	Scope of work	Ge
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Title Scope of work for
Replacement of ash and
sluice lines

Unique Identifier.

Alternative Reference Number N/A

Area of Applicability Engineering

Documentation Type Specification

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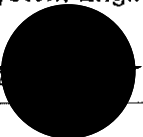


Aux. System Engineer



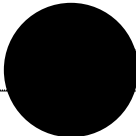
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Aux. Eng. Manager

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1. INTRODUCTION

There are ash lines pipes that are in the sluiceways which are not accessible for any maintenance activities and they are covered with ash build up and moisture. They are currently maintained on the philosophy of run to failure, whereas the rest of the ash line pipes are currently maintained by turning the lines 90 degrees every six months. Frequent pipe leaks are being experienced and the latest thickness testing reports indicate that the ash lines are close to the minimum allowable wall thickness. The accessible line are also exposed to ash build up due to pipe lines which subsequently shorten the pipe life span (quickly get corroded).

Leaks are frequently experienced on the bends including the bend joints (bends that are joined by Johnson couplings). The bends are misaligned on the plinth contours which make it easier for bends to move due to change in momentum. Due to unavailability of drawings for the bends it makes life difficult to accurately fabricate bends with correct radius. As a temporary measure to compensate for the incorrect bend radius, Eskom (Duvha Power Station) ends up gagging all Johnson couplings (short and long barrel) that are on the bends and welding a steel bar across all pipes on the bend to prevent movement. Some of the plinths are damaged and have missing clamps and hold down bolts.

Based on the above mentioned problem statement, there is a great need to replace ash lines sections which poses a leaks risk that can lead to environmental contravention.

2. SUPPORTING CLAUSES

2.1 SCOPE

To dismantle, removing of the existing pipe work and the supply, delivery, and installation of the ash pipes for the following units 2, 3, 4, 5&6. This is based on the thickness testing results that was conducted by Eskom (Duvha Power Station). The concluded quantities for all the lines required are detailed under section 3.1 of this document. Repairing of the existing plinths, supply and delivery of the clamps are also part of this scope of work.

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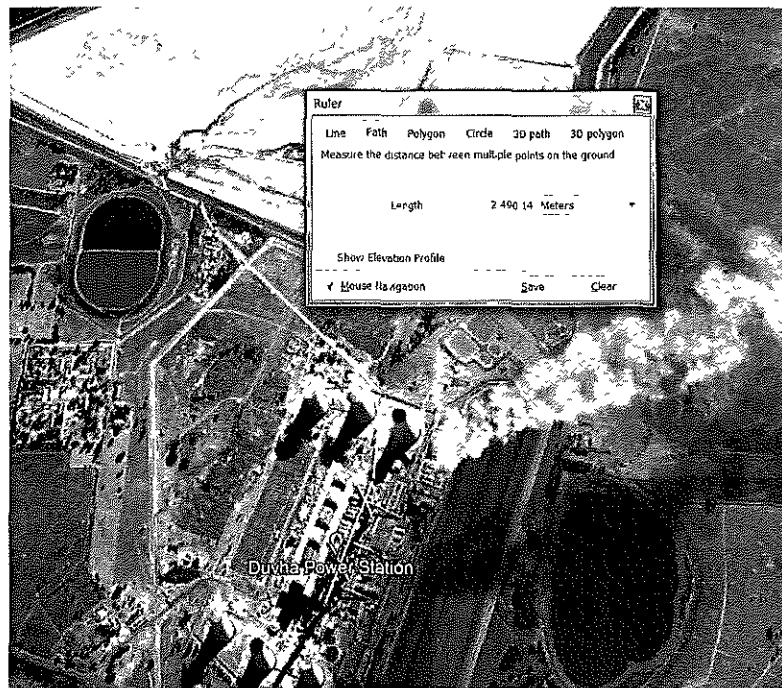


Figure 1 showing the plant layout of the pipe route

2.1.1 Applicability

This document applies to Duvha Power Station only.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs

2.2.1 Normative

- [1] 32-727 - Eskom Safety, Health, Environment and Quality (SHEQ) Policy
- [2] Occupational Health and Safety Act No 85 of 1993,
- [3] QM58 - Suppliers contract quality requirements specification
- [4] 240-106628253 - Standard for Welding Requirements on Eskom Plant
- [5] 240-83539994 – Standard for non-destructive test for Eskom plants
- [6] ISO 9001 Quality Management Systems.
- [7] Construction Regulations, 2014
- [8] SANS 1200 Standard Specification For Civil Engineering Construction

These documents are indispensable for the application of this document, i.e. documents to be used together with this document.

