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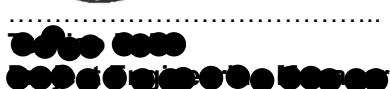



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1. INTRODUCTION

The Water Treatment Plant (WTP) laboratory is located west of the WTP Mechanical Building (Figure 1). The foot print consists of in-situ material and compacted fill of approximately 10.5m deep below existing ground level (EGL). The WTP laboratory is a 1650m² single story building that consists of the following structural elements:

- A raft/at-grade reinforced concrete slab.
- Reinforced concrete columns and beams.
- A reinforced concrete gutter slab.
- A structural steel roof.

In order to arrest further settlement of the Water Treatment Plant (WTP) Laboratory, remedial measures to support the foundations need to be considered. A direct method would be adopted by means of underpinning through the use of micro-piles. The structural load from the raft foundation is imparted onto the micro-piles to transfer the load to competent bedrock.

The degree to which underpinning will be achieved under the raft foundation will comprise of cased micro-piles installed by pre-drilled holes and pressure grouted. A central reinforcing bar for additional reinforcing will be installed. The remedial measure needs to be carried out directly from on top of the raft foundation.

To do this, the building will need to be vacated and all equipment removed, before the infill brick walls are demolished. The underpinning would then be done optimally around the column positions and along the line of load bearing infill walls. Additional underpinning will be done inside the room to limit the deflection of the floor.

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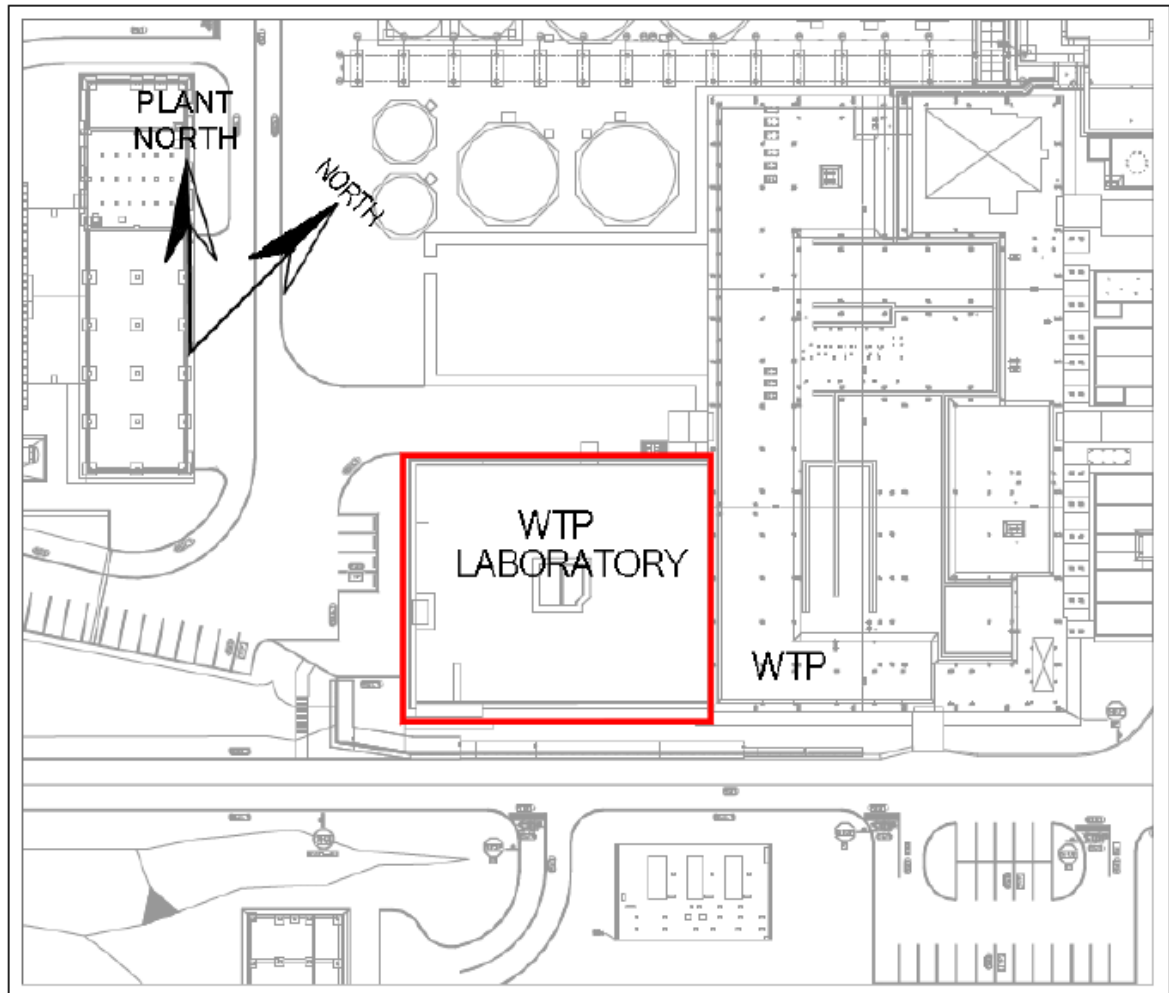


Figure 1: WTP Laboratory Location

1.1 SCOPE

1.1.1 Purpose

This document shall outline the scope in order to appoint Construction and Supervision contractor to perform remedial works to the WTP laboratory.

1.1.2 Applicability

This document applies to Kusile Power Station.

1.2 NORMATIVE/INFORMATIVE REFERENCES

1.2.1 Normative

- [1] ISO 9001: Quality Management Systems.

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- [2] Occupational Health and Safety Act No. 85 of 1993
- [3] 240-76992014: Project/Plant Specific Technical Documents and Records Management Work Instruction
- [4] 240-124499452 Kusile Project Document Work Instruction
- [5] 240-86973501: Engineering Drawing Standard
- [6] Construction Regulations, 2014
- [7] 240-53114026: Eskom Project Engineering Change Management Procedure
- [8] 240-53113685: Design Review Procedure
- [9] 240-128515850 – Document Handover Specification
- [10] 240-56355754 - Field Instrument Installation Standard
- [11] IP65 Standard: Electric/electronic enclosures (transmitters, electrical boxes) and analysers
- [12] Kusile WTP Control & Instrumentation Specification
- [13] GGS 1427: Instrumentation Piping for Fossil and Hydro Power Stations
- [14] 240-56227443 - Requirements for Control and Power Cables for Power Stations
- [15] 240-56355815 - Junction Boxes and Cable Termination Standard
- [16] 240-56356396 - Earthing and Lightning Standard
- [17] 240-56355731 Environmental Conditions for process control equipment

1.2.2 Informative

- [5] 474-58 (Rev1): Document and Records Management
- [6] Kusile Power Station – Water Treatment Plant (WTP) Laboratory Design Of Underpinning For G171-63-18-Tn160_R0_Kusile WTPp Lab Up
- [7] Technical Specification for Micropile Installation-G171-63_SPC-180702_r0_Specification.
- [8] 0.90/137: Kusile Power Station Layout
- [9] NWS 1527: The Installation of Cables And Cable Racks At Power Stations

1.3 DEFINITIONS

1.3.1 Classification

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

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1.4 ABBREVIATIONS

Abbreviation	Description
BOP	Balance of Plant
CADD	Combined Annotation Dependent Depletion
CCTV	Closed-Circuit Television
CIM	Communication Interface Memorandum
C&I	Control & Instrumentation
ECP	Engineering Change Procedure
EGL	Existing Ground Level
FGD	Flue Gas Desulphurization
HVAC	Heating, ventilation, and air conditioning
ISO	International Organization for Standardization
KET	Kusile Execution Team
KKS	Kraftwerk Kennzeichen System
OSH	Occupational Health and Safety
PDF	Portable Document Format
PPE	Personal Protective Equipment
PRV	Pressure Regulating Valves
P&ID	Piping and Instrumentation Diagram
QCP	Quality Control Plan
SANS	South African National Standards
SPF	Smart Plant Foundation
SPO	SmartpPlant Owner Operator
SPRD	SmartPlant Reference Data
TOC	Top of Concrete
VDSS	Vendor Document Submission Schedule
URL	Uniform Resource Locator
WTP	Water Treatment Plant

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2. ENGINEERING AND THE *CONTRACTOR'S* DESIGN

2.1 DESCRIPTION OF THE *WORKS*

This document provides the requirements and specifications relating to the underpinning of the WTP Laboratory foundation slabs. WTP Laboratory building is founded directly on a 350mm thick reinforced concrete mat foundation, which in turn is founded on a 9,5m thick terrace fill.

The underpinning is to comprise of self-drilling, continuous-thread hollow-core steel bar micro-piles installed to a depth of approximately 15m (2,5m socket) with grout flush. The micro-piles are designed for a working load capacity of 100kN / pile using R25N bars.

The underpins are to be installed on a regular grid pattern of < 3m c/c in two directions approximately, but adjusted locally for walls and columns, through holes cored in the foundation, positioned to avoid the top layer of reinforcing.

