, including, lights (in and out-side), power connection sockets and a 100L geyser (electrical-solar optional).
- The office facility must have air-condition facility.
- The office must be equipped with the following furniture, 1) 2x tables, b) 6x chairs, c) 2x steel cupboard and d) a single sink kitchen knock-down unit.

REQUIREMENTS

The office facility must comply with the following;

- The above mentioned equipment requirement.
- The National Building Regulation.
- The applicable SANS 1200 requirements
- The latest Occupational Health and Safety Act.

PS C 009 – Temporary Sanitation Facility

SCOPE OF WORKS

The scope of works include the supply, deliver, install and maintaining during for the Defects Notification Period, of the temporary sanitation facility for the particular pump stations.

EQUIPMENT (OFFICE FACILITY)

The equipment forming part of this scope of works, entail the following;

- A pre-fabricated, self-contained, sanitation facility, transported to site, and off-loaded in the approved allocated position.
- The sanitation facility must be installed onto elevated supports, minimum 300mm above the provided terrace area.
- The sanitation facility must be minimum 3m x 3m in size, with internal panels and doors to facilitate the specified features, manufactured from SANS approved and certified materials.
- The facility must have adequate access, natural lighting and ventilation, as per the National Building Regulation requirements.
- The office facility must be equipped with small power equipment, including, lights (in and out-side), power connection sockets and share the office facilities' 100L geyser (electrical-solar optional).
- The office must be equipped with the following features, 1) 2x separate toilets, b)1x shower and c) a single sink bathroom knock-down unit.

REQUIREMENTS

The sanitation facility must comply with the following;

- The above mentioned equipment requirement.
- The National Building Regulation.
- The applicable SANS 1200 requirements
- The latest Occupational Health and Safety Act.

PS C 010 – Water & Drain Connections

SCOPE OF WORKS

The scope of works include the supply, deliver, install and maintaining during for the Defects Notification Period, of the water and drain connections for the particular pump stations.

WATER CONNECTION

The equipment forming part of this scope of works, entail the following;

- A metered water connection to the local municipality water supply network.
- An isolation-able connection to the temporary office and sanitation facilities.
- Interconnecting pipe work between the local municipality connection and the temporary site facilities connection(s).

DRAINAGE CONNECTION

The equipment forming part of this scope of works, entail the following;

- Connections for all draining points from the temporary site facilities.
- Discharge connection at the active storage sump, used for the pump station.
- Interconnecting sewer gravitation pipe work between the temporary site facilities drainage connection and the pump station storage sump connection.

REQUIREMENTS

The water and drainage connection scope of works must comply with the following;

- The above mentioned equipment requirement.
- The National Building Regulation.
- The applicable SANS 1200 requirements
- The latest Occupational Health and Safety Act.

PS C 012 – Execution of Works Method Statement

The Contractor must submit as part of his tender bid, method statements for the following;

- A method statement for each different type of installation and construction action, and shall include:
 - The method statement must indicate which bill of quantity sections and items are abdicable.
 - The method statement must give a clear description of the type of action.
 - The method statement must clearly describe and list the minimum labour requirement for the specific action.
 - The method statement must clearly describe and list the minimum equipment and tools required for the specific action.
 - The method statement must clearly describe the step by step chronological execution of the action.
 - The method statement must clearly describe the risks involved with the specific action, and the Contractor's precautionary provisions to eliminate and address the risks.
 - The method statement must clearly indicate the specification and regulations considered to compile the method statement.
 - The method statement must clearly indicate compliance with the Specifications (including the latest Occupational Health and Safety Act and the Employers Health, Safety and Environmental Specifications).

PS M_001 – Mechanical Screening

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of the mechanical screening equipment, part of the pump stations and waste water treatment works, as per the specified requirements below.

DETAILED PERFORMANCE REQUIREMENTS

Leeuwnkuil Inlet Works:

One (1) mechanical front rake screens shall be supplied, delivered, installed, tested and commissioned at the inlet works channel. The channel is 1400mm wide. The screens shall be manufactured from 304/316 stainless steel and have a bar spacing of 10mm.

Screens shall be designed to retain only inorganic material, and shall incorporate a screenings washing system to minimize the amount of organic material removed with the screenings. The screenings are transported to the top of the screen by a continuous travelling rake bar system. This shall be controlled by a timer, level control switch or set to continuous under high flows. A discharge chute then conveys the screenings to the screenings conveyance system.

The mechanical front rake screens shall be supplied with an inductive climatic-proofed proximity overload switch to ensure that when debris block the screen, an alarm will sound, the screen will shut down and a power surge will not occur.

The environmental working conditions are industrial, wet, pollution degree 3 with temperature range from - 20°C to 40°C and humidity from 40% to 100%.

The maximum water level upstream of the screens (level of the emergency overflow weir) is 700mm above the bottom of the inlet channel.

The exposed face of the screen is to have hinged doors installed to offer adequate protection to the operator.

The design flows for the screens are as follows:

| | | |
|---------------------------------|-------------|---------|
| Average Dry Weather Flow (ADWF) | 20.0 Ml/day | 231 l/s |
| Peak Dry Weather Flow (PDWF) | 36.6 Ml/day | 424 l/s |
| Peak Wet Weather Flow (PWWF) | 54.9 Ml/day | 636 l/s |

The total PWWF flow of 54.9 Ml/day or 636 l/s must be catered for.

It may be possible to re-use the outer cage of the existing screen that is installed at the Inlet Works of the Leeuwnkuil WWTW and the Contractor must allow for this in his quotation.

Rietspruit Inlet Works:

The existing inlet channel at the 20 Ml/day Rietspruit WWTW contains the following mechanical equipment:

- Two (2) coarse screens with screenings conveyor and washer compactor;
- One (1) fine screen with screenings conveyor and washer compactor; and
- One (1) vortex degritter with grit removal system and grit classifier.

The condition and operability of the existing equipment is currently unknown, and it shall be the responsibility of the Contractor, once appointed, to undertake investigations of the existing equipment and to determine whether it can be refurbished or whether new equipment will be required. The Contractor shall provide the Engineer with his findings and a proposal to either refurbish or replace the existing equipment.

Should the Contractor propose replacement of any of the equipment, the specifications given below and in the relevant Standard Specifications shall apply.

Should the Contractor propose replacement of any of the equipment, the Contractor shall be responsible for the removal of the existing mechanical equipment at the existing inlet works channel and relocation of this equipment to the Employer/Emfuleni Local Municipality's store. The Contractor shall also be responsible for keeping the inlet works live and operational during the refurbishment and/or replacement of any equipment.

Mechanical equipment shall be installed at the existing inlet channels. The Contractor shall inspect and measure the existing inlet channels in order to prepare his Proposal.

The design flows for the inlet works are as follows:

| | | |
|---------------------------------|---------------------------|-------------------|
| Average Dry Weather Flow (ADWF) | 20.0 Ml/day | 231 l/s |
| Peak Dry Weather Flow (PDWF) | 36.0 Ml/day | 417 l/s |
| Peak Wet Weather Flow (PWWF) | 43.9 Ml/day – 47.2 Ml/day | 508 l/s – 547 l/s |

The peak wet weather flow of 47.2 Ml/day or 547 l/s must be catered for in all inlet works equipment.

WORKS

The refurbishment scope of works for the mechanical screen will typically entail the following;

- Isolate, drain and clean the civil structure where the mechanical screen is installed.
- Completely disconnect the mechanical screen from the existing infrastructure where it is installed.
- Remove the mechanical screen from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the mechanical screen completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the mechanical screen to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the mechanical screen, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the mechanical screen to site.
- The refurbished mechanical screen may now be installed.
- The mechanical screen must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the mechanical screen for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the mechanical screen, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.

- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the mechanical screen during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The mechanical screen must provide adequate hydraulic treatment capacity as per the original design specification, making provision for peak flows.
- The mechanical screen will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the mechanical screen must be similar or better than the original design.
- Coarse screen aperture must be between 10 to 8mm, and fine screen aperture between 6 to 4mm.
- Traveling perforated plate screenings field will be preferred.
- The mechanical screen must facilitate automating screen field cleaning, by means of mechanical scrubbing and high pressure wash water.
- The mechanical screen must be protected against damage, by means of drive torque monitoring.
- The mechanical screen must discharge the removed screening into the screenings conveyor. The discharge chute, into the conveyor must be totally enclosed to eliminate water spray. The chute enclosure must be accessible for inspection and removable for maintenance and cleaning.
- The mechanical screen's refurbishment must ensure that it is robust and ensure maximum treatment performance and minimal operation and maintenance requirements.
- The refurbished mechanical screen must ideally suit the existing civil structural housing.
- The refurbished mechanical screen must properly and efficiently interact with the adjacent and accompanying equipment.
- The mechanical screen adjacent equipment will be refurbished to totally eliminate any water spray or water spillage.
- The mechanical screen, as the complete assembly and as the individual assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS M_002 – Screenings Conveyor, Screw Press & Waste Bin Storage

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of the screening conveyance, dewatering and waste bin storage (screenings handling) equipment, part of the pump stations and waste water treatment works, as per the specified requirements below.

DETAILED PERFORMANCE REQUIREMENTS

Screenings Hydro Conveyor

Should a new Screenings Hydro Conveyor be required to replace the existing, one (1) screenings conveyance system shall be supplied, delivered, installed, tested and commissioned for collection of screenings. The conveyance system shall be of the hydro-conveyor type and each shall convey the screenings to the screenings washer/compactors. Municipal water shall be used as wash water until such a time that the quality of the effluent of the works meets the licence requirements.