2.2.2 Informative

- [9] 474-58 (Rev1) Document and Records Management

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2.3 DEFINITIONS

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
SANS	South African National Standards
SABS	South African Bureau Standards
SE	System Engineer
SHEQ	Eskom Safety, Health, Environment and Quality
QA	Quality Assurance
QM	Quality Manual
QC	Quality Control
NDT	Non-destructive test
IWE	International Welding Engineer registered with IIW
IIW	International Institute of Welding
IWP	International Welding Practitioner registered with IIW
IWS	International Welding Specialist registered with IIW
IWT	International Welding Technologist registered with IIW

2.5 ROLES AND RESPONSIBILITIES

Contractor

- Execute the scope of work as per the specification defined in this scope of work
- Develop the method statement on how the work will be executed which will be reviewed by the engineers
- Compile quality control strategy for quality assurance which must be inline with Eskom QM 58 procedure which will be approved by the engineer
- Provide the key skills to execute the work as defined in the technical criteria strategy
- Comply with Mandatory Eskom Duvha power station SHEQ requirements to ensure adherence to Eskom values of Zero harm

Project Manager

- Manage the contractor as per the NEC regulations
- Ensure that the work is executed within the define time frames
- Ensure that the contractor execute the work as per the scope of work

System Engineer

- Review and accept all works submitted by the contractor

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- Conduct inspection and QCP to ensure that the work is executed as per the scope of work

2.6 REQUIRED CRITERIA FOR CONTRACTOR

The contractor will be evaluated as per attached evaluation criteria stipulated in the contract strategy report

Principal contractor or subcontractor to submit a copy of ISO 3834 certificate with the tender returnable. Failure to submit will result in an automatic disqualification

2.7 RELATED/SUPPORTING DOCUMENTS

The following document will be supplied to the Contractor before execution of work

- Duvha SHEQ requirements
- Safety files assessment form (Check list to be used during safety file assessment)
- Eskom Safety, Health, Environment and Quality (SHEQ) Policy
- Eskom Waste Management Standard
- QM58
- Drawings and relevant sketches
- Bill of Material

3. SCOPE OF WORKS

3.1 DESCRIPTION OF THE *WORKS*

The scope of work is about dismantling, removing of the existing pipe work and the supply, delivery, and installation of the ash pipes for the following units 2, 3, 4, 5&6

3.1.1 Mechanical scope

- A total of 3564m length of pipe will be replaced. This is a total for all five lines, with partial replacement on unit 4 ash line
- The total number of bends to manufacture and supply is 55 Flanged on both sides (Flange table 16 BS4504, 16 holes and M24 bolts).
- Connection of bends to the straight section line must be flange to flange. All bends to be manufactured as built due to the unavailability of drawings. The contractor to provide drawings for all bends supplied. It is the responsibility of the contractor to confirm measurements before fabrication (fabricate as per sample or as built). For each bend two 12m length pipe flanged on one side will be required, this means a total length of 1320m pipe is required
- Supply long barrel Johnson couplings as per specification provided (56 Johnson couplings). On the straight section Johnson couplings needs to be 36m apart. The gap between two pipes when connecting Johnson coupling must be between 20mm -40mm.
- Supply clamps (1150 clamps) as shown in the sketch provided.
- Supply of 25 Ton crane for removal and installation of pipes.

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- Old pipe line will have to be removed and stacked neatly at the site 500m away from Duvha Power station main entrance. This site will be provided and shown to the contractor by Eskom.
- Refurbished plinths or pipe supports with brackets and hold down bolts. For refurbished plinths and where brackets/hold down bolts are missing, chemical anchors to be utilized for the hold down bolts. Grouting on the gap between the pipe and the plinth must be supplied by contractor.
- Paint the entire line till the distribution point once it's complete.