The underpins are to be installed inside the existing WTP Laboratory building, with limited headroom. A number of the cracked walls are to be demolished before underpinning commences. The micropile layout may be adjusted to suit the walls removed.

2.2 *EMPLOYER'S* DESIGN

1. The *Contractor* carries out all *works* as indicated in the drawings issued by the *Employer*.
2. Any discrepancy or ambiguity between the *Employer's* Specifications or requirements is immediately brought to the attention of the *Project Manager* for clarification.

3. CONSTRUCTION

3.1 WORK TO BE PERFORMED BY THE CONTRACTOR FOR THE *WORKS*

The technical specification for the micropile installation for the WTP Laboratory project entails the following:

3.1.1 Demolishing Scope of Work:

3.1.1.1 General

The *Contractor* shall remove and re-instate all existing facilities and equipment. Storage shall be provided by the *employer*.

3.1.1.2 Demolishing of walls:

Selected walls shall be demolished as depicted on the drawing: 366/231264 Rev 02.

Utility pipelines have been surfaced mounted on these walls. These utility pipelines are indicated on drawing 0.90/22217 Sheet 1 Rev F and consists of gas, portable water and demin water pipelines.

3.1.1.3 Doors and door frames:

Selected door and door frames shall be removed as depicted on the drawing: 366/231264 Rev 02. If any door frame cannot be recovered during the removal process the Contractor would have to make provision for a new one.

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During the removal process, all door leafs are to be preserved and stored only to be reused after remedial operations.

3.1.1.4 Ceiling Boards:

Where necessary, ceiling boards need to be removed for micropiling operations. The Contractor shall preserve and store the ceiling boards in a safe location.

Regarding resultant damages to the ceiling caused by the settlement of the building. The Contractor would also need to make provision to remediate the resultant damages.

3.1.2 Micropiling Scope of Work

The scope of the work is for underpinning the Water Treatment Process (WTP) Laboratory foundation slab, which is 350mm thick, to arrest further settlement of the existing foundations. The building of the WTP laboratory is approximately 39m by 48m and consists of vertical concrete columns with infill brickwork, either as facebrick or plastered, in accordance with the architectural details.

The underpins are to be installed inside the existing WTP Laboratory building, with limited headroom. A number of the cracked walls are to be demolished before the remedial works contract commences. The demolition and removal of the identified walls will be done prior to the commencement of the underpinning contract. The micropile layout may be adjusted to suit the walls removed.

The underpinning is to comprise self-drilling, continuous-thread hollow-core steel bar micropiles installed to a depth of approximately 15m (2,5m socket) with grout flush. The micropiles are designed for a working load capacity of 100kN / pile using R25N bars.

The underpins are to be installed on a regular grid pattern of < 3m c/c in two directions approximately, but adjusted locally for walls and columns, through holes cored in the foundation, positioned to avoid the top layer of reinforcing.

Prior to underpinning operations the scope should include the demolition selected walls depicted on the drawings. The WTP laboratory is to be cleared of furniture and equipment. Where necessary; door frames and ceiling boards must be removed prior to underpinning operations.

After micropiling operations are complete, construction activities that required demolition and removal prior to micropiling operations will be reinstated by Contractor.

3.1.3 Layout of Underpinning

The layout and depth of the micropiles is as depicted on the drawings: 366/231261 Rev 02.

The final position of the grid of micropiles will be based on access and existing walls remaining. Minor adjustments to the actual position of each micropile will be based on the layout and orientation of the existing reinforcing in the foundation slab identified at each position.

The depth will be finalised once site conditions beneath the WTP laboratory is confirmed during the drilling for the initial piles to provide a socket of 2,5m as agreed between the Engineer and the Contractor.

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3.1.4 Micropiles

3.1.4.1 General

The Micropiles are to consist of self-drilling, continuous-thread hollow-core steel bar micropiles installed to a depth of approximately 15m (2,5m socket) with grout flush, bonded to the existing 350mm thick foundation slab by the fully grouted 125mm diameter cored holes.

The Micropiles are designed for a working load capacity of 100kN / pile using R25N bars.

3.1.4.2 Micropile Reinforcing

The reinforcing for the micropiles, is to be provided by the R25N self-drilling, continuous-thread hollow-core steel bars, grouted in place once the flushing grout has been replaced by annulus grout. The micropiles are to be installed through pre-cored holes in the foundation slab.

The top 325mm of the continuous-thread hollow-core steel bar is to project into the existing 350mm thick foundation concrete.

A 110mm x 20mm hot-dip galvanised bearing plate held by a hexagonal nut is to be placed near the base of the existing foundation. The annulus between the continuous-thread hollow-core steel bar and the cored hole through the concrete is to be grouted with a high strength non-shrink grout.

3.1.5 Grout

3.1.5.1 General

Grout is to be used for both flushing the micropiles during drilling and then annulus grouting once the final depth has been reached.

3.1.5.2 Grout Mix, Mixing and Injection

A stable neat cement grout or a sand cement grout with a minimum 28-day unconfined compressive strength of 30 MPa is to be used for the annulus grout. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The grouting equipment used shall produce a grout free of lumps and undispersed cement.

A means and method of measuring the grout quantity and pumping pressure during the grouting operations is to be provided. The grout pump shall be equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed near the point of injection into the pile top. The pressure gauges shall be capable of measuring pressures of at least 3 MPa or twice the actual grout pressures used, whichever is greater.

The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile.

The grout pressures and grout takes shall be controlled to prevent heave or fracturing of the rock formations.

The grout mix shall comply with the following requirements:

- a. The grout mix shall consist of cement, water (and a non-shrink agent if used).
- b. Cement shall be CEM I or CEM II, 42,5N or 42,5R according to SANS 50197-1 & 203-770 Kusile Specification for Structural Concrete Rev 4.

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3.1.5.3 On-site Quality Control

Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation of the initial production piles.

During production, Micropile grout shall be tested for compressive strength at a frequency of no less than one set of three 50-mm grout cubes from each grout plant each day of operation or per every 20 piles, whichever occurs more frequently.

The compressive strength shall be the average of the 3 cubes tested.

Grout consistency, as measured by grout density, shall be determined by the Contractor at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance is an approved device for determining the grout density of neat cement grout. Grout samples shall be taken directly from the grout plant.

The results shall be reported on the grouting record sheet and submitted daily to the Engineer. Grout cube compressive strength and grout density test results are to be provided to the Engineer within 24 hours of testing.

The Contractor shall submit a sample of sand (if used) to an accredited testing laboratory for grading analyses every fortnight. Test certificates shall be handed to the Engineer on the first working day following receipt at the latest.

3.1.5.4 Approval of Grout Mix

Prior to commencement of grouting, the Contractor shall submit the proposed grout mix design, including the grading curve of any sand if used, to the Engineer for approval.

The Contractor shall prepare a trial mix of the proposed grout, check the density, marsh cone flow and submit nine test cubes of grout to an accredited concrete testing laboratory. Three cube strength tests each shall be carried out after 24 hours, 3 days and 7 days. The test certificates shall be submitted to the Engineer prior to the Engineer's approval of the mix design.

3.1.5.5 Flushing Grout

During drilling a 0,7 water: cement grout flush is to be used to flush the hole.

3.1.5.6 Annulus Grout

Once the required depth of the Micropile has been reached, the flushing grout is to be replaced by a 0,4 to 0,5 water: cement grout.

While injecting the annulus grout, the drill string is to be extracted by 6m and re-instated to the full depth whilst continuing to flush and pressure grout the hole.

The final injection pressure is to be recorded.

Once an initial grout set has been reached, the top 500mm of grout is to be flushed out and the core pressure cleaned.

3.1.5.7 Connection from Pile to foundation concrete

The top 500mm of the Micropile is to be pressure cleaned once the annulus grout has gained an initial set.

A 110mm x 20mm hot-dip galvanised bearing plate with a hexagonal; nut is placed near the bottom of the foundation slab.

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The cleaned core hole is then to be filled with a non-shrink cement grout, flush with the top of concrete slab.

3.1.5.8 Rock Socket

The piles are to be drilled into the underlying rock / shale to transfer the load from the pile into the rock over the length of the socket. The depth to be adjusted to suit actual founding conditions once construction commences and depth of rock socket confirmed.

A rock socket based on soft rock or better has been used in the design. If the underlying rock is found to be weaker, a longer socket will be specified.

3.1.6 Equipment

3.1.6.1 Coring Equipment

The coring equipment shall be capable of coring a 125mm diameter hole through the 350mm thick reinforced concrete slab. Details of the existing reinforcing are provided in Eskom's drawing No. 0.90/24353 Sheet 12 Rev 2

The slab is reinforced with two layers of reinforcing (top and bottom layer). The top and bottom have Y12 bars spaced 200mm apart in two perpendicular directions.

3.1.6.2 Drilling Equipment

The drilling equipment shall be capable of advancing the self-drilling, continuous-thread hollow-core steel bar micropiles to at least a maximum depth of 18m in the profile provided in the geotechnical report. No drilling muds are to be used, but downstage grouting may be used to stabilise the sidewalls of the borehole as it is being advanced.

3.1.6.3 Pile Installation

The Contractor is to provide a safe means for installing the self-drilling, continuous-thread hollow-core steel bar micropiles.