The installation of the hydro conveyor enables the screenings to be transported to the screenings washer/compactor by motive water flow and gravity. It is essential to regularly check for unusual debris or large items that may influence the effectiveness of the unit. These must be manually removed. The hydro conveyor is fixed to the floor at a suitable elevation and incline as required.

The performance of the hydro conveyor shall comply with the following:

| | |
|--|---|
| Capacity: | 10 l/s |
| Operating Range: | 1 000 kg/hr |
| Conveyor length: | 2 – 20 m |
| Conveyor diameter: | 300 mm U-shaped channel |
| Installation angle: | Typically 5° |
| Material: | 304/316 stainless steel |
| Water pump for coarse screen conveyance: | Centrifugal pump with a capacity of 2 l/s |

Screenings Washer Conveyor

One (1) screenings washer and compactor system shall be supplied, delivered, installed, tested and commissioned for the washing and compaction of the screenings.

The screenings washer/compactor shall be of the screw nozzle / impeller washer type. Screenings enter the feeding hopper from the hydro conveyor. The impeller washes the organics out and the screw compacts the washed screenings. The screenings exit via an outlet chute into a waste skip.

The screenings washer and compactor shall comply with the following:

| | |
|-----------|-------------------------------|
| Material: | generally stainless steel 304 |
| Capacity: | up to 5m ³ /hr |

| | |
|-------------------------|--|
| Guaranteed dry solids: | up to 50% |
| Volume of feed hopper: | 0.5m ³ |
| Agitator type: | direct couple / recess vortex impeller |
| Wash-water consumption: | 1.5 l/s @ 3 bar |

Waste Skip Bins

Two (2) No. waste skips and trolleys for easy moving shall be supplied and delivered for the collection and removal of the washed screenings. The skip bins must be self-draining and the filtrate liquid must be captured and returned to the inlet works channels.

| | |
|----------------------|---|
| Volume of the skips: | 6 - 10m ³ |
| Mass when dry: | 350 – 600 kg |
| Mass when full: | 3000 – 4500 kg |
| Material: | mild steel - fusion bonded epoxy coated |

WORKS

The refurbishment scope of works for the screenings handling equipment will typically entail the following;

- Isolate, drain and clean the civil structure where the screenings handling equipment are installed.
- Completely disconnect the screenings handling equipment from the existing infrastructure where it is installed.
- Remove the screenings handling equipment from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the screenings handling equipment completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the screenings handling equipment to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the screenings handling equipment, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the screenings handling equipment to site.
- The refurbished screenings handling equipment may now be installed.
- The screenings handling equipment must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the screenings handling equipment for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the screenings handling equipment, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.

-
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the screenings handling equipment during the refurbishment process.
 - The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
 - The screenings handling equipment must provide adequate solids handling capacity as per the original design specification, making provision for peak flows.
 - The screenings handling equipment will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
 - Material used to refurbish the screenings handling equipment must be similar or better than the original design.
 - The screenings handling equipment must receive the removed screening from the mechanical screen.
 - The screenings handling equipment may consist of screenings conveyors, screenings screw presses and a duty/stand-by waste bin system.
 - The Screenings conveyor must receive the screenings from the mechanical screen. The receiving chute and conveyor must be totally enclosed to eliminate water spray. The chute and conveyor must be accessible for inspection, and removable for maintenance and cleaning.
 - The conveyor must convey all received screenings to the screw press, without screenings left behind in the conveyor.
 - A hydro-conveyor will be preferred.
 - The conveyor must collect screenings from all the mechanical screens and the hand screens.
 - The Screw press must receive the screenings from the conveyor. The receiving chute and press must be totally enclosed to eliminate water spray. The chute and press must be accessible for inspection, and removable for maintenance and cleaning.
 - The press must wash and de-water all received screenings from the conveyor, without screenings left behind in the press.
 - A screw wash press will be preferred, utilising high pressure wash water for efficient screenings wash and de-watering.
 - The press must receive all screenings from all the mechanical screens and the hand screens, via the conveyor.
 - The screw press must ensure maximum screenings wash and de-watering to enable the return of all organic matter removed with the screenings.
 - The screw press must ensure maximum wash and de-watering of the screenings to also ensure a clean and dry screenings discharge, to eliminate fly and insect attraction and odour reduction.
 - The screw press must discharge the washed and de-watered screenings into the duty waste bin.
 - The screenings handling equipment must include the wash water supply system, providing all water for the mechanical screens, conveyors and the screw press. The wash water system must have for a minimum 1x duty wash water supply pump and 1x stand-by. High pressure instead of high water volumes, with regards to wash water use, is preferred, to limit the water volumes to be supplied for wash water and to be returned to the main raw sewage stream.
 - The waste bin system will comprise of, three waste bins (1x duty, 2x standby), each with a dolly, on a rail system (manually movable when bins are filled) and one trailer, operate-able by the hydraulic system of a 65kW (4x4) tractor.
 - The waste bin system layout must compliment the access for the removal and return of the waste bins, but must inter act with the integrated screening system, from the screen, to the screw press, via the conveyor.
 - The screenings handling equipment refurbishment must ensure that it is robust and ensure maximum treatment performance and minimal operation and maintenance requirements.
 - The refurbished screenings handling equipment must ideally suit the existing civil structural housing.

- The refurbished screenings handling equipment must properly and efficiently interact with the adjacent and accompanying equipment.
- The screenings handling equipment will be refurbished to totally eliminate any water spray or water spillage.
- The screenings handling equipment, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS M 003 – Hand Screening

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of the hand screening equipment, part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

The refurbishment scope of works for the mechanical screen will typically entail the following;

- Isolate, drain and clean the civil structure where the hand screen is installed.
- Completely disconnect the hand screen from the existing infrastructure where it is installed.
- Remove the hand screen from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the hand screen completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the hand screen to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the hand screen, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the hand screen to site.
- The refurbished hand screen may now be installed.
- The hand screen must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the hand screen for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the hand screen, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the hand screen during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The hand screen must provide adequate hydraulic treatment capacity as per the original design specification, making provision for peak flows.
- The hand screen will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the mechanical screen must be similar or better than the original design.
- Coarse screen aperture must be between 25 to 15mm, and fine screen aperture between 8 to 6mm.

- Static, 45° inclined bar screen field will be preferred.
- The hand screened screenings must be dumped into the screenings conveyor. The discharge chute, into the conveyor must be totally enclosed to eliminate water spray.
- The hand screen's refurbishment must ensure that it is robust and ensure maximum treatment performance and minimal operation and maintenance requirements.
- The refurbished hand screen must ideally suit the existing civil structural housing.
- The refurbished hand screen must properly and efficiently interact with the adjacent and accompanying equipment.
- The hand screen, as the complete assembly and as the individual assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS M_004 – Mechanical De-Gritting, Classification & Waste Bin Storage

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of the de-gritting, classification and waste bin storage equipment (de-gritting equipment), part of the pump stations and waste water treatment works, as per the specified requirements below.

DETAILED PERFORMANCE SPECIFICATIONS

Leeuwkuil Inlet Works:

One (1) vortex degritter/pista trap is located after the screenings channels at the existing Inlet Works. The vortex degritter is shown in Annexure C. The chamber is circular with an outer diameter of 6000mm, a 45 degree sloping floor and an inner diameter of 1500mm (refer to Section A-A for details).

The required operating range of the vortex degritter is as follows:

| | |
|-------|---------|
| ADWF: | 231 l/s |
| PDWF: | 424 l/s |
| PWWF: | 636 l/s |

Paddle Mixer

One (1) vortex de-gritting paddle mixer is required to separate the grit from the wastewater at the existing Inlet Works. The paddles are in contact with the wastewater and are to be rotated by a motor and gearbox in order to induce a vortex in the fluid inside the degritting chamber.

The following are the key design parameters for the grit paddle mixer:

| | |
|-----------------------------|--------------------------|
| Vortex Tank Diameter: | 6000mm |
| Operating speed of paddles: | 6 – 14 rpm |
| Influent flowrate: | 231 – 636 l/s |
| Grit separation efficiency: | 90% of particles > 200µm |

Grit Pump

The grit pump for the capture of grit at the vortex degritter shall be a self-priming type pump with 63mm solids handling capacity. The grit pump shall be installed on the concrete walkway above the vortex degritter chambers and in such a way that the suction pipework does not impede the operation of the paddle mixers. The delivery pipework shall transfer the captured grit into the grit washer.

The impeller of the grit pump shall be constructed of a hardened material for abrasion resistance, such as heat-treated ductile iron. The wear rings shall be double heat treated 420 stainless steel.

The Contractor shall provide the pump sets complete with all pipework, valves and fittings, and any other ancillaries to make the grit pump sets and grit capture system complete and operational.

Grit Washer

One (1) grit washer to be supplied, delivered, installed, tested and commissioned.

The grit washer unit shall consist of two basic items, a grit wash tank and a discharge screw. The grit/water mixture is fed into the grit washer tangentially via the inlet flange of the grit wash tank to enhance grit settling. Organic matter is held in suspension and floated off while the grit is deposited in the tank as sediment. With the addition of water, the sediment grit is separated from the remaining organic constituents using a stirring device and up-current technique. The washed grit is removed from the tank, de-watered and discharged via a shaftless discharge screw conveyor to a waste skip.