Note. all Johnson coupling must be installed after every third pipe (36 meters apart). It's the responsibility of the contractor to come on site and verify the dimension where it's not clear for the benefit of obtaining the exact measurements. All pipe lines inside trenches submerged to ash will be cleaned by Eskom. Failure to do so, a contract will be asked to assist and that can be treated as a compensation event. Inspection by contractor and the system engineer will be conducted after dismantling the pipe to identify the additional damaged plinths. Refer to the sketch provided for Brackets dimensions. All flanges are slip-on welded flanges and only dye penetration is required. The contractor must provide the welding procedure and the qualification of the welders.

3.1.2 Civil scope

3.1.2.1 Concrete Plinth

The damaged plinth with various sizes to be repaired to a depth of +/- 300mm (plant walk to identify the damaged plinth to be done with the supplier). The plinth is reinforced; however, only concrete repair on the damaged sections will be done.

The works consist of:

- Clean area before any concrete demolition work starts.
- Breaking concrete plinth partly up to approximately 300mm as directed by Engineer. The exact depth to be determined during the plant walk for each damaged plinth. The supplier must execute the work with care to prevent damage or displace the existing reinforcement.
- Clean existing reinforcement thoroughly with wire brush and treat steel against rust with a rust inhibitor paint.
- Supply and install smooth formwork around the plinth. The supplier will be required to fabricate formwork for each plinth due to plant arrangement. Wooden formwork is recommended for the work.
- Provide 25x25 chamfered edges to all exposed edges of the concrete plinths.
- Prepare, wire brush and clean the surface of the concrete to receive the new concrete topping.
- Apply 'wet to dry' epoxy to concrete surface where new concrete will be casted.
- Supply and pour/cast 30/19 Mpa concrete as per specification.
- Test the concrete using cube test and supply test results as indicated in the specification.
- Allow the concrete to cure and continuously pour water during the curing process. Allow for approximately 3 - 7 days dependant on ambient temperature for curing process.
- Remove the formwork after curing and do smooth surface finish to all exposed areas of the plinth.

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- Supply and install new M20 bolts where clamps will be installed

3.2.1.2 Pipe crossing the security fence

The pipes crossing the fence as shown on the layout (see Appendix A) are buried under the ground. The following must be done on that section:

- Excavate and expose the pipe. Stockpile the material on the area designated by the project manager.
- Replace the ash line pipe as per section 3.1.1 of the scope.
- Reinstatement of the area by backfilling the area to the natural ground level using stockpiled material. Top layer of 300 mm must be done using G5 material from certified borrow pit or commercial source. Backfill to layer not exceeding 200 mm and compact to 93% mod AASTHO.

3.1.2.3 Crossing culvert

The culvert next to the ash dam DB does not have enough allowance for a vehicle to turn. The current space turning radius is not adequate for heavy vehicles. A need to be extended the culvert by 5m is required. In order to satisfy the need the following must be done.

Temporary Ramp

A temporary ramp to be constructed for vehicle to cross over the ash lines while extension of the culverts is underway which include the following activities.

- Borrow, lay and compact G5 material from certified borrow pit or commercial source for construction of an earth ramp as indicated on figure 2 below. The ramp must be constructed in layer not exceeding 300 mm and compact to 93% mod AASTHO.
- After the culvert has been extended the contractor must remove the ramp and reinstate the plant to its original state.

Installation of Culverts

- Supply and install +/- 10m concrete culverts of (3600mm x 900mm) at two sections where the ash line crosses the road.
- Supply and installed dowel bars of 16mm, form work and cast in concrete of 30/19Mpa on the gaps between the culverts. (Note there is possibility of gaps between the culverts due to pipe arrangement on site)
- Borrow and fill the area shown in the sketch in Fig 2 below with G5 material from certified borrow pit or commercial source. Backfill and compact in layer not exceeding 150 mm to 93% mod AASTHO.

Note: The contractor together with the engineer will be required to verify the culvert size on site before the contractor can procure.