The top of the self-drilling, continuous-thread hollow-core steel bar is to be located 25mm below the foundation TOP OF CONCRETE surface.

3.1.6.4 Grout Batcher and Mixer

The grout batching and mixing system shall be capable of precisely proportioning the grout constituents and blending them into a homogeneous mix of uniform consistency. Automatic volumetric proportioning systems or batch-type mixers may be used.

3.1.6.5 Grout Pump

The pump shall be capable of pumping at variable rates with a pressure of up to 6MPa.

3.1.6.6 Grout Delivery Line

The grout delivery line shall consist of a high-pressure flexible hose or a combination of hose and rigid pipeline and shall be watertight under pressure. Couplings and fittings shall have the same internal diameter as the pipe or hose so as not to obstruct the flow of grout.

A water pressure test on the delivery line shall be carried out to confirm its water tightness at the maximum grouting pressure to be used.

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3.1.6.7 Pressure Gauges

Pressure gauges shall be installed at the grout pump and at the grout header. Gauges shall be in good working order and a calibration certificate no more than 3 months old shall be supplied for each gauge. Gauges shall be protected against grout intrusion, have a minimum face diameter of 75mm and a maximum pressure range of 200% of the anticipated maximum grouting pressure. Spare gauges shall be kept of site.

3.1.7 Setting Out and Tolerances

The holes shall be set out by the Contractor in the positions shown on the document: G171-63-Micropiles-coordinates.

Once established, Micropiles in relation to the columns are to be set out first, then the walls and finally the open areas.

Micropiles are not to be installed within 400mm of any column.

Micropiles adjacent to walls are to be installed at a distance of 300mm or less from the face of the wall.

The final position of each hole is to be adjusted to avoid the reinforcing bars as best as possible and may be offset from the specified position by 150mm in any direction.

The Micropile shall be plumb, within 2% of the total-length plan alignment.

The top elevation of the reinforcing specified shall be plus 15mm or minus 25mm maximum from the vertical elevation indicated.

3.1.8 Sequence of Construction

3.1.8.1 Sequence

The sequence of Micropile installation shall be as follows:

1. All rotary core holes through the foundation slab must be drilled as required.
2. The installation of the Micropiles is to be carried out by working symmetrically from the sides of the rooms to the centre.

Should a Micropile need to be abandoned due to installations problems etc., an additional Micropile is to be installed within a 300mm offset from the abandoned Micropile. The new position is to be agreed with the Engineer. Note that the spacing of the surrounding micropiles does not change.

3.1.8.2 Method

The method of construction is given on the drawings: 366/231769 Rev 02.

3.1.8.3 Micropile Installation Logs

The Contractor shall compile a pro-forma installation log sheet for approval by the Engineer.

The following parameters shall be recorded:

- Hole number, date cored, operator and any comments / observations.
- Date drilled, rig number, method of drilling, operator, drilled depth, depth of Micropile and any downstage grouting and re-drilling.

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- Drilling parameters including rate of penetration (seconds / metre), air loss, sample return, hammer tempo, voids or obstructions, colour and type of material, any cavities or collapse of hole and water strikes.
- Annulus grouting date, volume injected, maximum and average pressure, termination reason.
- Bearing plate & hexagonal nut installation date, grout volume and topping up to top of concrete.

3.1.9 Monitoring of Structures

3.1.9.1 Survey Monitoring by Contractor and Records

Before construction commences, a base reading level survey of all the existing monitoring points of the foundation are to be taken. Additional points are to be added to provide a method of monitoring the foundation in the area being underpinned.

At the start of day's shift, the levels of all monitoring points shall be recorded to an accuracy of $\pm 1\text{mm}$ using an engineer's level or a laser level. The monitoring surveys are to continue until the micropile installation has been completed. Post-construction monitoring is to be undertaken by KET.

During drilling and grouting, the Contractor shall observe the conditions in the vicinity of the activities on a daily basis for signs of ground heave or subsidence. The Engineer is to be immediately notified if signs of movements are observed. The Contractor may have to suspend or modify drilling or grouting operations as determined by the Engineer.

The Contractor shall submit the results of the level monitoring at the commencement of each shift to the Engineer electronically during the first half of the shift during which the levels were taken. Any sudden jump in levels or ongoing movement is to be immediately reported to the Engineer. A record shall be kept of all monitoring results during drilling and grouting. These records may be combined with the drilling and grouting records.

The Client shall appoint an independent surveyor who shall also monitor the levels of the monitoring points at regular intervals.

3.1.9.2 Micropile Integrity Testing & Reporting

Load tests to be carried out after the installation of the micropile as per the *Contractors* discretion which will be approved by the Engineer. The Contractor to provide a report for the evaluation of integrity of the micropiles that were casted which shall be validated by the Engineer.

3.1.10 Environmental Management

The Contractor shall take all reasonable precautions to prevent damage to the concrete slab foundation and surrounding area. The following minimum precautions shall be taken:

- The Contractor is to provide access ramp onto an off the concrete slab without damaging the concrete slab.
- Surface protection is to be provided beneath the tracks and skids of the equipment to avoid damaging the concrete.
- The Contractor shall control and properly dispose of all drill flush and construction related waste, including excess grout.
- Drip trays shall be provided below all machines.
- A spill kit shall be kept on site at all times.

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- All excess grout and flushing water shall be contained in lined sumps sufficiently long for solid particles to settle out. Only clear water may be discharged from the site.
- Any water discharged from the site shall be discharged into a lined drainage channel and not onto bare ground.
- Drill chippings, grout discharge and wastage collected to be spoiled at the allocated spoil site.

3.1.11 Contractor's Method Statement

Prior to commencement of the installation of the Micropiles, the Contractor shall submit for the Engineer's approval a method statement including the following information:

- Description of all equipment to be used for drilling, pile installation, batching, mixing, pumping, grout injection, flow and pressure measurement and survey monitoring;
- Calibration certificates for all gauges and other monitoring equipment;
- Names, qualification and experience of site manager and foremen to be employed on the works;
- Description of the drilling methods to be used.
- Proposed grout mix including grading and source of sand (if used) in the grout;
- Method of controlling pumping rate;
- Description of grout injection operations including any modifications proposed by the Contractor to the specified pumping rates and injection pressures;
- Environmental management plan; and
- Copies of proposed drilling, pile installation, grouting and monitoring record forms.

3.1.12 Submission of Records

3.1.12.1 Drilling, Grouting and Monitoring

All drilling logs, pile installation, grouting and monitoring records shall be captured electronically on Excel spreadsheets. The spreadsheets shall include co-axial graphs of drilling rates per meter and of grout takes per pile including the final pressure grouted.

Copies of all field data sheets shall be submitted to the Engineer daily and electronic records shall be submitted within two working days of the completion of any Micropile.

3.1.12.2 Close-out Report

Within one week of completion of micropile installation, the Contractor shall compile an electronic copy of all drilling, pile installation and monitoring for the entire contract period and submit this report to the Engineer.

The report shall contain:

- A summary of all holes drilled, piled and grouted including hole number, date drilled, and date(s) grouted, drilled depth, pressure grouting, and gravity grouted, total grout take and any comments.
- Electronic copies of drilling logs and grouting record sheets for each grout hole, compiled in Alpha-numeric order.
- Electronic copies of grout tests results.

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- Plots giving a graphical representation of grout acceptance volumes over the depth of the hole normalised to volume per metre grouted length, plotted co-axially with the drill penetration rates.
- Elevation vs time (date) plots of the level of all monitoring points from daily survey records.

3.1.13 General

The *Contractor* is required to:

1. Adhere to the South African environment protection act, the waste management code of practice and the South African Occupational Health and Safety Act No. 85 of 1993, the regulations promulgated thereunder and Eskom Health, Environment and Quality (SHEQ) Policy 32-727 for all *Works*.
2. Submit a comprehensive method statement of the entire *works* to the *Project Manager* for acceptance prior to the start of the *works*. The Contractor should allow for a 10 day review period.
3. Remove all fixed built in cupboards and any other fixtures in areas where the contractor requires access for demolishing/piling and reinstate once the associated scope is completed.
4. Submit a project specific safety file to the *Project Manager* for comments / acceptance.
5. Submit a detailed level 3 schedule for the *works* to the *Project Manager* for acceptance after contract award.
6. Take all necessary precautions to ensure that none of the existing plant that is not in the scope of works is damaged during execution of the *works*.
7. Store salvaged components elevated off the ground to protect from ingress of dust and rainwater, etc.
8. Manage his access to the Working Areas and the Site.
9. Manage his activities on Site to ensure that no interference takes place between his work and that of others.
10. Complete "Contract Activities Daily Reports".
11. Liaise with the Contracts / *Project Manager* regarding the location of waste disposal sites and rubbish dumps.

3.1.14 Construction

1. The *Contractor* is responsible for the construction activities in accordance with the detailed drawings and specifications.
2. The *Contractor* disposes of all waste at a licenced waste disposal site to be authorised by the *Project Manager*. The waste disposal site is selected to suit the classification of the materials to be disposed of. Certificates of disposal are required be submitted to the *Project Manager* where applicable.