The following are the key design parameters for the grit washer:

| | |
|---|---------------|
| Grit/slurry flow rate: | 18 l/s |
| Grit processing rate: | 50 cfh |
| Capture rate >200um grit: | 95% |
| Maximum volatile solids in discharged grit: | 3% |
| Maximum water content in discharged grit: | 15% |
| Wash-water consumption: | 1 l/s @ 2 bar |

Rietspruit Inlet Works:

One (1) vortex degritter/pista trap is located after the screenings channels at the existing Inlet Works.. The chamber is circular with an outer diameter of approximately 5000mm, a 45 degree sloping floor

The required operating range of the vortex degritter is as follows:

| | |
|-------|--------------|
| ADWF: | 231 l/s |
| PDWF: | 417 l/s |
| PWWF: | 508 -547 l/s |

Paddle Mixer

Should a new Paddle Mixer be required to replace the existing, one (1) vortex de-gritting paddle mixer is required to separate the grit from the wastewater at the existing Inlet Works. The paddles are in contact with the wastewater and are to be rotated by a motor and gearbox in order to induce a vortex in the fluid inside the degritting chamber.

The following are the key design parameters for the grit paddle mixer:

| | |
|-----------------------------|--|
| Vortex Tank Diameter: | Approx. 5000mm (to be confirmed by Contractor) |
| Operating speed of paddles: | 6 – 14 rpm |
| Influent flowrate: | 231 – 547 l/s |
| Grit separation efficiency: | 90% of particles > 200µm |

Grit Pump

Should a new Grit Pump be required to replace the existing, the grit pump for the capture of grit at the vortex degritter shall be a self-priming type pump with 63 mm solids handling capacity. The grit pump shall be installed on the concrete walkway above the vortex degritter chambers and in such a way that the suction pipework does not impede the operation of the paddle mixers. The delivery pipework shall transfer the captured grit into the grit washer.

The impeller of the grit pump shall be constructed of a hardened material for abrasion resistance, such as heat-treated ductile iron. The wear rings shall be double heat treated 420 stainless steel.

The Contractor shall provide the pump sets complete with all pipework, valves and fittings, and any other ancillaries to make the grit pump sets and grit capture system complete and operational.

Grit Washer

Should a new Grit Washer be required to replace the existing, one (1) grit washer to be supplied, delivered, installed, tested and commissioned.

The grit washer unit shall consist of two basic items, a grit wash tank and a discharge screw. The grit/water mixture is fed into the grit washer tangentially via the inlet flange of the grit wash tank to enhance grit settling. Organic matter is held in suspension and floated off while the grit is deposited in the tank as sediment. With the addition of water, the sediment grit is separated from the remaining organic constituents using a stirring device and up-current technique. The washed grit is removed from the tank, de-watered and discharged via a shaftless discharge screw conveyor to a waste skip.

The following are the key design parameters for the grit washer:

| | |
|---|--------|
| Grit/slurry flow rate: | 18 l/s |
| Grit processing rate: | 50 cfh |
| Capture rate >200µm grit: | 95% |
| Maximum volatile solids in discharged grit: | 3% |
| Maximum water content in discharged grit: | 15% |

Wash-water consumption: 1 l/s @ 2 bar

WORKS

The refurbishment scope of works for the de-gritting equipment will typically entail the following;

- Isolate, drain and clean the civil structure where the de-gritting equipment are installed.
- Completely disconnect the de-gritting equipment from the existing infrastructure where it is installed.
- Remove the de-gritting equipment from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the de-gritting equipment completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the de-gritting equipment to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the de-gritting equipment, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the de-gritting equipment to site.
- The refurbished de-gritting equipment may now be installed.
- The de-gritting equipment must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the de-gritting equipment for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the de-gritting equipment, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the de-gritting equipment during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The de-gritting equipment must provide adequate solids handling capacity as per the original design specification, making provision for peak flows.
- The de-gritting equipment will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the de-gritting equipment must be similar or better than the original design.
- The de-gritting equipment must consist of the grit removal equipment, the grit classification equipment and a duty/stand-by waste bin system.
- The grit removal equipment must periodically, continuously over a 24 hour period, remove the vortex settled grit from the bottom of the Pista Trap, and convey the grit-water solution to the classifier.
- A Pista Trap paddler, self-priming de-gritting pump and pipe work will be preferred.
- The paddler must be optimally sized to maintain a minimum velocity flow through the Pista, to ensure the non-settlement of the organic material. The paddler will run 24 hour per day.
- The de-gritting pump will be hydraulically sized to pump the ideal flow to the grit classifier.

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- The pump will be selected to optimally suit the duty point, with the suction lift conditions.
 - The pump will feature special materials to increase life expectancy under the conditions it will perform in, thus handling grit and sand.
 - The suction and delivery pipe work and valves will be selected to suit the hydraulic system requirements.
 - The pipe work and valves will be manufactured from 304 Stainless Steel material.
 - The grit pump will suck from the bottom of the Pista Trap, to the inlet connection of the classifier.
 - The layout of the de-gritting equipment will be such to ensure minimum distances between the equipment.
 - Pipe work and equipment will be retro-fitted to the existing civil structure and layout.
 - The suction pipe will run vertically down to the bottom of the Pista Trap, through the hollow shaft of the paddler.
 - The de-gritting pump will feature a by-pass flow, from the delivery, to the suction pipe work at the bottom of the Pista Trap, for settled grit flotation. The by-pass flotation pipe work must also feature the connection for compressed air, for un-clogging of the suction pipe work.
 - The grit classifier will receive the removed grit from the de-gritting pump(s).
 - The classifier must be optimally sized to receive the hydraulic and solids load from the Pista Trap.
 - The classifier must be totally enclosed, to eliminate any spray of spillages.
 - The enclosed classifier must allow access for inspection, operation and maintenance.
 - The stilling volute of the classifier must be specially designed to optimally settle the grit and sand particle, but not the organic material to be returned.
 - The classified (settled) flow from the Pista Trap must be returned to the main sewage stream, up-stream from the Pist Trap inflow.
 - The settled grit, must be continuously be augured from the bottom of the stilling volute, to the discharge chute of the classifier.
 - The design of the wearing-liner of the screw or spiral auger must ensure maximum operational life, ease of maintenance and most importantly, maximum grit de-watering.
 - The classifier discharge must discharge into the duty waste bin.
 - The main manufacturing material of the classifier will be 304 Stainless Steel, excluding the auger and its wearing liner.
 - The discharge from the classifier into the duty waste bin will feature a down feed chute to eliminate any spillage outside the bin.
 - The waste bin system will comprise of, three waste bins (1x duty, 2x standby), each with a dolly, on a rail system (manually movable when bins are filled) and one trailer, operate-able by the hydraulic system of a 65kW (4x4) tractor.
 - The waste bin system layout must compliment the access for the removal and return of the waste bins, but must inter act with the integrated de-gritting equipment system, from the Pista Trap to the classifier.
 - The de-gritting equipment refurbishment must ensure that it is robust and ensure maximum treatment performance and minimal operation and maintenance requirements.
 - The refurbished de-gritting equipment must ideally suit the existing civil structural housing.
 - The refurbished de-gritting equipment must properly and efficiently interact with the adjacent and accompanying equipment.
 - The de-gritting equipment will be refurbished to totally eliminate any water spray or water spillage.
 - The de-gritting equipment, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS M_005 – Sluice Gates, Penstocks, Hand stops & Flow Control Devices

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of the sluice gates, penstock, hand stops and flow control devices (flow control equipment) part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

The refurbishment scope of works for the flow control equipment will typically entail the following;

- Isolate, drain and clean the civil structure where the flow control equipment are installed.
- Completely disconnect the flow control equipment from the existing infrastructure where it is installed.
- Remove the flow control equipment from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the flow control equipment completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the flow control equipment to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the flow control equipment, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the flow control equipment to site.
- The refurbished flow control equipment may now be installed.
- The flow control equipment must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the flow control equipment for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the flow control equipment, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the flow control equipment during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The existing flow control equipment must be refurbished, especially where the frame has been grouted into the concrete.
- The flow control equipment will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.

- Material used to refurbish the flow control equipment must be similar or better than the original design.
- The flow control equipment may consist of sluice gates, penstocks, hand stops, tilting weirs and other flow divide/control devices.
- Any equipment, especially the guide frames, cast and grout into the concrete that has be damaged beyond repair, the equipment must be replaced.
- If the grouted and cast fixed parts and equipment are intact and will ensure maximum life expectancy, the equipment can be refurbished.
- All gates must be removed and check for alignment and damage.
- All seals must be replaces.
- If the spindles are intact and will ensure maximum life expectancy, the equipment can be refurbished.
- Head gear, including the hand wheel, bearing, head gear nut, spacer lock and spindle cover can be refurbished if intact and the maximum life expectance can be ensured, otherwise it must be replaced.
- The refurbishment of the flow control equipment must ensure proper flow isolation and control.
- The flow control equipment refurbishment must ensure that it is robust and ensure maximum treatment performance and minimal operation and maintenance requirements.
- The refurbished flow control equipment must ideally suit the existing civil structural housing.
- The refurbished flow control equipment must properly and efficiently interact with the adjacent and accompanying equipment.
- The flow control equipment, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS M_006 – Provisional Sum for Mechanical Equipment

SCOPE OF WORKS

The scope of works includes the cost to cover the refurbishment and repair and maintaining during the Defects Notification Period, of all the mechanical equipment part of the pump stations and waste water treatment works, as per the specified requirements below.

EQUIPMENT PART OF THE SCOPE OF WORKS

The Contractor must thoroughly inspect, measure and quote, including for all material, manufacturing, labour or any necessary work, for the refurbishment, repair and or replacement of the particular mechanical equipment. The scope of work cover all and any mechanical related equipment, infrastructure and facilities, which entails typically the following;

- Mechanical screen, screenings conveyors, screenings screw presses and waste bin systems.
- Hand screens. Screening baskets and rag-catchers.
- Grit removal equipment, grit classifiers and waste bin systems.
- Sluice gates, penstocks, hand stops, tilting weirs and flow control devices.
- Pumps; centrifugal, self-priming, end-suction, submersible, screw, etc.
- Steel pipe work.
- Valves, non-return valves, control valves, actuators, air release etc.
- Bridge scraper mechanisms.
- Mixers; vertical shaft, submersible, pumps-mixing.
- Aerators: vertical shaft surface.
- Chemical dosing equipment.
- Material handling and lifting.
- Bio-filter rotating distribution arm-mechanism.