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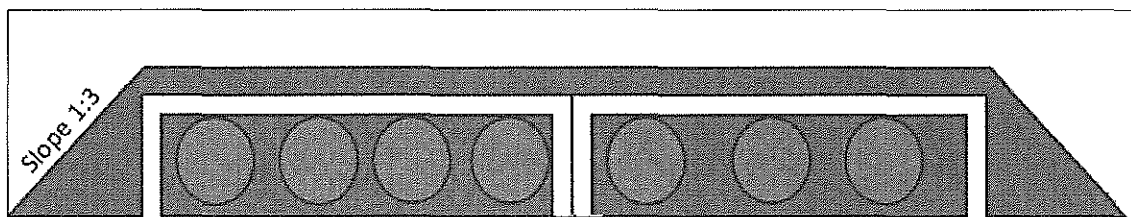
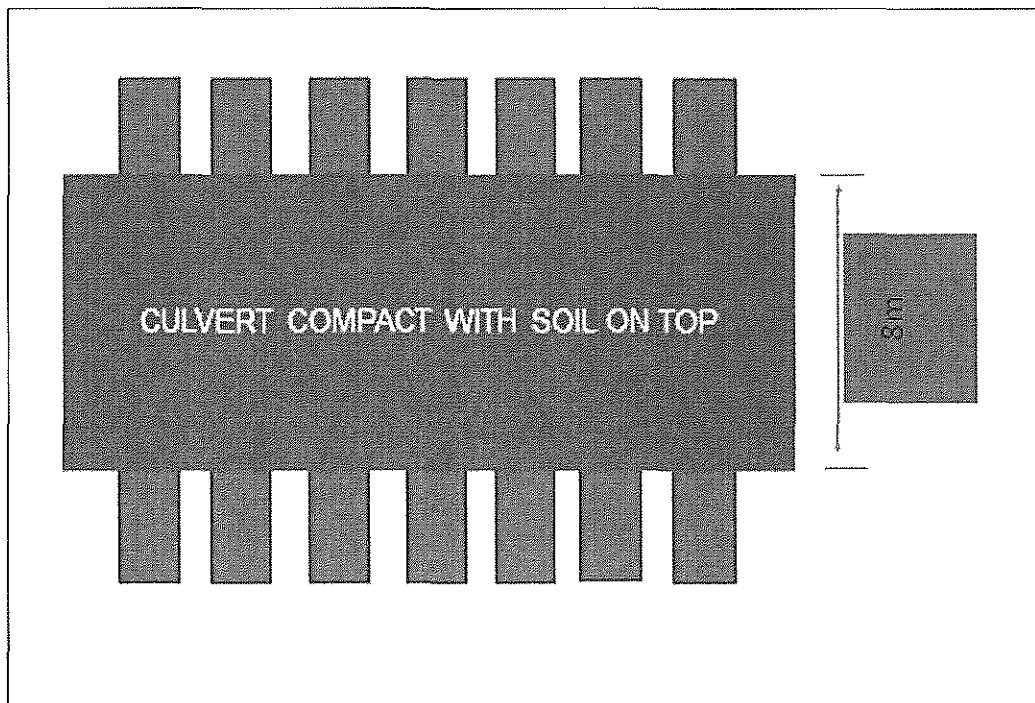


Figure 2: Ramp for vehicle to cross over ash lines

3.1.2 4 Guardrails

All the culvert section where ash lines are running under which are area next to ERI offices and next to the ash dam DB box (see layout on Appendix A) must be fixed with guardrails to enhance the safety of all vehicles. A total of 100m should be allowed for to be fixed in all sections as indicated on the layout. The culvert must be fixed on the natural ground level and should protrude to the culvert level.

- The guardrails must be a complete galvanised system and should be on 3.81m spaced posts
- Timber posts shall be used. The height will be as per estimation on the drawing,
- End Treatments in accordance with the drawings where single guardrail sections are used
- Reflective Plates shall be fixed on all space post
- Guardrail drawing is provided for details specification

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Note. Plant walk will be done with the contractor and the engineer to agree on the route and how the guardrails will be fixed on site due to site constraints. The exact timber post height will also be determined during the plant.

3.2 EMPLOYER'S DESIGN REQUIREMENTS

3.2.1 Pipes

MS OD 406mm and 10mm thickness SABS719 GRB

Longitudinal welded end type: Plain

Length: 12m or 9m

Paint to be used is Bituminous Aluminium Paint (no primer is required and painted to standard micron 25 – 30µm)

3.2.2 Long barrel Johnson coupling

TC 4000 carbon steel for Steel pipe SABS 719, coupling range 407- 410mm, OD 430mm and the width of the coupling must be 600mm wide

3.2.3 Flanges

Flanges Table 16 BS4504 16 holes MS M24 bolts readily cut rubber gasket to be utilized