3.1.15 Quality Management

1. All work is carried out under the supervision of an experienced supervisor.
2. The Quality requirements are specified in Appendix A.

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3.1.16 Handover

1. Apart from any statutory data packages required, the *Contractor* also compiles a data package of the relevant drawings, test certificates etc. to the *Project Manager* for acceptance. These include, but are not limited to all as per section 3.1.11.
2. The *Contractor* is required to submit as-built data and drawings of the completed *works* upon handover. As-built drawings are compiled and submitted based on the requirements specified in Section 3.3.1 Documentation and Configuration Management.
3. Detailed handover requirements will be as per Appendix E, as a minimum the Contractor will provide Employer with the back-ups and information to replicate completely replicate the Contractor Smart Plant instance on the Employer's environment. Any uncertainty regarding this process should be clarified with the Employer.

3.1.17 Technical Assurance during Construction and Sign-off:

Technical Construction monitoring is required as part of this project scope, to provide the following:

1. Level 2-3 as per ECSA guidelines
2. Technical queries (RFIs, Redlines drawings, etc.)
3. Construction Completion Report
4. As-built drawing with Pr. Number
5. Professional Engineering Certificate (COC) for the construction supervision and completion as per provided design:
 - a. Structural COC for Superstructure.
 - b. Structural COC for micropile/foundation.

3.1.17.1 Refurbishment Scope of Work

3.1.17.1.1 Reinstatement of walls

Selected walls shall be reinstated to its original state after micropiling operations have been completed. Walls to be reinstated is depicted on drawing: 366/231264 Rev 02. Utility pipelines surfaced mounted on these walls shall be reinstated. These utility pipelines are indicated on drawing 0.90/22217 Sheet 1 Rev F and consists of gas, portable water and demin water pipelines.

3.1.17.1.2 Doors and door frames:

Selected doors and door frames shall be reinstated to its original state after micropiling operations have been completed. Door and door frames to be reinstated is depicted on drawing: 366/231264 Rev 02.

Each door leaf corresponds to a door frame. The Contractor is to ensure that during installation that each door leaf label corresponds to the same door frame label.

If the door frame could not be recovered, the door leafs must be retrofitted to accommodate the new frame.

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3.1.17.1.3 Ceiling Boards:

All ceiling boards that were removed or damaged during remedial operations shall be reinstated.

All Bulkheads that were damaged or removed during remedial operations shall be reinstated. Refer to drawing KLE_00_R) 00UGD10R035_GA-006, Sheet 35D/35E for the control room Bulkhead details.

3.1.17.1.4 Tiling remedial:

All tiles that were damaged or removed during remedial operations shall be reinstated.

A floor coating system is required for all laboratory areas. This will replace the current chemical resistant tiles currently installed in these areas. Since all the areas in the Laboratory are going to handle chemicals of varying degree of corrosiveness, a monolithic floor is preferred.

This is a type of floor which is not produced in a factory but cast as a single piece in-situ and is typically constructed from either sheet vinyl, linoleum, or rubber. The main advantage of this type of flooring is that it is easier to clean and maintain. The flooring should continue up the wall for a few centimetres, thus creating a lip. All seams are welded shut, ensuring that nothing can get through the flooring.

Prior to installation, the Contractor will submit a proposal for a floor coating system to the Engineer for approval.

3.1.17.1.5 Floor coating in the control room

The vinyl flooring currently installed in the control room shall be reinstated to its original state after micropiling operations have been completed.

3.1.17.1.6 Fire detection

All fire detection devices that were damaged or removed during remedial operations shall be reinstated. Refer to drawing 0.90/24080 Rev 4 for the fire detection layout

3.1.17.1.7 Electrical works

All electrical fixtures and cabling that were damaged or removed during remedial operations shall be reinstated. Refer to drawings 0.90/23584 and 0.90/23585 for electrical installations

3.1.17.1.8 Basic Services

Any basic services that were damaged or needed to be replaced will be reinstated after micropiling operations.

4. SPECIFICATIONS FOR THE *WORKS*

4.1 APPLICABLE NATIONAL & ESKOM STANDARDS

Number	Title
203-1239	Conceptual architectural Design Specifications for Structures and Other Buildings
240-56364545	Structural Design and Engineering Standard

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Number	Title
203-770	Kusile Specification for Structural Concrete
SANS 10400	The Application of the National Building Regulations
SANS 2001-CC1	Construction works Part CC1: Concrete works (structural)
SANS 2001-CC2	Construction works Part CC2: Concrete works (minor works)
SANS 2001-CG1	Construction works Part CG1: Installation of glazing in window and door frames
SANS 2001-CM1	Construction works Part CM1: Masonry walling
SANS 1200 F	Standardized specification for civil engineering construction Section F: Piling
SANS 50197-1	Standardized specification for Cement Part 1: Composition, specifications and conformity criteria for common cements.
SANS 2001-EM1	Construction works Part EM1: Cement plaster
SANS 1200 A	Standardized specification for civil engineering construction Section A: General

SYSTEM INTEGRATION CODES AND STANDARDS

Number	Title
240-53114186	Document and Record Management Procedure
240-132735850	Kusile Engineering Change Management Procedure
ISO 10007:2003	Guidelines for Configuration Management
ISO 10007:2003	Guidelines for configuration management
VGB-B 105 E	KKS Guidelines
VGB-R 171e	VGB Guideline - Supply of Technical Documentation for Fossil-fired and Regenerative Powers Stations
240-86973501	Engineering Drawing Standard Common Requirements
240-4417997	Documentation Preservation Standard
240-52843902	Engineering Terms and Abbreviation Standard for Eskom Power Plants
240-71432150 Rev 2	KKS Plant Labelling and Equipment Descriptions Standard
240-72273656	Power Generation Asset Criticality Classification Standard
240-64550692	Labelling Specification and Plant Coding Procedure
IEC 61355-1	Classification and designation of documents for plants, systems and equipment
VGB-B 106 B2 E KKS	Application Explanations Part B & Part B2 - Identification in Civil Engineering.
VGB-B 106 B3 E KKS	Application Explanations Part B & Part B3 - Identification in Elec and Control and instr. Eng.
240-49230111	Hazard and Operability Analysis Guideline
240-54179170	Technical Documentation Classification and Designation Standard

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Number	Title
240-107305502	Data Take on Standard

4.2 ADDITIONAL REQUIREMENTS AND PREREQUISITES

4.2.1 General

1. The *Contractor* is confirms all site dimensions, levels and cast-in items positions on site prior to any installation and casting of the micropiles.
2. The *Contractor* is submits a comprehensive method statement of the *works* to the *Project Manager* for acceptance prior to the start of the *works*.
3. The *Contractor* is responsible for the design, erection, maintenance and removal of all temporary works required for the execution of the *works*.
4. Any reference made to the *Engineer* in the project specifications and/or drawings issued by the *Employer* is directed at the *Project Manager*.
5. Any reference made to approval in the project specifications and/or drawings issued by the *Employer* means accepted.
6. Documentation is to be managed as per Appendix F.

4.2.2 Concrete

1. All concrete work is required to be in accordance with SANS 2001-CC1 unless otherwise stated.
2. Concrete is required to be 25/19MPa unless stated otherwise on the issued drawings; i.e. 19 mm aggregate is to be used in combination with other aggregates, cement and water to attain minimum 28 day cube strength of 25MPa.
3. All concrete surfaces and cast-in items are to be inspected and accepted by the Project Manager in writing before casting of concrete may commence.
4. The Contractor is required to obtain written acceptance from the Project Manager for the use of any add-mixture or the use of ready mixed concrete or to use cement or cement blends other than ordinary Portland cement (OPC)
5. Compaction of concrete is required to be done by means of mechanical vibrators only.
6. The Contractor is required to submit the concrete mix design to the Project Manager for acceptance.
7. The Contractor is required to demonstrate, by means of a report from an approved laboratory, that the aggregates do not exhibit excessive shrinking properties in accordance with SANS 1083 and is also required to demonstrate that the aggregates do not have a potential alkali silica reaction.
8. All concrete is required to have a maximum water/cement ratio of 0.45 with a minimum cement content of 325 kg/m³ and maximum cement content of 400 kg/m³.
9. The Contractor is required to perform a slump test on the same batch of concrete every time a sample is taken and the result recorded.

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5. LIST OF DRAWINGS

5.1 DRAWINGS ISSUED BY THE *EMPLOYER*

The following is issued to the *Contractor*.