REQUIREMENTS

Typical mechanical requirements, entail the following;

- Mechanical equipment must perform their original intended design function.
- Mechanical equipment must be structurally sound.
- Mechanical equipment must comply with all applicable SANS requirements.
- Mechanical equipment must comply with the latest Occupational Health and Safety Act.
- Special requirements by the Engineer and/or the Employer will be specified during the inspection and the determination of the scope or works for the particular mechanical equipment.

PROVISIONAL SUM MANAGEMENT

The provisional sum to cover the cost for the refurbishment of the equipment and structures must be managed.

This is not a quantified sum, therefore the management of the provisional sum will be addressed as follows;

- The Contractor will prepare a quotation, covering the applicable equipment, after thoroughly inspecting and assessing the equipment and structures condition. The Contractors quoted price will

include for all equipment, supply, manufacturing, and the delivery, installation, commissioning and maintaining during the Defects Notification Period.

- The quotation will be evaluated and approved by the Engineer and the Employer, before the Contractor may continue to procure or install any equipment.
- The approved cost for the Contractor will be the quote plus mark-up.
- The mark-up will be pre-approved during the tender evaluation procedure.

PS M 007 – Pump Sets

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of the pump sets part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

The refurbishment scope of works for the pump sets will typically entail the following;

- Isolate, drain and clean the civil structure where the pump set are installed.
- Completely disconnect the pump set from the existing infrastructure where it is installed.
- Remove the pump set from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the pump set completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the pump set to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the pump set, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the pump set to site.
- The refurbished pump set may now be installed.
- The pump set must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the pump set for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the pump sets, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the pump sets during the refurbishment process.

- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The pump sets will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the pump sets must be similar or better than the original design.
- The materials and parts used for the refurbishment of the pump sets shall at all times be original manufactured material and parts. No second grade, no-name branded replacement material or parts will be acceptable. The Contractor and the supplier of the material and parts must provide proof of the material quality and origin.
- The pump sets include the pump, coupling/drive connection, electrical motor and the base plate (frame).
- The pump types include, centrifugal, end-suction, self-priming, submersible, screw pumps, fixed installations and mobile units.
- The existing pump sets, to be refurbished, will perform according to their original design requirements. During the pump inspection stage, the Contractor will confirm with the Engineer whether the existing pump duty are sufficient for the application.
- During the pump inspection stage, the Contractor will confirm with the Engineer whether the existing type of pump and rest of the assembly sufficient for the application.
- During the pump inspection stage, the Contractor will confirm with the Engineer whether the existing installation configuration and layout is sufficient for the application.
- The pump set refurbishment must ensure that it is robust and ensure maximum handling performance and minimal operation and maintenance requirements.
- The pump set must ideally suit the existing civil structural housing.
- The pump set must properly and efficiently interact with the adjacent and accompanying equipment.
- The pump set, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

MOBILE PUMP SET UNITS

Requirements for the supply, manufacture, deliver, installation, commissioning, operation and maintaining during the Defects Notification Period of new mobile pump sets entail the following;

- The pump selected for the particular duty, will feature the ideal characteristic for the application.
- The pump selected for the mobile unit, will be manufactured of the best available material and the best manufacturing processes. The Contractor and supplier must provide proof the quality control and origin of the material used.
- The pump will be a centrifugal, self-priming pump unit, adequately selected to accommodate the priming conditions of the system.
- The Contractor and supplier must provide proof, assurance and guarantees of the pump's performance, as per the design, application and their internal testing.
- The pump will be driven by a premium efficiency electrical motor, sized for the maximum delivery of the pump, not only the required duty required.
- The motor will at least 20% spare capacity.
- The motor will suit the main (Eskom) electrical and standby power supply.
- The motor-pump coupling will be direct, with the best available quality and technology type coupling.
- The motor-pump assembly will be mounted onto a skid-type base frame.
- The base frame must be designed to handle and absorb all static and dynamic loads from the operational conditions of the pump set, including suction and delivery pipe work.

- The skid frame must be designed to handle movement, skidding, on the installed area (paving, concrete slab, natural ground and prepared terraces).
- The mobile pump set unit must be completely stand alone, only requiring an electrical supply cable connection.
- The mobile pump set unit must facilitate its own motor control switch gear, mounted onto the skid base frame. The switch gear control panel must provide soft start motor control, with the best available technology equipment. The control gear must provide the best protection against power surges, power stability and motor-pump malfunction.
- The mobile pump set unit must be designed for outside weather conditions, without any cover or additional protection against the environmental conditions.
- The mobile pump set unit must be designed to be lifted via crane or high-up, from the transport, onto the place of installation.

PS M_008 – Pipe Work, Valves & Accessories

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of all steel pipe work, valves, jointing sets and accessories (pipe work), part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

The refurbishment scope of works for the pipe work will typically entail the following;

- Isolate, drain and clean the civil structure where the pipe work are installed.
- Completely disconnect the pipe work from the existing infrastructure where it is installed.
- Remove the pipe work from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the pipe work completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the pipe work to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the pipe work, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the pipe work to site.
- The refurbished pipe work may now be installed.
- The pipe work must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the pipe work for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the pipe work, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the pipe work during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The pipe work will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the pipe work must be similar or better than the original design.
- The materials and parts used for the refurbishment of the pipe work shall at all times be original manufactured material and parts. No second grade, no-name branded replacement material or parts

will be acceptable. The Contractor and the supplier of the material and parts must provide proof of the material quality and origin.

- The pipe work include the steel pipe work, special pipe pieces, isolation valves, non-return valves, air-release valves, adaptors, jointing sets, flexible couplings, pipe supports, pressure gauges and other instrumentation sockets.
- Pipe work must be as per the drawing and design specification.
- During the pipe work inspection stage, the Contractor will confirm with the Engineer whether the existing installation configuration and layout is sufficient for the application.
- The pipe work refurbishment must ensure that it is robust and ensure maximum handling performance and minimal operation and maintenance requirements.
- The pipe work must ideally suit the existing civil structural housing.
- The pipe work must properly and efficiently interact with the adjacent and accompanying equipment.
- The pipe work, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

MOBILE PUMP SET UNIT's PIPE WORK

Requirements for the supply, manufacture, deliver, installation, commissioning, operation and maintaining during the Defects Notification Period of new pipe work for the mobile pump set units entail the following;

- The pipe work for the mobile pump sets must comply with the above regulations.
- Each mobile pump set must have its own suction pipe, from the storage sump to the pump suction.
- The pump deliveries will both discharge into a jointing manifold, running to the delivery connection chamber.
- Each suction will facilitate a bell-mouth suction entrance, with minimum one isolation valve.
- Each pump delivery will have minimum one isolation and one non-return valve.
- The single delivery line will also have an isolation valve.
- The pipe work installation configuration will be semi-permanent, thus although mobile and easily removable, it must be properly secured and supported from the suction point, surface running to the pump, at the pump suction and delivery connection, running to the delivery connection and at the connection chamber.
- The pipe work must be high quality flexible hose, reinforced to endure the working pressures and the handling during setup and removal actions.
- The pipe routes and layout must be minimum distances and the suction must be kept especially short.
- The pipe work must not be covered and must not be laid across general access ways.

PS M_013 – Material Lifting Equipment

SCOPE OF WORKS

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintaining during the Defects Notification Period, of the material lifting equipment, part of the pump stations and waste water treatment works, as per the specified requirements below.

WORKS

The refurbishment scope of works for the material lifting equipment will typically entail the following;

- Isolate, drain and clean the civil structure where the material lifting equipment are installed.
- Completely disconnect the material lifting equipment from the existing infrastructure where it is installed.
- Remove the material lifting equipment from the installed position, onto proper transportation and transport to the Contractors (or sub-Contractor's) workshop.
- Dismantle and strip the material lifting equipment completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the material lifting equipment to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and Employer will be notified timeously of the completion of the refurbishment and repair work on the material lifting equipment, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the material lifting equipment to site.
- The refurbished material lifting equipment may now be installed.
- The material lifting equipment must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the material lifting equipment for the Defect Notification Period.

REQUIREMENTS

Requirements during the refurbishment process and the final performance of the material lifting equipment, entail the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the material lifting equipment during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The material lifting equipment will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the material lifting equipment must be similar or better than the original design.

- The materials and parts used for the refurbishment of the material lifting equipment shall at all times be original manufactured material and parts. No second grade, no-name branded replacement material or parts will be acceptable. The Contractor and the supplier of the material and parts must provide proof of the material quality and origin.
- The material lifting equipment include electrical hoists, manual hoists, hoist trollies, trolley drives (electrical and manual), remote control, trailing cables and rails, specialised lifting clamps and equipment, beams and booms.
- During the inspection stage, the Contractor will confirm with the Engineer the SWL capacities of all the material lifting equipment, to ensure the capacity of the equipment are sufficient.
- During the inspection stage, the Contractor will confirm with the Engineer whether the existing installation configuration and layout is sufficient for the application.
- The material lifting equipment refurbishment must ensure that it is robust and ensure maximum handling performance and minimal operation and maintenance requirements.
- The material lifting equipment must ideally suit the existing civil structural housing.
- The material lifting equipment must properly and efficiently interact with the adjacent and accompanying equipment.
- The material lifting equipment, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS_M_015 – Rock Catcher for Pump Station 34

PS_M_015.1 GENERAL

This Specification shall apply to the rock catcher at the existing Pump Station 34 at the Leeuwkuil WWTW.