3.2.5 Clamps

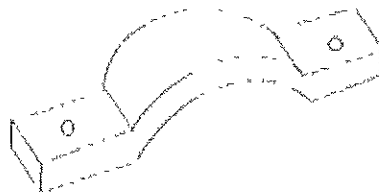
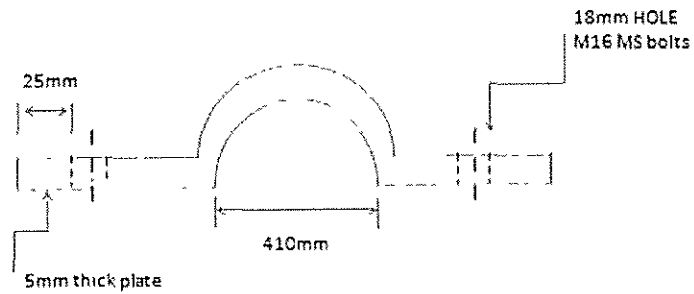


Figure 2 pipe clamp sketch

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Bracket or clamp manufactured from 1095mm flat bar x 50mm wide x 5mm thick

Figure 3: clamp dimensions

The above mentioned clamp will be connected to the saddles since there is broken hold down bolts on the existing plinths. The sketches for the saddles are as follows

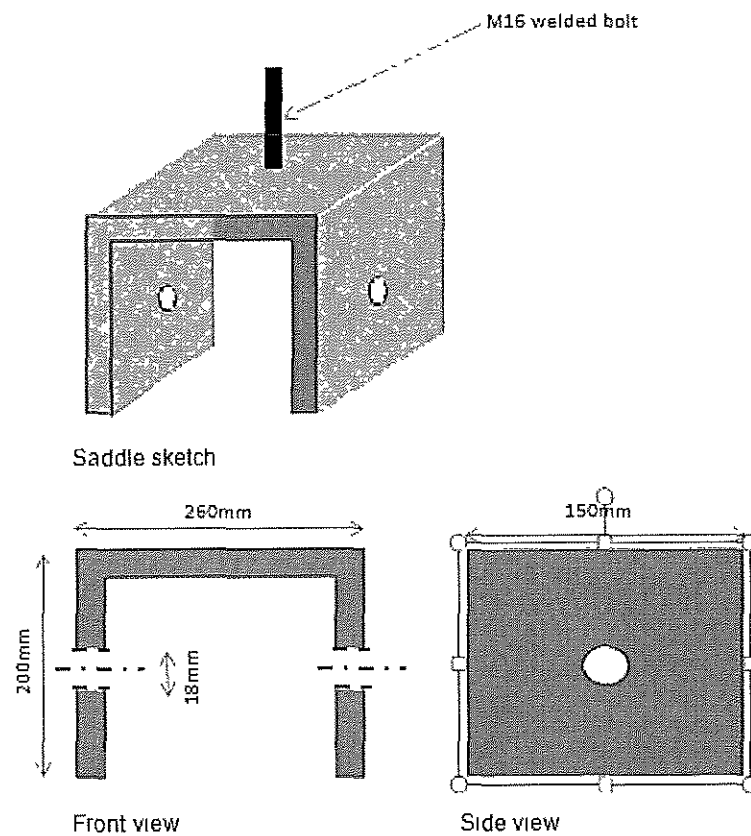


Figure 4 saddle sketch

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3.2.6 Concrete

Concrete used for repair work should have adequate flexural strength and good dimensional stability. The concrete should be placed, compacted and finished to acceptable dimensional tolerances and surface texture.

(i) General requirements

Materials for the concrete are covered by SANS 10100-2, subject to the requirements of 5.2.2 to 5.2.7 (inclusive).

Cement

Cement shall comply with the requirements of SANS 50197-1 of cement 42,5N or 52,5N.

Superplasticiser type CHRYSO Fluid L or similar shall be used to improve workability of the concrete ONLY if necessary. Superplasticiser shall be the chloride free type.

