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| Drawing1 | Specification | Technology |

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| --- | --- | --- | --- |
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| Date: …………………………… | Date: …………………………… | Date: …………………………… |
| |  | | --- | | Authorised by | | ………………………………….. | | T Railo  Project Engineering Manager | | Date: …………………………… | |  |  |

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# Description of the Works

## Executive Summary

Kusile Power Station is a coal-fired power station located approximately 40 km from Emalahleni in Mpumalanga. The drainage system design at the ash Transfer House 9 is unable to drain ash‑laden water from the transfer house into the station drains as initially designed due to drainpipe blockages. The drainage system is designed to cater for only floor washing, and the belt wash system water did not form part of the drainage system design. The belt wash system is a continuous water spray system that requires continuous drainage within the Transfer House footprint. The additional water resulted with lack of drainage and a pipe blockage, therefore causing ponding water on the foundation slab and contaminated water spillages into the environment.

Kusile Power Station overland link conveyor 1 & 2 (OLC 1 & 2) system transmits mixed coarse ash and gypsum from the station to the radial stacker. During the contracts phase the scope of work did not consider the dirty water catchment area. As a result, the system is operating without stormwater drainage infrastructure along the conveyor servitudes, resulting in ponding and environmental contamination. The proposed new drainage system addresses the aforementioned problems.

## *Employer*s Objectives and Purpose of the Works

### Background

The existing drainage at the ash Transfer House 9 is unable to drain ash-laden water from transfer house into the station drains, resulting in ash-laden build-up within the containment footprint. The continuous accumulation of ash-laden water results in spills into the environment, i.e. contaminating the surrounding environment.

The lack of stormwater drainage infrastructure along the overland link conveyor 1&2 (OLC 1&2) has resulted in ponding and environmental contamination.

The Transfer House 9, and the OLC1&2 conveyor servitude currently does not comply with the National Environmental Management Waste Act. Due to this contravention, a new drainage system is required at Kusile Power Station.

### Objectives

The objective of this project is to provide a new drainage system for the ash-laden water at Transfer House 9 to address the existing problems as well as to provide a drainage system to contain ash contaminated runoff water along the OLC 1&2 servitudes. The existing problems at these facilities are, namely;

* Lack of drainage within the TH8 and TH9 foundation footprint, as well as the OLC 1&2 dirty footprint
* Contaminated water spills into the environment, resulting in environmental contravention

1. Contamination of surrounding clean environment
2. Contamination of surrounding clean watercourses (wetlands and stream diversion)

* Saturation of foundation slab ground, may affect the ground conditions

## Abbreviations

The following abbreviations are used in this document:

|  |  |
| --- | --- |
| **Abbreviation** | **Description** |
| ADDD | Ash Dump Dirty Dam |
| BMH | Bulk Material Handling |
| C&I | Control & Instrumentation |
| e.g. | Example |
| KET | Kusile Execution Team |
| LDE | Lead Discipline Engineer |
| LPS | Low Pressure Services |
| N/A | Not Applicable |
| O & M | Operation & Maintenance |
| OH&S | Occupational health and safety |
| OEM | Original Equipment Manufacturer |
| OHSA | Occupational Health and Safety Act |
| OLC | Overland Link Conveyor |
| OPC | Ordinary Portland Cement |
| P&ID | Process & Instrumentation Diagram |
| PFD | Process Flow Diagrams |
| QCP | Quality Control Procedure |
| Rev | Revision |
| SANS | South African National Standards |
| SHEQ | Safety Health Environmental and Quality |
| ST | Settling Tank |
| TH | Transfer House |
| TH9 | Transfer House 9 |
| TL | Technical Lead |

## Definitions

### Disclosure Classification

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

## Normative/Informative References

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

### Normative

1. ISO 9001 Quality Management Systems.
2. 246864 Radial Stacker Slab Upgrade – Detailed Design Report
3. 366-222393 Stormwater Drainage System Concept Design for Kusile Power Station Overland Link Conveyor 1&2 – Engineering Change Report
4. 366-388170 Kusile Power Station Overland Link Conveyor 1&2 Drainage Project – Concept Design Report
5. 366-391093 Kusile Power Station Overland Link Conveyor 1&2 Drainage Project – Detail Design Report
6. 366-390426 Kusile Transfer House 9 Hydrology and Hydraulic Analysis
7. 366-246884 Radial Stacker Upgrade – East & West Settling Tanks & Stacker Slab O&M
8. 240-56364545 Structural Design and Engineering Standard
9. SANS 10100-1 The structural use of concrete Part 1: Design
10. SANS 10160-1 Basis of structural design and actions for buildings and industrial structures Part 1: Basis of structural design
11. SANS 10160-2 Basis of structural design and actions for buildings and industrial structures Part 2: Self-weight and imposed loads
12. SANS 10162-1 The structural use of steel Part 1: Limit‑states design of hot‑rolled steelwork
13. SANS 10400-G The application of the National Building Regulation Part G: Excavations
14. SABS 1200-DK Civil Engineering Construction Part DK: Gabions and Pitching
15. BS 8007: 1987 Design of concrete structures for retaining aqueous liquids