The following Standard Specifications are to be read in conjunction with this section:

- MGD: General Mechanical
- MCP: Corrosion Protection
- MMM: Machine Mountings
- MMA: Nuts, Bolts and Fastening Sets

All related SANS specifications will apply for the material, equipment or method of manufacturing forming part of the complete design and assembly of the rock catcher.

Where applicable, and the SANS does not provide sufficient specification on the material, equipment or method of manufacturing, the designer and or manufacturer shall state the applicable BS, ANSI or EN followed design, manufacture and install the rock catcher.

The rock catcher must be designed, manufactured, and installed in the existing sewage Pump Station 34, for the purpose of catching and removing large solid objects, conveyed via the outfall sewer line discharging into the existing receiving manhole of Pump Station 34.

The rock catcher will be utilized in the existing Pump Station 34 until the New Pump Station 34 is constructed. The rock catcher will at that stage be removed from the existing Pump Station 34 and installed inside the New Pump Station 34.

The following specification and information will collectively describe the equipment and final product to be referred to as the rock catcher.

PS_M_015.2 DESIGN CRITERIA

The following specification and information will collectively describe the equipment and final product to be referred to as the rock catcher.

PS_M_015.2.1 Position of Installation

The rock catcher shall be installed in the receiving manhole of the existing Pump Station 34. The Contractor must take note that the rock catcher will only be utilized inside Pump Station 34 for the interim, until the new Pump Station 34 has been constructed.

Therefore, the design, supply and manufacture of the rock catcher must be such as to suit both the existing and the new pump station layouts and configurations.

The existing Pump Station 34 consist of three pre-cast manhole structures. The first manhole receives the sewage inflow from the outfall sewer pipeline. The flow these divides into two separate manholes which serves as the suction sumps for the existing pumps.

The rock catcher shall, for this scope of works, be installed in the receiving manhole sump of the existing Pump Station 34.

The receiving manhole is a pre-cast manhole structure, with a nominal diameter of 1500mmØ. The outfall sewer pipeline diameter is 500mmØ. The invert of the receiving manhole sump is expected to be 8500mm from the top of the manhole.

The Contractor must confirm the actual dimensions before commencing with the design procedure of the rock catcher.

The following figure shows the existing Pump Station 34:



Figure 1: Existing Pump Station 34

The rock catcher will only function inside the existing Pump Station 34 for the interim. As and when the new Pump Station 34 has been constructed, the rock catcher must be removed and re-installed inside the inlet chamber of the new Pump Station 34.

The following figure shows the new Pump Station 34:

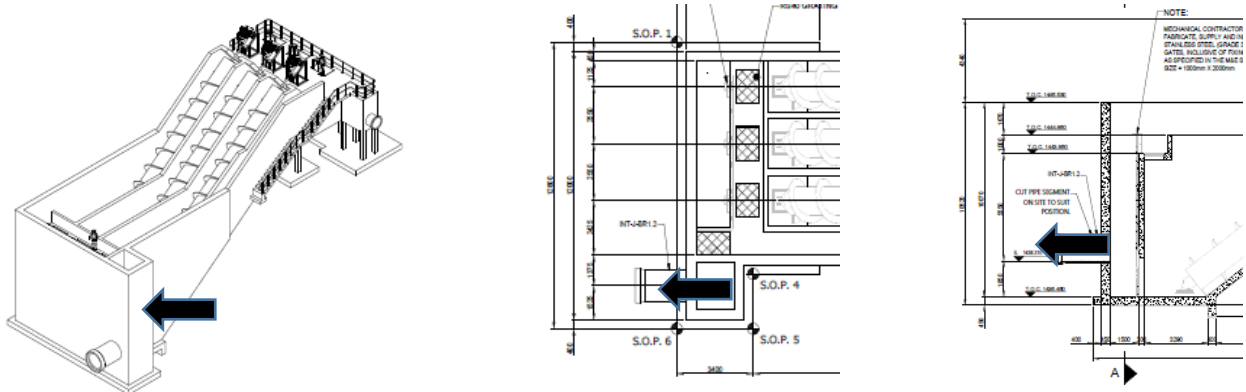


Figure 2: New Pump Station 34

The new Pump Station 34 inlet chamber is 2150 mm wide and 1500 mm long. The pipe invert is 8200 mm deep from the top of concrete. Refer to the drawings part of the contract document for the details of the new Pump Station 34.

PS_M_015.2.2 Hydraulic Load Capacity

The type of flow volume received from the outflow sewer pipeline is typical raw sewage from low to medium income households, via sewer reticulation networks and pump stations. The raw sewage generally contains substantial solids and grit volumes. The rock catcher shall be designed to accommodate the general raw sewage.

The rock catcher shall be designed to always cater for a maximum hydraulic load capacity of 1000 l/s.

PS_M_015.2.3 Functional Performance

The purpose of the rock catcher shall be to catch and retain solids, larger than 40mm in size, suspended in the sewage stream or washed down in the outfall sewer pipeline.

The rock catcher design concept shall include but is not limited to the following.

- i. The Screen Field
- ii. The Solids Basket/Container
- iii. Lifting Guide Rails
- iv. Lifting Mechanism
- v. Discharge conduits and conveyance
- vi. Solids Waste Bin System

The following design features shall be included in the **screen field** design:

- The screen field shall have a bar aperture of 40mm.
- The screen field must allow optimal removal of all captured solids, by means of the removal/rake mechanism, which shall form part of the Solids Basket/Container component.
- The screen field will be fixed onto the existing receiving manhole structure. The Contractor shall ensure that the existing structure is structurally sound to efficiently fix the screen field onto it. The Contractor must provide for any alterations and modifications required to fix the screen field.
- The screen field shall be designed to properly enclose the pipeline opening, ensuring that all flow must pass through the screen field.
- The screen field shall stay in position, to prevent any large solids from passing, during the solids removal procedure of the solids basket/container.
- The screen field mechanism shall be designed to withstand the forces exerted during the capture of the solids and the removal procedure of the solids.
- The screen field shall be manufactured with a high corrosive resistant material. No material that will require layered type of corrosion protection products will be acceptable.
- The screen field shall be designed to suit both inside the existing and the new pump stations.

The following design features shall be included in the **solids basket container**:

- The solids basket component may be of a bottom seated type or a drop-down grab type.

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- The bottom seated type will normally be in position at the bottom of the sump (or channel) and will lift up-ward out of the sump to remove the retained solids from the screen field, to be discharged up-top into the discharge conduits and waste bins.
 - The drop-down grab type will normally be in position at the top, outside, the sump (or channel) and will drop down into the sump (or channel) to grab (or rake) to remove the retained solids from the screen field. The basket will then lift back-up to the top to discharge the solids into the discharge conduits and waste bins.
 - The basket shall efficiently remove any retained and contained solids against the screen field, regardless of the type of solids basket.
 - The basket shall during the removal (or raking) of the screen field, not drop or waste any of the solids back into the sump, either up-stream or down stream from the screen field.
 - The basket shall allow for the maximum load to be removed and lifted to the top, outside the sump.
 - The integration between the screen field and the basket removal (or raking) mechanism shall not allow for solids to collect under the seating position of the basket at the bottom of the sum, unless the removal (or raking) mechanism can remove the solid during the seating action.
 - During the upward and downward traveling of the basket, the basket shall securely and smoothly travel inside the guide rail component of the rock basket. The basket and guide rail inter-action shall be designed as to be self-aligning, to ensure that the basket does not wedge inside the guide rails.
 - The basket shall be designed as to have a proper discharge mechanism and/or motion when the basket reach the top of the sump. The basket discharge mechanism or motion shall ensure 100% discharge of all collected and removed solids, into the waste bin via the discharge conduits and conveyance.
 - After the solids have been discharged, the basket must return to its normal position, waiting for the next cleaning cycle.
 - The basket mechanism shall be designed to withstand the forces exerted during the removal and raking of the screen field, as well as the upwards, downwards and discharge actions of the basket.
 - The basket shall be manufactured with a high corrosive resistant material. No material that will require layered type of corrosion protection products will be acceptable.
 - The basket shall be designed to suit both inside the existing and the new pump stations.

The following design features shall be included in **the lifting guide rails**:

- The purpose of the guide rails shall be to align the basket whilst traveling upwards and down wards inside the sump.
- The guide rails shall self-align the basket to prevent the basket from wedging in the guide rails, with and without any load.
- The guide rails shall be permanently and firmly fixed to the exist pre-cast manhole sump. The Contractor shall provide any additional means or modifications to the manhole sump to accommodate the proper fixing of their rock catcher.
- The guide rails shall support and assist the basket during the solids removal and raking action at the bottom of the sump, as well as the discharge action at the top of the sump.
- The Contractor shall allow and provide the necessary civil support infrastructure outside the sump, to support the proper mounting and fixing of the guide rails at the top of the manhole.
- The guide rails shall be designed to ensure self-cleaning of the rails, to prevent smaller solids from accumulating onto the guiderails. The basket roller or rail fixing shall interact and promote the self-cleaning of the guide rails.
- The guide rail mechanism shall be designed to withstand the forces exerted during the removal and raking of the screen field, as well as the upwards, downwards and discharge actions of the basket.
- The guide rails shall be manufactured with a high corrosive resistant material. No material that will require layered type of corrosion protection products will be acceptable.
- The guide rails shall be designed to suit both inside the existing and the new pump stations.