Aggregates

Aggregates shall comply with the requirements of SANS 1083. In addition, the following requirements should be stated in the project specifications. Coarse aggregate shall comply with the 10 % fine aggregate crushing test (10 % FACT) values, as specified in SANS 1083; the maximum nominal size of the coarse aggregate shall be the lesser of 25 % of the thickness of the floor slab and 37,5 mm, if the nominal size of the coarse aggregate exceeds 26,5 mm, a coarse aggregate of smaller maximum size shall also be incorporated in the concrete mix, a coarse aggregate of size smaller than 19,0 mm shall not be used; during the work, no fine aggregate such that the fineness modulus of the aggregate varies by more than 0,20 from that on which the original mix design is based shall be used, unless the mix proportions are adjusted accordingly; and when bleeding is likely to be excessive, the use of a suitable fine blending sand, or a different sand, or a water-reducing admixture, or air-entrainment, shall be considered.

NOTE: In certain conditions, additional tests might be necessary to determine the suitability of aggregates (see SANS 1083).

Admixtures

Please Note: Admixtures shall ONLY be used with the approval of the Engineer. Admixtures shall be chloride free.

(ii) Concrete mix proportioning

General

Ready mix concrete class 19 for blinding, 25/19 for manhole benching and 30/19mm for headwalls shall be used for this application. The contractor shall provide a mix design to the Engineer. No placing of concrete shall commence without the prior approval of the mix design.

Proportioning

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The concrete mix should be proportioned to try and provide a smooth and as continuous an overall grading as possible. Where more than one size of coarse aggregate is used, the sizes should be chosen to avoid particle interference between the two sizes.

Fresh concrete

- The concrete should be designed to ensure adequate consistence as measured by the slump test (see SANS 5862-1). Suitable slumps are in the range of 70 mm to 120 mm depending on the equipment to be used.
- The concrete should be cohesive enough to ensure complete compaction and to avoid segregation. This can be assessed by tapping the base plate in the slump test after the slump has been determined. A cohesive mix should settle gradually without the concrete falling apart.
- The bleeding of the fresh concrete should be minimized as excessive bleeding can result in zones of weakness when trapped below aggregate particles and reinforcing steel and also interfere with finishing operations. Care shall be taken not to reduce bleeding too much as this will significantly increase the risk of plastic shrinkage cracking.
- The effect of admixtures, when used, on setting and bleeding should be assessed.
- The amount of paste on the surface after compaction should be assessed in the laboratory. Too little paste could result in difficulty in finishing the surface and disturbance of the coarse aggregate near the surface. Too much paste could result in durability problems such as dusting and crazing of the surface of the floor.
- Concrete for the plinths should be cast within 2 hours from dispatch.
- Concrete should be thoroughly compacted in terms of SANS 10100 /2 by using suitable concrete vibrators.
- Damp curing of the topping should start immediately after surface finishing by covering the patch with polyurethane or damp hessian. Damp curing should be maintained for at least 3 days.
- The construction area is to be barricaded for at least 3 days.

(iii) Finishes:

Finishes shall be a smooth power float finish.

(iv) Hardened concrete

The 28 d compressive strength for concrete should be 30 MPa and 25 Mpa

(v) Quality Control

All work is carried out under the supervision of an experienced supervisor. The Contractor complies with the Employer's Quality Requirements as specified in Eskom Generation Standard GGS 0462. Annexure B to this Standard indicates the specific application thereof. All quality control documentation is submitted to the Project Manager within 7 days of Contract date. *Quality Control:*

- The contractor to provide a Quality Control Plan to Eskom Duvha for approval prior to construction. The contractor shall also assure that the following quality

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control documentation are available during construction and are submitted to ESKOM on completion

- Ready Mix Concrete delivery note (if ready mix concrete will be used)
- QCP plan with signed off witness and hold points by Eskom's Engineer
- Slump test to be done in terms of SANS 5862-1
- Cube Testing in terms of SANS 5860, SANS 5860 – 2&3
- Cube test samples to be taken and tested by an approved laboratory which will be agreed upon prior to execution of work
- Testing of cubes shall be done on 7 and 14 as well as 28 days.

(vi) Formwork

All formwork to be provided with a smooth finish

All exposed concrete edges to be provided with a 25 x 25 chamfer Contractor to liaise with the Engineer for approval.