### Informative

1. Design Review Procedure (240-53113685)
2. Engineering Change Management Procedure (240-53114002)
3. National Environmental Management Waste
4. Reinforced Concrete Designer’s Handbook10th Edition – Charles E. Reynolds and James C. Steedman
5. Analysis and Design of Concrete Structures – John M. Robberts and Vernon Marshall
6. Design of Structural Steelwork to SANS 10162 – J Mahachi

## Roles and Responsibilities

* The Civil KET is responsible for the development of this document with assistance from BMH KET, C&I KET, LPS KET and Electrical KET.
* The appointed *Contractor* is responsible for the execution of the *works* in accordance with this document.

## Related/Supporting Documents

* Not applicable

# Engineering and the *Contractors* Design

## Description of the Works

The description of the works includes:

### Transfer House 9 Drainage System:

A new 775 mm upstand wall will be constructed around the perimeter of the radial stacker slab to prevent runoff into the environment. The new storm water infrastructure will convey water from the radial stacker slab to a storage facility that will settle the ash with the clarified water being pumped to the ADDD. The upstand wall will be fitted with 2 specially designed sluice gate outlets G1 and G2, located at strategic points on the East boundary of the Radial stacker Slab. These are each equipped with downward opening sluice gates (366-238331 and 366-238333) that will initially store the full storm run-off and then after ash has settled, the sluice gate across the inlet will be opened to release clarified water. All three gates will be opened to release clarified water after each storm event.

The tank complex has an inlet channel from the existing RSS East perimeter drain, fitted with sluice gates to direct flow into one or the other tank compartment. See drawing 366-238314. Each settling tank compartment is equipped with four downward opening sluice gates at different elevations for release of clarified water to the pump sump after settling of ash particles, depending on the depth of accumulated ash. The gates are shown on drawing 366-238331. The settling tank structure is underlain by a sub-soil drain network to relieve any build-up of ground water under the tank. Drawing 366-238315 refers.

The pumps are each serviced by a 3.2-ton slewing pillar jib crane (6m pillar height, 6m reach). A 300mm above ground steel pipeline will be provided to transfer clarified water from the East settling tank sump to the Ash dump dirty water drain. See drawings 366-238328 and 366-238330.

### OLC 1&2 Drainage System:

This design entails a collection sump to act as a drainage basin to temporarily store dirty runoff from the identified dirty footprint of the OLC 1&2 system. The collection sump is situated on the south side of the OLC 1&2 system at the lowest point to ensure gravity flow within the channels to the collection sump ash. Stormwater v-drain channels are designed to drain the runoff from the dirty footprint to the collection sump. Moreover, it includes an access road, which is tied to the proposed Radial Stacker East Tank Road, for operation and maintenance purposes. Electrical pumps (two pumps, one for redundancy) empty the sump with the water being pumped through pipelines to the Radial Stacker East Tank. Lastly a 2-ton crawl beam is designed for operation and maintenance (replacement of pumps and for cleaning of the sump).



Figure 1: Locality Plan indicating Transfer House 9, and OLC 1&2 for Kusile Power Station

## *Employer’s* Design

The *Employer* has conducted the detailed and basic designs of the works, the extent of which is indicated in the drawing referenced in Appendix A.

### Architectural Design

N/A

### Civil & Structural Design

#### Transfer House 9 Drainage System:

The *Employer* has provided a detailed design where reference is made to Eastern and Western storage facilities within the TH9 design. All references regarding the Western storage facility shall be excluded from the design and Scope of Works (Gate 3 and new North Drain).

The East Radial Stacker Settling Tanks (ST) is comprised of two compartments of 1798.1 m3 storage capacity each and a pump sump. The outer walls are vertical concrete walls and the inner divider wall between the two compartments also as a vertical concrete wall.