The following design features shall be included in the **lifting mechanism**:

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- The purpose of the lifting mechanism shall be not only to lift the basket upward and drop it downwards, but also to bring about both the solids removal and the discharge actions of the basket.
 - The lifting mechanism shall efficiently integrate with the basket and guide rails to ensure a smooth and robust lifting and drop action of the basket component.
 - The drive equipment of the lifting mechanism shall be mounted, and fixed on a suitable structural frame, at the top of the sump. The contactor shall provide and make provision for the necessary civil infrastructure to securely fix the lifting mechanism.
 - The drive equipment shall be electrically driven.
 - The lifting mechanism shall have an emergency standby electrical motor/gearbox unit, mounted on the lifting mechanism component, with a mechanical clutch on both drive units. The clutch for both the drive units shall be electrically switched or manually.
 - The physical link between the drive unit and the solids basket shall be preferred to be stainless steel cable. The cable shall be positioned to balance the loads and to promote the self-alignment of the basket inside the guide rails.
 - The typical lifting and drop speed for the basket shall be between 5 to 10 m/s.
 - The safe workload (SWL) for the lifting mechanism shall be approximately 1350 kg, with a minimum 1.5 safety factor for design purposes. The contract shall confirm in their proposal the proposed design criteria for the SWL.
 - The design shall make provision for safe and easy access to, and onto the lifting mechanism for inspection and maintenance purposes.
 - The lifting mechanism shall be designed to withstand the forces exerted during the removal and raking of the screen field, as well as the upwards, downwards and discharge actions of the basket.
 - The lifting mechanism shall be manufactured with a high corrosive resistant material. No material that will require layered type of corrosion protection products will be acceptable.
 - The lifting mechanism shall be designed to suit both the existing and the new pump stations.

The following design features shall be included in the **discharge conduits and conveyance mechanism**:

- The purpose of the discharge conduits and conveyance mechanism shall be to safely, without spillage or spray, receive the collected and removed solids from the basket during the discharge action of the basket, and to guide, convey and discharge the solids into the duty waste bin.
- The conduit and conveyance shall be open for visual monitoring and inspections, but shall always ensure safety, non-spillage, and non-spray.
- The rock catcher design shall enable gravity conveyance of the solids discharged into the conduits and conveyance equipment.
- An electro-mechanical or hydro conveyance system shall not be preferred.
- The conduits and conveyance mechanism shall be permanently mounted and fixed onto a proper concrete base/plinth. The contract shall provide the necessary civil infrastructure for fixing the conduits and conveyance mechanism.
- The design shall make provision for safe and easy access to, and onto the conduits and conveyance mechanism for inspection and maintenance purposes.
- The conduits and conveyance mechanism shall be designed to withstand the forces exerted during the discharge action of the basket.
- The conduit and conveyance mechanism shall be manufactured with a high corrosive resistant material. No material that will require layered type of corrosion protection products will be acceptable.
- The conduits and conveyance mechanism shall be designed to suit both the existing and the new pump stations.

The following design features shall be included in the **solids waste bin system**:

- The purpose of the waste bin system shall be to safely, without spillage or spray, receive, store, transport and tip the removed solids from the conduits and conveyance mechanism.

- The system shall provide one duty waste bin for the conduits and conveyance mechanism to discharge into.
- The system shall provide a standby waste bin, to inter-change, for when the duty waste is full.
- The system shall provide a dolly for each of the waste bins to fit into, onto a rail. The dollies shall have roller wheels, suited for the expected load, and to have a minimum operational life expectancy of 10 years.
- The system shall provide rails for the dollies, as to allow space for three waste bins and dollies. The rails shall be linearly aligned. The rails shall be mounted and fixed onto a proper civil base/plinth. The Contractor shall provide and allow for the necessary civil infrastructure to secure the rails. The rails shall efficiently suit the roller wheel of the dollies.
- The waste bins, dollies and rails shall ensure efficient on and off-load of the waste bins. The on and off-load action shall not disturb or damage the waste bins, dollies, or rails.
- The waste bin design shall conform and suit the service provider's existing waste bin trailers.
- The waste bin shall have a minimum volumetric capacity of 6 m³.
- The waste bin system shall allow for and provide for drainage form inside the bins to an acceptable drain, to be identified on site and approved by the Engineer.
- The combined layout of the basket, solids conveyance and waste bin layout shall allow safe and easy access for the collection and off-load of the waste bins.
- The waste bin system shall be designed to withstand the forces exerted during the discharge action of the conveyance mechanism.
- All the components of the waste bin system shall be manufactured with a high corrosive resistant material. No material that will require layered type of corrosion protection products will be acceptable.
- The waste bin system shall be designed to suit both the existing and the new pump stations.

PS_M_015.2.4 Electrical Equipment

The provision of the electrical equipment forms part and shall comply with the electrical scope of works. The electrical equipment shall provide and be designed to comply with the control philosophy specified hereunder.

PS_M_015.2.5 Standard Equipment and Shelf Item Equipment

All standard and shelf item equipment (electrical motors, gearboxes, couplings, bearings, V-belts, stainless steel cables etc.) shall comply with related SANS specifications.

Where applicable, and the SANS does not provide sufficient specification on the equipment, the designer and or manufacturer shall state the applicable BS, ANSI or EN.

PS_M_015.2.6 Fabrication

All fabrication process utilized during the manufacturing, assembly and installation shall comply with the related SANS specifications.

Where applicable, and the SANS does not provide sufficient specification for the fabrication process, the designer and or manufacturer shall state the applicable BS, ANSI or EN.

PS_M_015.2.7 Fasteners

All fasteners utilized during the manufacturing, assembly and installation shall comply with the related SANS specifications.

Where applicable, and the SANS does not provide sufficient specification for the fasteners, the designer and or manufacturer shall state the applicable BS, ANSI or EN.

The fasteners shall always correspond and compliment the material being fastened.

PS_M_015.2.8 Spares

The Contractor shall provide a full part list as part of the Operation and Maintenance Manual.

The Contractor shall advise, by means of an emergency spare part list, which spare part to be hold in the service providers stores. The Contractor shall include in their pricing schedule "Rate Only" prices for these emergency spare parts.

The Contractor shall state in their summited proposal their guarantee with regards to the availability of parts in the future, after the Defects Notification Period.

PS_M_015.2.9 Safety

The design, manufacture, equipment supply, delivery, and installation shall comply with the latest Occupational Health and Safety Act.

The final installed rock catcher shall ensure the utmost safety of the operational staff.

PS_M_015.3 CONTROL PHILOSOPHY

The electrical operation and control gear shall allow for the following operational philosophy.

PS_M_015.3.1 Manual Operation

When the "manual" mode is selected, the rock catcher shall operate as follows:

- i. The rock catcher removal/raking cycle shall be started with a start push button. The rock catcher shall continue to complete a full removal/raking and discharge cycle and then stop at the seating position.
- ii. A stop push button shall be able to stop the rock catcher at any time, weather on the downward or upward travel.
- iii. A return push button shall return the rock catcher to its seating position, regardless weather the removal/raking or discharge actions have been completed.

PS_M_015.3.2 Automatic (Auto) Operation

When the "auto" mode is selected, the rock catcher shall operate as follows.

- i. The rock catcher removal/raking cycle shall be activated by a timer. The rock catcher shall continue to complete a full removal/raking and discharge cycle and then stop at the seating position.

- ii. The timer shall be an adjustable digital type, with second, minute and hour selectable time units.

PS_M_015.3.3 Protection

The control philosophy shall allow for the following protection:

- i. Over and under voltage, phase reversal and phase failure.
- ii. Over and under current.
- iii. Thermal overload.
- iv. Over and under torque protection on the drive units.

PS_M_015.3.4 General

The control philosophy shall allow for the following general components:

- i. Trip indication (identifying cause of trip), visual and audible alarm on the protection conditions.
- ii. Different visual and audible alarm for rock catcher start and stop a removal/raking/discharge cycle.

PS_M_015.4 MEASUREMENT AND PAYMENT

PS_M_015.4.1 Manufacture, Supply and Delivery of Rock Catcher

Unit: No.

The tendered amount shall include full compensation for all actions and costs involved in the design, manufacture, corrosion protection, factory testing, storage, supply, transportation, delivery to site, handling and off-loading, marking and labelling, quality assurance including all ancillary equipment and fixings, painting and all necessary insurance of the rock catcher as specified above, including mounting frames, fasteners and holding down bolts.

PS_M_015.4.2 Installation, Testing and Commissioning of Rock Catcher

Unit: Sum

The tendered Sum shall include full compensation for all actions and costs involved in the installation, testing and commissioning, and maintaining during the Defects Notification Period, of the equipment as specified, including the repair of damage to protective coatings, and all other costs and actions required to provide a complete and properly operating system.

PS_M_016 – Pump Station 34 and Balancing Dam Pumps

PS_M_016.1 GENERAL

This Specification shall apply to the pumping equipment at the existing Pump Station 34 and Balancing Dam at the Leeuwnkuil WWTW.

The condition and operability of the existing pumping equipment is currently unknown, and it shall be the responsibility of the Contractor, once appointed, to undertake investigations of the existing equipment and to determine whether it can be refurbished or whether new equipment will be required. The Contractor shall provide the Engineer with his findings and a proposal to either refurbish or replace the existing equipment.

The refurbishment scope of works for the pumping equipment is described below. Should the Contractor propose replacement of any of the equipment, the specifications given below and in the relevant Standard Specifications shall apply.

The Contractor shall provide pump sets complete with all ancillaries required to make the pump sets complete and operational.