Drawing number	Revision	Title	Status
366/231261	2	Water Treatment Plant Laboratory Raft Foundation - Micropile Underpinning layout	For tender purposes
366/231264	2	Water Treatment Plant Laboratory Raft Foundation – Underpinning Restrictions and services	For tender purposes
366/231769	2	Water Treatment Plant Laboratory Raft Foundation - Underpinning Method Statement and Details	For tender purposes
G171-63		Micropiles-coordinates	For tender purposes
0.90/22217	F	Water Treatment Plant Lab Utilities Layout	For tender purposes
0.90/135423	D1	Laboratory Building WTP Control Room – General Arrangement	For tender purposes
0.90/134876	D2	Physical and Logical Network Architecture Drawing	For tender purposes
0.90/134876	D2	BOP Overview Network Architecture Drawing	For tender purposes
0.90/150303	0	Lab Fume Cabinet & Hood positions	For tender purposes
0.90/156348	0	Sample Line GA & Panels	For tender purposes


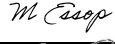


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203-7362	B	WTP General Assembly Drawings	For tender purposes
0.90/87951		Water Treatment Laboratory CCTV System Cable Layout	
0.90/88097		Kusile CCTV Mounting Typical Drawing -	
0.90/23584	3	Laboratory Building Lighting Layout	
0.90/23585	6	Laboratory Building Small Power, Telephone & Data and Lightning Protection Layout	

6. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation	Signature
●●●●●●●●	Kusile Power Station Lead Civil Discipline Engineer	
●●●●●●●●●●	Kusile Power Station Quality	
●●●●●●●●	Kusile power station EDWL	
●●●●●●●●●●	Kusile Power Station Lead Integration Engineer	

7. REVISIONS

Date	Rev.	Compiler	Remarks
August 2018	0	●●●●●●●●	Draft document for review
October 2018	1	●●●●●●●●	Inclusion of C&I and Chemical scope
Feb 2020	2	●●●●●●●●●●	Inclusion of additional scope
October 2021	3	●●●●●●●●	Front page signatory and general updates
July 2022	4	●●●●●●●●	Minor updates to removal, reinstate and storage



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8. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- [REDACTED] – Lead [REDACTED] Engineer.

9. ACKNOWLEDGEMENTS

N/A

APPENDIX A – QUALITY REQUIREMENTS

1 QUALITY REQUIREMENTS

1.1 OVERVIEW

- 1) The fundamental objective of the set of quality requirements stated within this contract is to ensure that the *Contractor* produces goods/products/services that the *Employer* are wholly satisfied with whilst ensuring that work is done right the first time. To achieve this, the *Contractor* shall ensure that three approaches are taken. These are as follows:
 - a) Ensuring that the *Contractors* Quality Management System (QMS) is set up and maintained
 - b) Quality Assurance
 - c) Quality ControlThese are broad areas each with numerous requirements.
- 2) The *Contractor* shall comply with all requirements specified in the Eskom standard, 240-10565800 “Supplier Quality Management: Specification” [1]. It is of utmost importance that this standard be complied with.

1.2 CODES, STANDARDS AND DOCUMENTS TO BE COMPLIED WITH

The Contractor shall comply with the following documents as well as all documents referenced therein:

- [1] 240-105658000 “Supplier Quality Management: Specification” (QM 58)
- [2] ISO9001:2015 “Quality Management Systems – Requirements” (Take note that the level of compliance to this standard are determined by [1] above and section 1.3 below)
- [3] ISO10006:2003 “Quality Management Systems – Guidelines for Quality Management in Projects”
- [4] 240-132155951 “Kusile Project RFI/PA001 Process”
- [5] 240-150475305 “Kusile Defects Management Process Work Instruction”
- [6] 240-132156363 “Kusile NC Process”
- [7] 240-43921898 “Kusile Project Audit Process Flow”
- [8] 240-134232676 “Data book Review and Final Submission Process”
- [9] ISO 10005 – Quality Management – Guidelines for Quality Plan

1.3 QUALITY MANAGEMENT SYSTEM REQUIREMENTS

- 1) The *Contractor* shall ensure that QMS that complies with ISO 9001 or any applicable standard of quality management system (the latest applicable revision) is developed and implemented without necessarily being certified. The Contractor shall comply with the requirements of 240-105658000 “Supplier Quality Management: Specification”. Compliance

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to Category 2 requirements is mandatory. The following documents (approved copies) shall be submitted:

- a) Quality Management System manual or a document that have defines and describes the QMS and its scope
 - b) Quality Policy
 - c) Quality Objectives
 - d) Control of documented information
 - e) Records required by ISO 9001 standard (List of Records)
 - f) Internal audit procedure
 - g) Control of non-conformity outputs
 - h) Nonconformity and Corrective action procedure
 - i) Latest copy of an internal management system audit reports. The audit reports must include, if applicable, nonconformity identified, and the resulting remedial actions (correction and/ or corrective action reports)
 - j) Documented information for Control of Externally Provided Processes, Products and Services Processes, Products and Services
 - k) Information for roles, responsibilities and authorities
- 2) The Quality Management System shall drive the *Contractor's* business management processes to ensure that all of the *Employers* requirements are fully met on a consistent basis.
 - 3) The *Contractor* shall comply with all requirements specified in section 3.1 of the Supplier Quality Management Specification.
 - 4) The *Employer* has the right to conduct formal audits on any or all parts of the *Contractor's* Quality Management System as well as any documentation, materials, or equipment associated with the work, at any time and at any project work location.
 - 5) The *Employer* also has the right to carry out assessments and audits on the *Contractor's* sub-contractors at planned intervals.
 - 6) In the event that the *Employer* is dissatisfied with the *Contractor's* work for any reason, the *Employer* has the right to conduct additional audits of the *Contractor*.
 - 7) The *Contractor* shall address all audit findings to the satisfaction of the *Employer* within a time frame acceptable to the *Employer*.

1.4 QUALITY ASSURANCE REQUIREMENTS

- 1) The *Contractor* shall ensure that Quality Assurance is performed at all levels and phases of work carried out for the *Employer*.
- 2) The *Contractor* shall use processes to ensure that quality is built into their products/services i.e. its business processes are organized such that quality is built into the process of producing goods and rendering services.
- 3) The *Contractor* shall ensure that it can be relied on to deliver quality goods and services without the need for the *Employer* to have to inspect all the time.

1.5 QUALITY CONTROL REQUIREMENTS

- 1) Quality Control is a product oriented set of activities for ensuring quality in products/services. These activities focus on inspection and identifying defects before these reach the *Employer*.
- 2) The *Contractor* shall ensure that Quality Control is performed at all levels and phases of work carried out for the *Employer*.

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- 3) The *Contractor* shall comply with all requirements specified in section 3.4 of the Supplier Quality Management Specification [1].
- 4) The *Contractor* shall complete a Quality Control Plan (QCP) and Inspections and Test Plan (ITP) before contract award. This shall be reviewed and signed off by the *Employer* within 30 days after contract award.
- 5) The *Contractor* shall submit the following documents within 30 days after the contract date, prior to the commencement of work, for acceptance by the *Employer*:
 - a) QCPs and ITPs for review and acceptance by Eskom prior to the commencement of any work, inclusive of subcontracted work, within 30 days after contract award.
 - b) The sub- contractor QCPs and ITPs shall be submitted for review and comment by the *Contractor* and by the *Employer* within 30 days after the award of the tender. All *Contractor* and *Employer* comments shall be resolved prior to commencing work.
 - c) The QCPs and ITPs show each activity/requirement of the Works Information.
 - d) Data book index for acceptance by the *Employer*.
Note: these documents are to be compiled in line with Eskom's requirements and will have to be discussed with, and approved by the *Employer* prior to any work commencing.
- 6) The project programme shall show all quality intervention points such as witness, hold, verification, surveillances and review points. These shall be updated if changes are made to the programme.
- 7) The *Contractor* shall make use of the Kusile Project RFI/PA001 Process to request the *Employers* personnel to perform inspections. The *Contractor* shall ensure that all inspections have been "Passed" by their in house quality control representative prior to requesting the *Employers* personnel to perform any inspection.
- 8) In the event of poor quality, re-work or incidents where products inspected by the *Employer* fail to meet requirements, the *Contractor* shall receive a Non-conformance (NCR) if deemed so by the *Employer*. The *Contractor* shall be liable for the *Employers* costs of re-inspection as well as be liable to pay penalties as specified in this contract.

1.5.1 Inspections

- 1) The *Contractor* shall be responsible for the inspection of all the Works that is performed and the *Employer* only verifies that the Works is acceptable.
- 2) The *Contractor* conducts all inspections in accordance with the accepted QCP / ITP.
- 3) The *Contractor* provides suitably qualified personnel to conduct on-and-offsite inspections
- 4) The *Contractor* ensures that all Works are inspected and approved before the *Employer* is invited for the inspections.
- 5) The *Contractor* shall submit the results of their internal/in-house inspection when sending the RFI to the *Employer*. Failure of the *Contractor* to perform adequate internal/in-house inspections shall result in NCRs and would necessitate the *Contractor* replacing their Quality Control personnel.
- 6) The *Contractor* provides a minimum of 5 working days' notice for local inspections (onsite and offsite) and 21 working days' notice for foreign inspections. The notice contains copies of the Contractor's inspection reports.
- 7) For onsite inspections, the *Contractor* shall send a Request for Inspection (RFI) reminder 4 hours prior to the inspection so that the Quality Department may mobilise to perform the inspection. This shall be done via the Communication Interface Memorandum. This is over and above the aforementioned 5 working days' notice period.
- 8) The *Contractor* shall provide all tools and equipment required by the *Employer's* inspectors/Quality Controllers to perform any verification during the inspection for example measuring equipment etc.