3.2.7 Anchor Bolts

General

- Once the pump motor and steel frame were removed all the bolts need to be torque tested with a torque wrench as per specification below
- All loose bolts shall be removed and replaced as per procedure below
- All bolts that is found to be in tact shall be wire brushed and thoroughly cleaned before corrosion protection coating as specified below is applied.
- Where necessary existing Anchor bolts shall be replaced with Grade 8 8 threaded bar, complete with 2 nuts
- Bolts and nuts to comply with the relevant requirements as stipulated in SANS 136 Washers for bolts and nuts shall comply with the relevant requirements of SANS 1149

Materials :

Bolts:

Bolt strength : Grade 8 8
Diameter of bolt . M20

Cementitious Grout:

Sika 212 or similar approved cementitious grout

Procedure for the reinstatement of the damaged bolts in embedded concrete:

Procedure for the testing of the bolts:

The bolt needs to be Verify that bolt is loose by applying the following torque loads to the nut of the anchor bolt

Bolt Torque Values at Proof Load			
Bolt Size	Grade 4 8	Grade 8.8	Grade 10 9
M10	26 6 N-m	50.0 N-m	73 0 N-m
M12	46 0 N-m	86.0 N-m	127.0 N-m
M14	73 0 N-m	137 0 N-m	201 0 N-m
M16	113 0 N-m	214 0 N-m	314 0 N-m

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M20	222 0 N-m	432 0 N-m	615.0 N-m
M24	383 0 N-m	744.0 N-m	1060.0 N-m
M30	772.0 N-m	1500.0 N-m	2130 N-m

3.2.8 Backfilling

Earthworks

(i) General

Water in Excavations:

No water shall be allowed to accumulate in any portion of the excavations. Any water found in the excavations shall immediately be removed by pumping or baling. It is the Contractor's responsibility to keep trench water free and the Contractor must supply all pumps etc. that may be necessary for clearing out the water. Water must be cleared in such a way that it cannot seep or flow back into the excavations.

Filling Materials:

Filling shall be of approved clean gravel compacted in layers of depth as specified, well watered, rammed and thoroughly consolidated to a density as specified. The contractor shall perform tests to verify that the filling material conform to all requirements as specified.

Materials:

Borrow to fill material shall be imported natural gravel (G5) material. The material shall be used for the construction sub-base and base course layers of the terrace. These layers shall be constructed underneath the concrete floor and pavement to the required levels and falls as indicated on the relevant drawings. The layers shall be compacted in layers not exceeding 150mm to the following requirements.

- 93% MOD AASHTO density
- CBR = 45 @ 95%
- CBR swell = 0, 5
- PI = 10 max

3.3 WELDING REQUIREMENTS

- All welding activities shall be in-line with the *Standard for Welding Requirements on Eskom Plant*, doc. no. 240-106628253 attached under Appendix C.
- Welding procedure qualification for welds shall be in accordance with the appropriate welding standard incorporated into the relevant design and construction code. Combination or mixing of different codes shall not be permitted.
- A WPS supported by a valid WPQR/PQR, approved by a registered IWE or IWT, shall be submitted to Eskom for review.
- Welders and welding operators shall be qualified in accordance with the requirements of the latest applicable construction code or engineering specification relevant to the plant.

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- NDT on welds shall be performed according to the requirements of the relevant design and construction codes, applicable (additional) engineering or product specifications and Eskom standard 240-83539994
- Company to perform welding shall have accreditation to ISO 3834 Part 3 as minimum (for Eskom Level 2 plant)
- Records pertaining to the repairs or modifications shall be compiled as per the requirements of QM 58.

(vii) Quality Control

All work is carried out under the supervision of an experienced supervisor. The Contractor complies with the Employer's Quality Requirements as specified in Eskom Generation Standard GGS 0462 All quality control documentation is to be submitted to the Project Manager within 7 days before the work can commence to be approved by system engineer

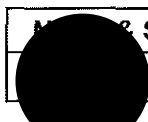
- The contractor to provide a Quality Control Plan to Eskom Duvha for approval prior to commencement with the works. The contractor shall also assure that the following quality control documentation are available during the work and are submitted to ESKOM on completion
- QCP plan with signed off witness and hold points by Eskom's Engineer

3.4 CONTRACTOR'S DESIGN

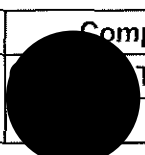
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4. AUTHORISATION

This document has been seen and accepted by:

Signature & Surname	Designation
	Auxiliary Engineering Manager

5. REVISIONS

Date	Rev.	Compiler	Remarks
June 2019	0	 T	Draft Document

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Appendix A. Layout Plan



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