PS_M_016.2 REFURBISHMENT SCOPE OF WORKS

Based on the available information, the existing pumps installed at Pump Station 34 and the Overflow Dam at Leeuwnkuil WWTW are as follows:

- Two (2) submersible pumps at Pump Station 34:
Make: Flygt
Model: CP 3201 HT
Motor size: 30 kW
Duty flow: 100 l/s (estimated)
- One (1) self-priming pump at the Balancing Dam:
Make: Gorman Rupp
Model: V6A60-B
Motor size: 22 kW (estimated)
Duty flow: 70 - 80 l/s (estimated)

The refurbishment of these pump sets and any pipework, valves and accessories shall be undertaken as described below.

PS_M_016.2.1 Pump Sets

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintenance during the Defects Notification Period, of the pump sets part of Pump Station 34 and the Overflow Dam pumps.

The refurbishment scope of works for the pump sets will typically entail the following;

- Isolate, drain and clean the civil structure where the pump set are installed.
- Completely disconnect the pump set from the existing infrastructure where it is installed.
- Remove the pump set from the installed position, onto proper transportation and transport to the Contractor's (or sub-Contractor's) workshop.

-
- Dismantle and strip the pump set completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
 - From inspection and measurement compile a comprehensive quote to refurbish the pump set to the specified requirements herein.
 - The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
 - The Engineer and the Employer will be notified timeously of the completion of the refurbishment and repair work on the pump set, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the pump set to site.
 - The refurbished pump set may now be installed.
 - The pump set must undergo a full dry and wet commissioning procedure.
 - The Contractor must maintain the pump set for the Defect Notification Period.

Requirements during the refurbishment process and the final performance of the pump sets, entails the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the pump sets during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The pump sets will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the pump sets must be similar or better than the original design.
- The materials and parts used for the refurbishment of the pump sets shall at all times be original manufactured material and parts. No second grade, no-name branded replacement material or parts will be acceptable. The Contractor and the supplier of the material and parts must provide proof of the material quality and origin.
- The pump sets include the pump, coupling/drive connection, electrical motor and the base plate (frame).
- The pump types include, centrifugal, end-suction, self-priming, submersible, screw pumps, fixed installations and mobile units.
- The existing pump sets, to be refurbished, will perform according to their original design requirements. During the pump inspection stage, the Contractor will confirm with the Engineer whether the existing pump duty are sufficient for the application.
- During the pump inspection stage, the Contractor will confirm with the Engineer whether the existing type of pump and rest of the assembly sufficient for the application.
- During the pump inspection stage, the Contractor will confirm with the Engineer whether the existing installation configuration and layout is sufficient for the application.
- The pump set refurbishment must ensure that it is robust and ensure maximum handling performance and minimal operation and maintenance requirements.
- The pump set must ideally suit the existing civil structural housing.
- The pump set must properly and efficiently interact with the adjacent and accompanying equipment.
- The pump set, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SABS and latest Occupational Health and Safety Act regulations.

PS_M_016.2.2 Pipework, Valves and Accessories for Pump Sets

The scope of works include the disconnection, removal, loading, transportation to the workshop, dismantling, inspection and quote for refurbishment and repair, transport back to site, off-loading, installation, commissioning and maintenance during the Defects Notification Period, of all steel pipe work, valves, jointing

sets and accessories (pipe work), part of the pump stations and waste water treatment works, as per the specified requirements below.

The refurbishment scope of works for the pipe work will typically entail the following;

- Isolate, drain and clean the civil structure where the pipe work are installed.
- Completely disconnect the pipe work from the existing infrastructure where it is installed.
- Remove the pipe work from the installed position, onto proper transportation and transport to the Contractor's (or sub-Contractor's) workshop.
- Dismantle and strip the pipe work completely. Properly clean all parts to enable inspection and measurement of wear and damaged parts.
- From inspection and measurement compile a comprehensive quote to refurbish the pipe work to the specified requirements herein.
- The quote will be evaluated, together with the dismantled and stripped equipment. On acceptance and approval of the quote by the Engineer and the Employer, the Contractor may proceed with the refurbishment as per the approved quotation.
- The Engineer and the Employer will be notified timeously of the completion of the refurbishment and repair work on the pipe work, to arrange for a factory acceptance test. On acceptance of the refurbished equipment, the Contractor can deliver the pipe work to site.
- The refurbished pipe work may now be installed.
- The pipe work must undergo a full dry and wet commissioning procedure.
- The Contractor must maintain the pipe work for the Defect Notification Period.

Requirements during the refurbishment process and the final performance of the pipe work, entails the following;

- The Contractor will at all times ensure that the existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, to the best of his ability, that there is not additional damage to the pipe work during the refurbishment process.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- The pipe work will be refurbished to its as-new condition. If the existing equipment and parts cannot ensure the maximum expected operational life, the equipment must be replaced with new improved technology equipment.
- Material used to refurbish the pipe work must be similar or better than the original design.
- The materials and parts used for the refurbishment of the pipe work shall at all times be original manufactured material and parts. No second grade, no-name branded replacement material or parts will be acceptable. The Contractor and the supplier of the material and parts must provide proof of the material quality and origin.
- The pipe work include the steel pipe work, special pipe pieces, isolation valves, non-return valves, air-release valves, adaptors, jointing sets, flexible couplings, pipe supports, pressure gauges and other instrumentation sockets.
- Pipe work must be as prescribed by the drawings and designs.
- During the pipe work inspection stage, the Contractor will confirm with the Engineer whether the existing installation configuration and layout is sufficient for the application.
- The pipe work refurbishment must ensure that it is robust and ensure maximum handling performance and minimal operation and maintenance requirements.
- The pipe work must ideally suit the existing civil structural housing.
- The pipe work must properly and efficiently interact with the adjacent and accompanying equipment.
- The pipe work, as the complete system and as the individual equipment and assemblies must comply with the relevant Particular Specifications, SABS and latest Occupational Health and Safety Act regulations.

PS_M_016.3 PERFORMANCE REQUIREMENTS FOR REPLACEMENT EQUIPMENT

PS_M_016.3.1 Pump Station 34 Pump Sets

Should the existing pumps at Pump Station 34 require replacement, the replacement pumps do not need to be replaced like-for-like, however, the performance of the replacement pumps shall be similar or better than the existing pumps and shall be designed for the refurbished system (i.e. should take into account any pipe replacement and changes to pump and pipework configurations).

The Contractor shall provide pump sets complete with all pipework, valves and ancillaries required to make the pump sets complete and operational. The replacement pumpsets shall have the following requirements:

| | |
|-----------------------|---|
| Type of pump: | Submersible, greater than 100mm solids handling |
| Configuration: | 2 x duty |
| Duty flow: | 100 l/s per pump (estimated, to be confirmed) |
| Static head: | 9.0 m (estimated, to be confirmed) |
| Rising main diameter: | 355 mm HDPE Class PN10 PE100 |
| Material pumped: | Raw Sewage, screened |

PS_M_016.3.2 Balancing Dam Pump Sets

During peak flows the excess raw water from the inlet pipeline manhole will be deviated to the Balancing Dam via an overflow system. When the peak flows have passed, the pump at the Balancing Dam pump station will be managed manually to return the excess raw sewage in the Balancing Dam to the Inlet Works.

Should the existing pump at the Balancing Dam require replacement, the replacement pump does not need to be replaced like-for-like, however, the performance of the replacement pump shall be similar or better than the existing pump and shall be designed for the refurbished system (i.e. should take into account any pipe replacement and changes to pump and pipework configurations).

The Contractor shall provide pump sets complete with all pipework, valves and ancillaries required to make the pump sets complete and operational. The replacement pump set shall have the following requirements:

| | |
|-----------------------|---|
| Type of pump: | Self-priming, 102 mm solids handling, centrifugal type pump with wedge belt drive |
| Configuration: | 1 x duty |
| Duty flow: | 70 - 80 l/s |
| Static head: | to be confirmed on site |
| NPSH required: | to be confirmed on site |
| Rising main diameter: | 200 mm HDPE Class PN10 PE100 |
| Material pumped: | Raw sewage, unscreened |

PS_M_016.4 OPERATION AND CONTROL

PS_M_016.4.1 Pump Station 34

The sumps shall be supplied with an ultrasonic level sensor to stop the pump when the level in the sump is below the safe operating conditions for the pump.

The pumps will be fitted with a "flow/no-flow" switch as well as overheating sensors.

PS_M_016.4.2 Balancing Dam

During peak flows the excess raw water from the inlet pipeline manhole will be deviated to the Balancing Dam via an overflow system. When the peak flows have passed, the pump at the Balancing Dam pump station will be managed manually to return the excess raw sewage in the Balancing Dam to the Inlet Works. The pumps will be fitted with a "flow/no-flow" switch as well as overheating sensors.

PS_M_016.4 PAYMENT ITEMS

PS M 016.4.1 Supply and delivery of pumping equipment

Unit: No

Pumping equipment shall be measured and paid for based on the number of pumps, complete with electric motors, couplings, pipework, valves, fittings and pressure gauges supplied and delivered to site. The tendered rate shall be held to include the supply and delivery of all pumps including all appurtenances necessary to ensure satisfactory operation of the pumping installation.

PS M016.4.2 Installation, testing and commissioning of pumping equipment

Unit: No. or Sum

Pumping equipment shall be measured and paid for based on the number of pumps, complete with electric motors, couplings, pipework, valves, fittings and pressure gauges installed, tested and commissioned on site. The tendered rate or Sum shall be held to include the installation, testing and commissioning of the complete pumping installation, including all appurtenances necessary to ensure satisfactory operation of the pumping installation.

PS M016.4.3 Investigations of the existing pump station equipment

Unit: Sum

The tendered Sum shall include for all site visits, including travel, investigations, testing, measurement etc. required for the Contractor to evaluate the existing mechanical and electrical equipment at the existing Pump Station 34 and Overflow Dam. The Sum shall include all time and cost to prepare a summary of findings and proposal document for approval of the Engineer.