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- 9) The Contractor shall plan their work to ensure that no inspection is scheduled to start later than 15h30. This prevents *Contractor* and *Employer* personnel from rushing or hurrying to complete inspections in order to knock off work.

1.6 QUALITY PLAN

- 1) The *Contractor* shall submit a Quality Plan within 30 days of contract award for acceptance by the *Employer*.
- 2) The *Contractor* shall comply with all requirements specified in sections 3.2, 3.3 and 3.4 of the Supplier Quality Management Specification.
- 3) The *Contractor* shall submit a detailed contract organogram showing the quality personnel to be used in the Contract. The *Contractor* shall provide CVs of the quality management employees who will be responsible for quality on site.

1.7 QUALITY DOCUMENTATION REQUIREMENTS

- 1) For all products and services, the *Contractor* shall submit the following quality documents as a minimum:
 - a) Data book Index
 - b) Method statement (describing how work will be executed)
 - c) Equipment list
 - d) Drawings
 - e) ITPs, QCPs and check sheets
 - f) Inspection notifications accompanied by their inspection report
 - g) Updated onsite, off site and offshore inspection schedules
 - h) Inspection and or factory acceptance test dates as applicable
 - i) Site Acceptance Tests
 - j) Inspections completed / outstanding.
 - k) Inspection and test reports
 - l) Weekly and monthly contract quality progress report
 - m) Materials used
 - n) Material certificates
 - o) Data sheets
 - p) Equipment list
 - q) Welding documents (if applicable) include Welding Procedure Specification (WPS), Procedure Qualification Record (PQR), welder qualifications, Welding Procedure Qualification Record (WPQR), welding consumables and all other documents required by relevant welding standards
 - r) Quality Plan (as earlier described)
 - s) Non-conformance and Defects registers and reports
 - t) Schedule of unpriced orders to be placed and this is updated regularly
- 2) The *Contractor* shall submit data books for all work for acceptance by the *Employer* if applicable. These are defined as follows:
 - H1 – Fabrication
 - H2 – Construction
 - H3 - Commissioning
- 3) The *Contractor* shall submit data books in accordance with the *Employers* requirements. The *Employers* requirements vary depending on the type of component or system hence the *Contractor* shall modify the data books to meet the requirements of the *Employer*.

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- 4) Components may only be released for delivery to site once the H1 data book(s) has been accepted by the *Employer* if applicable.
- 5) Commissioning may only commence once the H2 data book(s) has been accepted by the *Employer* if applicable.
- 6) The *Contractor* shall ensure that all data book(s) have been submitted to and accepted by the *Employer* as per the *Employers* requirements and meet the time frames specified by the *Employer*.
- 7) Failure of the *Contractor* to submit data book(s) and obtain the *Employer's* approval at 100 % work completion shall affect payment.
- 8) Failure of the *Contractor* to submit H1 data book(s) and obtain the *Employer's* approval prior to construction will affect payment.
- 9) Failure of the *Contractor* to submit H2 data book(s) and obtain the *Employer's* approval prior to Commissioning will affect payment.
- 10) Failure of the *Contractor* to submit H3 data book(s) and obtain the *Employer's* approval prior to takeover will affect payment.
- 11) Failure of the *Contractor* to submit all data book(s) and obtain the *Employer's* approval will prevent take-over of the Works by the *Employer*.
- 12) The *Employer* has 21 days to review a data book from the time the *Contractor* transmits the data book to the document controller until feedback is received.
- 13) The *Contractor* shall specify the review status and discipline on the transmittal when transmitting data books to the *Employers* Doc control.
- 14) The *Employer* shall only take handover subject to meeting and *Employer* approval of all quality requirements and required number of the data books accepted by the *Employer* respectively.

1.8 CONTRACT EXECUTION

- 1) Correspondence shall be directed to the *Employer*, and periodic quality review meetings shall be convened by *Employer* with the *Contractor*.
- 2) The mandatory quality review meetings are to be convened by the nominated project quality manager or his/her representative for the *Contractor*.
- 3) Quality Management employee's responsibilities shall include but are not limited to the following:
 - a) Implementation of the QMS on site
 - b) Administration of QA/QC systems on site
 - c) Verification of approval status of Subcontractor's QCP and procedures
 - d) On-and -offsite inspections
 - e) Co-ordination, inspection and verification of the *Employer's* intervention points
 - f) Review of *Contractor* testing and inspection documents (procedures, test results)
 - g) Weekly and monthly progress reporting on quality performance
- 4) The *Contractor* shall comply with section 5 of the Supplier Quality Management Specification.
- 5) Monthly quality performance and management reports shall be prepared by the *Contractor* during contract execution. The content of these reports shall be agreed by the *Employer* when submitted to the *Employer* on a monthly basis.

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1.8.1 Quality Reporting

- 1) The *Contractor* shall submit a monthly quality report, on the last working day of the month. The report includes but not limited to the following:
 - a) A register of NCRs and defects
 - b) Updated QCP / ITP register
 - c) QA monthly report summary
 - d) Planned and completed local and foreign inspection dates
 - e) Completed and outstanding Inspections
 - f) Audit findings report

1.9 SUPPLIER QUALITY PERFORMANCE MONITORING PHASE

- 1) During the contract execution phase, the *Contractor* shall be monitored by the *Employer* for performance on quality-related aspects. The outcomes of such monitoring will enable the *Employer* to take any appropriate actions pertaining to the *Contractor*.
- 2) The monitoring shall be carried out periodically by the *Employer* or at predetermined intervals during the execution of a contract.
- 3) The monitored key performance areas include the following:
 - a) Quality
 - b) Delivery
 - c) Design
 - d) Cost
 - e) Management system
- 4) Subsequent key performance indicators associated with these areas will include the following:
 - a) Nonconformity monitoring
 - b) Audit and assessment evaluation scoring
 - c) Management system compliance and accreditation
 - d) Achievement of delivery targets as per contractual agreements
 - e) Process improvements
 - f) Corrective and preventive action response and closure

1.10 PRESERVATION, SHIPPING AND TRANSPORTATION TO BE ADDRESSED

- 1) Requirements for preservation, shipping and transportation are addressed in 240-105658000 [1].

1.11 GENERAL QUALITY REQUIREMENTS

- 1) The *Contractor* shall comply with all requirements specified in section 6 of the Supplier Quality Management Specification.
- 2) All documents shall be approved by the *Employer*. If the *Employer* is dissatisfied with a document then it is the *Contractors* responsibility to ensure that the *Employers* requirements are met.
- 3) All planning Quality Assurance and Quality Control documents shall be submitted for approval by the *Employer* within 30 days of contract award.

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- 4) The *Contractor* shall make use of qualified and experienced Quality Controllers to ensure that products/services are of a high quality prior to inspection by the *Employers* quality representative(s).
- 5) The *Contractor* shall ensure that all defects and NCRs are addressed correctly and timeously.
- 6) Defects and NCRs shall be closed within a time frame or period specified or accepted by the *Employer*.
- 7) When NCRs and Defects notifications are issued, the *Contractor* shall acknowledge receipt within (5) working days and include the Root cause(s), Correction(s) and Corrective action(s) and proposed implementation dates to the *Employer* as per the contract response period.
- 8) The corrective actions will include the implementation and completion dates. Progress on all NCRs and Defect notifications issued to the *Contractor* must be reported to the *Employer* on weekly basis.
- 9) The *Contractor's* quality manager keeps a register of all NCRs and Defect notifications issued.
- 10) Deviations from the Contract are treated as a non-conformance.
- 11) Records of NCRs and Defect notifications are kept and form part of the data book records.
- 12) During the contract execution phase, the *Contractor* will be monitored by the *Employer* for performance on quality related aspects. The monitoring will be in the form of audits and assessments. The *Employers* quality department will be involved in every assessment to ensure that all NCRs and Defects raised are closed or the necessary penalties are implemented as stipulated contractually.
- 13) The *Contractor* is accountable for the quality of the output and liable for any failures.
- 14) The interventions points include all witness, hold, verification, surveillances and review points required by the Employer. The Contractor's failure to allow the intervention points will constitute a non-conformance. The *Employer* has the right to approve or reject intervention points and may add or remove these points as desired.
- 15) The *Contractor* shall only be paid subject to meeting and *Employer* approval of all quality requirements and three copies of the data books accepted by the *Employer*.
- 16) The *Contractor* shall provide all information, material and records required to comply with the Eskom Quality Management System and such further information, material and records as may be requested by the *Employer* from time to time.
- 17) The *Contractor* shall ensure that no inspections are missed and all schedules are observed.
- 18) The *Contractor* shall comply with all relevant Eskom governance documents (codes, standards etc.) whether specified in this contract or not.
- 19) The *Contractor* shall make use of an Authorised Certification Authority such as SABS to certify *Contractor* QMS if applicable.
- 20) The *Contractor* shall make use of Recognised International Accreditations such as SANAS which accredits the Authorised Certification Authority if applicable.
- 21) The quality requirements shall be met by the contractor and all sub-contractors.
- 22) The *Contractor* shall ensure that all measuring and test equipment is calibrated at all times and proof thereof must be readily available.
- 23) In the event of poor quality, re-work or incidents where products inspected by the Employer fail to meet requirements, the *Contractor* shall receive a Non-conformance (NCR) if deemed so by the *Employer*. The *Contractor* shall be liable for the Employers costs of re-inspection.
- 24) Costs incurred due to the *Contractor's* failure to comply with the inspection requirements as specified in this section will be borne by the *Contractor* and no compensation event or variation order will arise out of this.