PS M016.4.4 Removal of existing equipment

Unit: Prov Sum

The tendered Sum shall include for the removal of the existing mechanical equipment and all appurtenant pipework, valves, fittings, cables etc. at Pump Station 34 and Overflow Dam and moving the equipment to a suitable storage location at the Leeuwkuil WWTW. The Sum shall also include for all necessary works to

remove and relocate the mechanical equipment and prepare the pump stations for the new equipment, while keeping the existing inlet works live and operational.

PS_M_017 – Mobile Pump Sets

PS_M_017.1 GENERAL

This Specification shall apply to the mobile skid-mounted pump unit at the Leeuwkuil WWTW.

The following Standard Specifications are to be read in conjunction with this section:

- MGD: General Mechanical
- MCP: Corrosion Protection
- MPW: Pipework, Valves and Fittings
- MWP: Water and Wastewater Pumps

The Contractor shall provide pump sets complete with all ancillaries required to make the pump sets complete and operational.

PS_M_017.2 PERFORMANCE REQUIREMENTS

PS_M_017.2.1 Skid-Mounted Mobile Pump Set

Requirements for the supply, manufacture, delivery, installation, commissioning, operation and maintenance during the Defects Notification Period of new mobile pump sets entails the following;

- The pump selected for the particular duty, will feature the ideal characteristic for the application.
- The pump selected for the mobile unit, will be manufactured of the best available material and the best manufacturing processes. The Contractor and supplier must provide proof the quality control and origin of the material used.
- The pump will be a centrifugal, self-priming pump unit, adequately selected to accommodate the priming conditions of the system.
- The Contractor and supplier must provide proof, assurance and guarantees of the pump's performance, as per the design, application and their internal testing.
- The pump will be driven by a premium efficiency electrical motor, sized for the maximum delivery of the pump, not only the required duty required.
- The motor will at least 20% spare capacity.
- The motor will suit the main (Eskom) electrical and standby power supply.
- The motor-pump coupling will be direct, with the best available quality and technology type coupling.
- The motor-pump assembly will be mounted onto a skid-type base frame.
- The base frame must be designed to handle and absorb all static and dynamic loads from the operational conditions of the pump set, including suction and delivery pipe work.
- The skid frame must be designed to handle movement, skidding, on the installed area (paving, concrete slab, natural ground and prepared terraces).
- The mobile pump set unit must be completely stand alone, only requiring an electrical supply cable connection.
- The mobile pump set unit must facilitate its own motor control switch gear, mounted onto the skid base frame. The switch gear control panel must provide VSD motor control, with the best available technology equipment. The control gear must provide the best protection against power surges, power stability and motor-pump malfunction.
- The mobile pump set unit must be designed for outside weather conditions, without any cover or additional protection against the environmental conditions.
- The mobile pump set unit must be designed to be lifted via crane or high-up, from the transport, onto the place of installation.

Pump Duty Requirements:

The Contractor shall provide pump sets complete with all pipework, valves and ancillaries required to make the pump sets complete and operational. The pumpset shall have the following requirements:

| | |
|-----------------------|---|
| Type of pump: | Self-priming, 100 mm solids handling, centrifugal type pump with wedge belt drive |
| Configuration: | 1 x duty |
| Duty flow: | 250 l/s |
| Static head: | 9.0 m (estimated, to be confirmed) |
| NPSH required: | 2.5 m (estimated, to be confirmed) |
| Rising main diameter: | 355mm HDPE Class PN10 PE100 |
| Material pumped: | Raw sewage, unscreened or screened |

The motor of the pump provided shall be wedge-belt driven and shall be oversized to allow for future flexibility by simply changing the speed of the pump for various applications.

The skid base shall be fitted with at least the following, complying with the specifications:

- a. at least four lifting points which double up as drag points for dragging on soft terrain
- b. stainless steel suction intake
- c. discharge pipework
- d. 350mm non-return valve
- e. Coupling and stainless steel coupling guards
- f. Control panel mounting bracket
- g. Suction and discharge pipe supports
- h. Lifting lugs

PS_M_017.2.2 Skid-Mounted Mobile Pump Set Pipework, Valves and Accessories

Requirements for the supply, manufacture, deliver, installation, commissioning, operation and maintenance during the Defects Notification Period of new pipe work for the mobile pump set units entails the following;

- The pipe work for the mobile pump sets must comply with the above regulations.
- Each mobile pump set must have its own suction pipe, from the storage sump to the pump suction.
- The pump deliveries will both discharge into a jointing manifold, running to the delivery connection chamber.
- Each suction will facilitate a bell-mouth suction entrance, with minimum one isolation valve.
- Each pump delivery will have minimum one isolation and one non-return valve.
- The single delivery line will also have an isolation valve.
- The pipe work installation configuration will be semi-permanent, thus although mobile and easily removable, it must be properly secured and supported from the suction point, surface running to the pump, at the pump suction and delivery connection, running to the delivery connection and at the connection chamber.
- The pipe work must be high quality flexible hose, reinforced to endure the working pressures and the handling during setup and removal actions.
- The pipe routes and layout must be minimum distances and the suction must be kept especially short.
- The pie work must not be covered and must not be laid across general access ways.

PS_M_017.2 MEASUREMENT AND PAYMENT

PS_M_017.2.1 Supply and Delivery of Skid-Mounted Mobile Pump Set

Unit: Sum

The tendered Sum shall include full compensation for all actions and costs involved in the design, manufacture, corrosion protection, factory testing, storage, supply, transportation, delivery to site, handling and off-loading, marking and labelling, quality assurance including all ancillary equipment and fixings, painting and all necessary insurance of the skid-mounted mobile pump set and pipework, valves and accessories as specified above, including mounting frames, fasteners and holding down bolts.

PS_M_017.2.2 Installation, Testing and Commissioning of Skid-Mounted Mobile Pump Set

Unit: Sum

The tendered Sum shall include full compensation for all actions and costs involved in the installation, testing and commissioning of the equipment as specified, including the repair of damage to protective coatings, and all other costs and actions required to provide a complete and properly operating system.

PS OM 001 – Operation

SCOPE OF WORKS

The scope of works include the assistance, execution of necessary actions and insurance that operational tasks and actions are being performed to operate the facility, falling under the contract scope of works.

WORKS

The operation scope of works will typically entail the following;

- 24 hour facility monitoring to ensure that the facility performs its function.
- 24 hour assistance from the Contractor to the service delivery entity.
- Accommodating the service delivery entity to cope with the refurbishment and construction work hampering the normal operations of the facility.
- Any other actions, tasks, assistance to ensure that the facility deliver its intended service.
- The operation service must last the full duration of the contract period.

REQUIREMENTS

Requirements during the operational service, entail the following;

- The existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, that the service delivery entity are assisted where ongoing refurbishment work takes place.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- Service means any form of action, work, support, material, equipment to ensure the operation of the facility.
- The service must at all times comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS OM 002 – Maintenance

SCOPE OF WORKS

The scope of works include the assistance, execution of necessary actions and insurance that equipment are maintained and kept operation to ensure the operation of the facility, falling under the contract scope of works.

WORKS

The maintenance scope of works will typically entail the following;

- 24 hour facility monitoring to ensure that the facility's equipment performs its function.
- 24 hour assistance from the Contractor to the service delivery entity.

- Routine equipment monitoring.
- Scheduled equipment lubrication and performance checks.
- Scheduled maintenance work.
- Breakdown maintenance work.
- Emergency replacement work on critical essential equipment.

REQUIREMENTS

Requirements during the maintenance service, entail the following;

- The existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, that the service delivery entity are assisted where ongoing refurbishment work takes place.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- Service means any form of action, work, support, material, equipment to ensure the operation of the facility.
- The service must at all times comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS OM 003 – Site Keeping

SCOPE OF WORKS

The scope of works include the assistance, execution of necessary actions and insurance that site keeping is done during the ongoing contract duration.

WORKS

The site keeping scope of works will typically entail the following;

- Keeping the site clean of overgrown vegetation, cutting grass and trimming bushes and trees.
- Keeping the structures open for operation and maintenance access.
- Keeping the site clean of screenings, grit and other foreign material.
- Keeping the perimeter fence clean, 3m on the outside of the fence.

REQUIREMENTS

Requirements during the maintenance service, entail the following;

- The existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, that the service delivery entity are assisted where ongoing refurbishment work takes place.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.

- Service means any form of action, work, support, material, equipment to ensure the operation of the facility.
- The service must at all times comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS OM 004 – Site Clearance

SCOPE OF WORKS

The scope of works include the collection, removal, loading, transportation and disposal or off-loading of any scrap, rubbish or foreign material from the facility, during the ongoing contract duration.

WORKS

The site clearance scope of works will typically entail the following;

- Collecting any scrap, rubbish or foreign material on the site.
- Removing, loading and transportation, any scrap, rubbish or foreign material, from the site to a designated site for disposal or storage.

REQUIREMENTS

Requirements during the maintenance service, entail the following;

- The existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The Contractor will at all times ensure, that the service delivery entity are assisted where ongoing refurbishment work takes place.
- The Contractor will ensure minimum repair time to ensure the approved completion target date are met.
- Service means any form of action, work, support, material, equipment to ensure the operation of the facility.
- The Contractor must get approval for the storage and disposal sites before removing the scrap, rubbish or foreign material from the site.
- The service must at all times comply with the relevant Particular Specifications, SANS and latest Occupational Health and Safety Act regulations.

PS OM 005 – Maintain During the 12-Month Defects Notification Period

SCOPE OF WORKS

The scope of works include the monitoring, operational and maintenance service, on all the equipment and infrastructure, forming part of the contractual scope of works, during a Defects Notification Period.