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APPENDIX B - VENDOR DOCUMENT SUBMITTAL SCHEDULE

VENDOR DOCUMENT SUBMITTAL SCHEDULE													
ITEM	SUBMITTAL ITEMS	CALANDER DAYS	PROJECT STAGES										
			PROCUREMENT SPECIFICATION FOR SUB CONTRACTORS	CONTRACT AWARD	ORDER	DESIGN FREEZE	MANUFACTURING AND ASSEMBLY	FACTORY ACCEPTANCE TESTING (FAT)	FACTORY RELEASE	DELIVERY	INSTALLATION	SITE ACCEPTANCE TESTING (SAT)	SYSTEM HANDOVER

APPENDIX C - MASTER DOCUMENT LIST

Kusile Power Station – COMPANY NAME														
DRAWINGS AND SPECIFICATION SCHEDULE														
Doc Code	Doc Code	Doc Code	Doc Code	Rev.	Cust. Doc No.	Title	Action	Tslip N°	Actual tSlip date	Client receipt date	Client Document status	Client ref letter for doc status	ALSTOM Document status	Identical Document for Medupi

APPENDIX D - DOCUMENTATION REQUIREMENTS FOR FINAL HANDOVER

Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Sub Chapter	Documents for Final Handover
Engineering Documentation	1.6	1.6	Risk Assessments
	1.7	1.7	Non-Conformance Management
	2B, 2C, 2D, 2E, 2F	2.41	Design Philosophy
	2B	2.45	Safety Studies
	3.8	3.8	Commissioning/Shutdown Procedures
	3.9	3.9	Storage and Handling Instructions
	4.1	4.1	Commissioning Procedure / Manual
	4.2	4.2	Handover Certificate
	4.3	4.3	Commissioning Certificate
	Electrical	5.3.1	Contractor Application for Eskom's Inspection of the Works/Part of the Works
		5.3.2	Data Pack (e.g. Material Certificates, Qualifications, NDE and Welding Documentation, Isometric Drawings, Cutting Instructions, Factory Design Review Reports, C&I Loop checks, etc.)
		5.3.3	Partial/final Inspection certificate
		5.3.4	Defects Notification Certificate/Clearance
		5.3.5	Safety and Housekeeping Certificate
		5.3.6	Safety Clearance Certificate
		5.3.7	Completion Certificate
		5.3.8	Defects Certificate
		5.3.9	Take over Certificate
		5.3.10	Specific Requirements
		5.3.11	KKS and Labelling Certificate

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Sub Chapter	Documents for Final Handover
	Civil	5.4.1	Contractor Application for Eskom's Inspection of the Works/Part of the Works
		5.4.2	Data Pack (e.g. Material Certificates, Qualifications, NDE and Welding Documentation, Isometric Drawings, Cutting Instructions, Factory Design Review Reports, C&I Loop checks, etc.)
		5.4.3	Partial/final Inspection certificate
		5.4.4	Defects Notification Certificate/Clearance
		5.4.5	Safety and Housekeeping Certificate
		5.4.6	Safety Clearance Certificate
		5.4.7	Completion Certificate
		5.4.8	Defects Certificate
		5.4.9	Take over Certificate
		5.4.10	Specific Requirements
		5.4.11	KKS and Labelling Certificate
	6.2	6.2	Site Acceptance Test (SAT)
	6.3	6.3	Inspection Test Procedures (ITP's)
	6.4	6.4	QCP's / QIP's (signed off)
	6.5	6.5	COC (Domestic Circuits)
	6.6	6.6	Electrical Tests - Motors
	6.7	6.7	Calibration Certificate
Safety Requirements	7.1	7.1	Safety Signs, Labels and Colour Coding
	7.2	7.2	Demarcation of Hazardous Area (Certificate & Reports)
	7.3	7.3	Lighting
	7.4	7.4	Safety and Housekeeping Certificate
Guarantees & Warrantees	8.1	8.1	Related Extract from SOW of Works Information Indicating Plant area / Component
	8.2	8.2	Certificate from Supplier indicating validity of the guarantee / Warrantees Period
		10	Insurance Cover (90 Days Notification Period)
Provisional Handover Certificate	13.1	13.1	Provisional
	13.2	13.2	Pending Approval

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Dossier Chapter	Dossier Sub- Chapter	Dossier Sub- Sub Chapter	Documents for Final Handover
	13.3	13.3	Approved
Final Hand over Certificate	14.1	14.1	Provisional
	14.2	14.2	Pending Approval
	14.3	14.3	Approved

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APPENDIX E: SPECIFIC DOCUMENTS REQUIRING EMPLOYER'S APPROVAL

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APPENDIX F: OTHER REQUIREMENTS

1. Documentation

1.1 Submittal Requirements

All project documents must be submitted to the delegated *Project Manager* with transmittal note according to Project / Plant Specific Technical Documents and Records Management Work Instruction (240-76992014). In order to portray a consistent image it is important that all documents used within the project follow the same standards of layout, style and formatting as described in the Work Instruction.

The *Contractor* is required to submit the Vendor Document Submission Schedule (VDSS) as per agreed dates to the delegated Eskom Representative (template is included in Appendix A. Eskom will pre-allocate document numbers on the VDSS and send back to the *Contractor* through the delegated Eskom Representative. The VDSS is revisable and changes must be discussed and agreed upon by all parties. The *Contractor's* VDSS shall indicate the format of documents to be submitted. Contractor documents all documentation that will be sent to the Employer in the Master Document List (MDL) as provided by the Employer in Appendix B.

Contractor engineering program shall allow a minimum of 21 days for mailing, processing, and review of drawings and data by Employer. The Contractor is responsible for the compilation and the supply of all the documentation required during the various project stages and to provide the documentation programmed to link with the milestone dates. Documentation and drawings are programmed for delivery to meet the milestone dates and in accordance with the agreed Vendor Document Submittal Schedule (VDSS) Appendix A.

If the Contractor makes further changes to the equipment and materials shown on submittals that have been reviewed by the Employer, the changes shall be clearly marked on the submittal by the Contractor and the submittal process shall be repeated. If changes are made by Contractor after delivery to the Plant, as-built drawings indicating the changes shall be prepared by Contractor and submitted to Employer for review. Any resubmittal of information shall clearly identify the revisions by footnote or by a form of back-circle, with revision block update, as appropriate.

1. All document exchange shall be done using formal Transmittals. The following is the minimum information required for sending transmittals:
 - Title of the document
 - Reason for issuing/submission
 - Transmittal Number
 - Transmittal Name
 - Transmittal Description
 - Contract Number:
 - Package Number
 - Transmittal purpose
 - Sender Name
 - Sender E-Mail
 - Sender Organization
 - Recipient Name
 - Recipient E-Mail
 - Recipient Organization
 - Disclosure Classification
 - Date received
 - Quantity of documentation referenced on the transmittal
 - Number of copies

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- Format/medium submitted (e.g. paper, DVD, etc.)
 - Sender signature
 - Recipient signature, once submitted, to acknowledge receipt
2. If a transmittal is in response to an Eskom communication via transmittal, the Eskom Transmittal Number shall be referenced in the transmittal response and shall be provided in addition to the meta-data required in 1.4.
 3. The Contractor shall follow a structured and standard definition for Transmittal Descriptions, i.e. a subject line convention of YYYYMMDD – <Contract & Package Number> – <Vendor> – <Short Description> – <Sender Initials>.
 4. The Contractor shall follow a structured method of communication as defined within Communication Interface Memorandum (CIM) for any correspondence
 5. The Contractor shall follow a structured and standard definition for email subjects i.e. a subject line convention of YYYYMMDD – < Package File Number> – > – <Email Subject line>.
 6. The Contractor shall select the purpose for transmittal in line with the standard Eskom Selection Criteria:
 - Issued for Approval
 - Issued for Award
 - Issued for Basic Design
 - Issued for Commissioning
 - Issued for Concept Design
 - Issued for Consideration
 - Issued for Construction
 - Issued for Detail Design
 - Issued for Document Review
 - Issued for Handover
 - Issued for Information
 - Issued for Installation
 - Issued for Manufacturing
 - Issued for Procurement
 - Issued for Review
 - Issued for Tender
 7. Issuing of documents with different transmittal purposes shall be done separately and shall not combined into one transmittal. This will ensure fast and efficient processing of incoming and outgoing transmittals and information exchange.

Electronic technical data submittals shall be made using the Eskom Document Control email address (KusileDocControl@eskom.co.za) and Zendto, a Web-based file transfer service. If Contractor does not already have Zendto transmittal capability, information is available at <https://zendto.eskom.co.za/>. (The Uniform Resource Locator [URL] to be used for electronic file submittals will be made available upon Contract award.)

In case of email submission, the Contractor should note that if a single file to be transmitted is over 2MB in size, then the document shall be uploaded on Zendto portal.

Notification to Engineer that submittals have been posted to Zendto shall be in accordance with the correspondence requirements of this Contract. For the Zendto submission, a transmittal record must be submitted to the project email document control address information the Employer of such a submission.

8. The Contractor submits documentation to the Eskom Representative as well as the Project's
9. Documentation Centre in the following media:

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- Electronic copies can be submitted to Eskom Documentation Centre through generic email address agreed to by the project. Electronic copies large for email will be delivered on CD/DVD, large file transfer protocol and/or hard drives to the Project Documentation Centre. A notification email, with the transmittal note attached, shall be sent to the project generic email address. The Representative will be copied on the email as well.
- Hard copies shall be submitted to the Eskom Representative accompanied by the Transmittal Note.

In addition, the *Contractor* shall be provided with the following standards which must be adhered to:

- Kusile Project Document Work Instruction (240-124499452).
- Project / Plant Specific Technical Documents and Records Management Work Instruction (240-76992014).

1.2 Drawings Submittal

All documents and records management will be performed according to Project/Plant Specific Documents and Records Process. Any uncertainty regarding this should be clarified with the Employer. The Contractor shall comply with all minimum document metadata as specified in Technical Documentation Classification and Designation Standard (240-54179170).

The Contractor shall use Smartplant Owner Operator (SPO) for documents and records management. Contractor shall submit electronic copies of the documents using a fully secure web based solution providing carefully controlled access to appropriate project information for authorized personnel. All electronic design data and documents shall be in such a form which will enable importing such data, documents and drawings, including 3-dimensional drawings, seamlessly into the Intergraph SPF (Smart Plant Foundation) system. Hard copy submittals will only be required for the IOM Manuals and final asbuilt submittals.

Transmittal letters shall be provided with each document submittal. The transmittal letter shall include the Contractor drawing number, revision number, and title for each drawing attached. Each drawing title shall be unique and shall be descriptive of the specific drawing content.

Catalog pages are not acceptable, except as drawings for standard non engineered products and when the catalog pages provide all dimensional data, all external termination data, and mounting data. The catalog page shall be submitted with a typed cover page clearly indicating the name of the project, unit designation, specification title, specification number, component identification numbers, model number, Contractor drawing number, and Employer's name. Drawings shall be submitted with all numerical values in metric units.

1.3 Drawings Format and Layout

The creation, issuing and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 (Engineering Drawing Standards – Common Requirements) to be supplied as part of the enquiry documents. All drawings must be issued to Eskom in both native CADD format and PDF format as per 240-86973501 (Engineering Drawing Standards – Common Requirements). Drawings shall be in sufficient detail to indicate the kind, size, arrangement, component weight, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the Schedule of Submittals. Contractor shall fully complete and certify drawings for compliance with the Contract requirements.

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Drawings shall have title block entries that clearly indicate the drawing is certified. Each submitted drawing shall be project unique and shall be clearly marked with the name of the project, unit designation, Employer's Contract title, Employer's Contract file number, project equipment or structure nomenclature, component identification numbers, and Employer's name. Equipment, instrumentation, and other components requiring Engineer-assigned identification tag numbers shall be clearly identified on the drawings. If standard drawings are submitted, the applicable equipment and devices furnished for the project shall be clearly marked.

Transmittal letters shall identify which Schedule of Submittals item (by item number) is satisfied by each drawing or group of drawings. The transmittal letter shall include the manufacturer's drawing number, revision number, and title for each drawing attached. Each drawing title shall be unique and shall be descriptive of the specific drawing content. Transmittal letters for resubmitted drawings shall include the Employer's drawing numbers.

The Contractor includes the Employer's drawing number in the drawing title block. This requirement only applies to design drawings developed by the Contractor and his Subcontractors. It does not apply to drawings developed by manufacturers for equipment and material such as valves, instruments, etc.

Drawing numbers will be assigned by the Employer as drawings are developed. The project name shall be listed on all drawings, including manufacturers' drawings. Tag numbers and equipment names shall be listed on all manufacturers' drawings. A separate sheet may be attached to the submittal if needed to adequately list all tag numbers associated with the drawings such as valves or instruments which may have numerous tag numbers associated with it.

The language of all documentation shall be in the English language. The units of measure shall be metric. The Contractor retains project design calculations and information for the entire life cycle of the plant and provides these to the Employer on prior written notice at any time notwithstanding the expiry or termination of the contract.

1.4 Information Requirements

The Employer requires drawings, documentation, plans, information and data (collectively "Information") from the Contractor for two fundamental purposes; namely for the management and execution of the Contract and for the operation, maintenance and support of the Works during its entire operational phase until disposal and decommissioning.

The Contractor shall, during the progress of and upon completion of the Works, supply the Information required in terms of the Contract and all such Information as may usually be supplied in connection with similar Works, including, whether or not specified in the Contract, all Information necessary or useful for:

1. Design reviews and the interface management of the Works with the Project Works;
2. Quality assurance and control; and
3. The operation, maintenance, support, inspection, integrity management, training and technical optimization of the Works, over the lifecycle thereof.

In addition to the official documentation submittals listed in Appendix C, the Contractor shall provide additional information for review and design coordination as requested by the Employer from time to time.

The Contractor shall use the Employer's SmartPlant Environment and all design tools as the delivery mechanism for all project data and document deliverables. The EDMS and design tools shall be provided to the Contractor pre-configured based on Employer's data handover requirements. Any project data and document deliverables not generated from design tools provided by the Employer shall be supplied in a format specified by the Employer.

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1.5 Design Review Documentation

The Employer reviews the Contractors submitted documents and ensures adherence to the Works and that a technically sound design approach is incorporated. Specific information required from the vendors during tender phase is set-out in the Vendor Document Submittal Schedule, Appendix A.

After a contract is established, the Contractor proceeds in the detail design phase. Each document requires a transmittal note from the vendor. Employers review cycle is in-line with FIDIC contract requirements and is finalized during contract negotiations with the Contractor. Appendix D lays out the specific documents requiring Employers approval before the Contractor can proceed with design, fabrication and construction activities.

The Contractor is the Design Authority as defined in the Design Review Procedure (240-53113685). All design reviews will be conducted according to the Design Review Procedure (240-53113685).

The Contractor is responsible for following this design procedure and conducts all the design reviews as specified in this procedure. The Contractor is responsible for conducting the following design reviews:

1. Design Freeze Review
2. System Integrated Design Review
3. Pre-Commissioning Review
4. Acceptance testing Review
5. Handover Review

The Contractor shall conduct design reviews as per the Contractors official design review procedure. Contractor further takes note of the Employers Design Review Procedure (240-53113685) and participates in all design reviews as specified by the Employer. The Employer may "Accepted"; "Accept with Comments" or "Rejected". If required, the Contractor makes the necessary revisions on the documentation and ensures acceptance is obtained from Employer. The Contractor includes these design reviews as part of the schedule and suggests appropriate timing for such reviews.

1.6 Document identification

All documents supplied by the *Contractor* shall be subject to the *Employers* approval. The language of all documentation shall be in English. The *Contractor* shall include the *Employer's* drawing number in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his *Subcontractors*. Drawing numbers will be assigned by the *Employer* as drawings are developed.

The *Contractor* shall ensure that document has the following minimum attribute on the cover page:

- Title of the document
- Document Unique Identification number (Eskom number)
- *Contractor* Document number, if applicable
- Document status
- Revision number
- Document Type
- Document security level
- Document revision table/history
- Page number on the footer
- Document Author/Authoriser/
- Document Originator *Contractor*

The following additional attributes are important for technical documents:

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Package/System name, sub-system if applicable

- Unit/s number
- *Contractor* name
- *Contractor* number
- Plant Identification Codes

1.7 Format and Layout of Documents

For consistency it is important that all documents used within a specific domain follow the same layout, style and formatting standard.

Layout and Typography

Every document should comply with the following font specifications:

- Font Colour: Black
- Main Headings Font Type: Arial, Bold, Capital Letters
- Main Heading Font Size: 12pt
- Sub Headings Font Type: Arial, Bold, Title Case
- Sub Headings Font Size: 11pt
- Body Font Type: Arial, Sentence Case i.e., only the first letter of the first word is a capital letter.
- Body Text Font size: 11pt
- Line Spacing: 1.5 line spacing
- Margins: standard
- Alignment: full justification to be used
- Paragraphing: one line skip between paragraphs
- Pagination: centred page numbers (about 0.5 inches from bottom)
- Indentations: standard tab for all paragraphs (about 0.4 to 0.5 inches)

Document Headers

The header should include the project name, document title, document number, revision number and page number.

Naming of files

The *Contractor* will comply with the Eskom standard for naming documentation files. The standard is as follows:

For documents that have approval date and signature

(YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtention)

For documents that do not necessarily require the 'Approved Date' and 'Revision & Versioning', use the date of update

(YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtention)

All further requirements shall be according to IEC 61355 – 1:2008 (Edition) Classification and designation of documents for plants, systems and equipment – Part 1: Rules and classification tables.

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