The East Radial Stacker ST receives discharges of dirty water and stormwater run-off through a rectangular channel from the radial stacker slab and ash dump access road and associated grassed slopes.

The tank is sized to settle ash and store a 1:50 year storm event from the slab, ash dump access road terrace and grassed slopes catchment.

After suspended solids have been settled in the tank, the settled water is released through sluice gates at different elevations to a pump well compartment and transferred from there by pump and pipeline to the Ash Dump Dirty Water Drain, which flows to the Ash Dump Dirty Dam (ADDD).

The East Radial Stacker ST is optimally located approximately 300 m to the North of the existing ash dump terrace and 780m to the east of the existing Ash Dump Dirty Dam (ADDD).

The selected position avoids surrounding defined wetlands. The Radial Stacker ST top water elevation is

1467.54 meters above sea level (m.a.s.l).

In terms of Section 117(c) (i) of the National Water Act, 1998, a facility with a storage capacity of more than 50,000 m3 and a vertical wall height exceeding 5.0 m is considered to be a tank with a safety risk. The Radial Stacker ST does not fall within the definition of a tank subject to DWA tank safety regulations, as its wall height is less than 5 m and storage is less than 50 000 m3.

Table 1: Radial Stacker ST Summary

|  |  |
| --- | --- |
| Name of Tank | Kusile Power Station – Radial Stacker East Settling Tank, see Figure 2. |
| Purpose of Tank | Settlement of suspended solids from the Radial Stacker slab water run-off and 1:50 year, 24-hour storm storage. |
| Maximum concrete wall height | 4.6m |
| Hazard potential category | Low |
| Non-overspill crest (NOC) level | 1467.54 mamsl |
| Full supply level (FSL) | 1466.79 mamsl |
| Overflow weir level | 1466.79 mamsl |
| Floor level | 1463.32-1463.09 mamsl |
| Maximum water depth at FSL | 3.7m at settling basin |
| Maximum Water depth at tank outlet weir elevation (Overall tank weir at pump sump) | 3.85m |
| Gross storage capacity at FSL for both compartments | 3596.2m3 |
| Access ramp slope | 1: 7.95 |
| Outside earth embankment wall slope | 1: 3 |
| Type of spillway | Concrete rectangular for both compartments. Trapezoidal type for the emergency spillway of overall tank. A rectangular spillway is also provided in the concrete divider wall between the north and south compartments to allow flow from one compartment to the next. |
| Spillway channel base width | 1.75m |
| Spillway channel side slopes | 1:3 |
| Total freeboard above FSL | 0.75m |
| Inlet Works | A new rectangular stormwater inlet channel leads from the existing channel on the East perimeter of the existing radial stacker slab, and from ash dump access road terrace and associated grassed slopes. Flow from these is distributed to the two halves of the settling tank via a hand operated sluice gate (1 for each side) |
| Settling Tanks | There are two settling tank compartments, each 25.5 m long.  Each compartment is fitted with a series of over-flow weirs to still the water flow. Also, each compartment is fitted with 4x hand-operated sluice gates at different elevations that can be opened for release of water to the pump sump. |
| Outlet Works | Discharges from the Radial Stacker settling tank pump sump is delivered by pumping using a 2\*105kW submersible Pumps, through a 300 mm ND pipe steel, above ground pipe to the ash dump dirty water drain, which then flows to the Ash Dam Dirty Dam (ADDD). |
| Tank wall materials | Reinforced concrete vertical wall. |
| Crest/Perimeter road | 6 m wide with gravel subgrade, sub-base and wearing course layers, refer to Figure 4.  The East Radial Stacker ST can be accessed through the new gravel access road to both compartments. The gravel access roads provide access to both maintenance access ramps. Refer to 366-238325 for GA of road |
| Tank wall foundations | In-situ material compacted to 93% AASHTO Density. |
| Tank Floors | The 200mm thick concrete tank floors over the liner system. |
| Tank liner system | The liner is classified as a Class C liner, comprising: 300mm thick reinforced concrete tank floor   * 75mm thick concrete blinding, * A6 Geofabric, 1.5mm smooth * HDPE geomembrane liner, * Geosynthetic Clay Liner (GCL), * 75mm thick layer of 19mm stone no fines concrete, * Prepared foundation with groundwater under-drainage |
| Cleaning Access | A concrete lined ramp is provided for machine and personnel access to each of the two compartments and pump sump. |
| Ground water interception | 110mm dia. and 160mm dia. perforated, corrugated, subsoil (finger) drains below the liner system, discharging to stream (see Figure 3). |

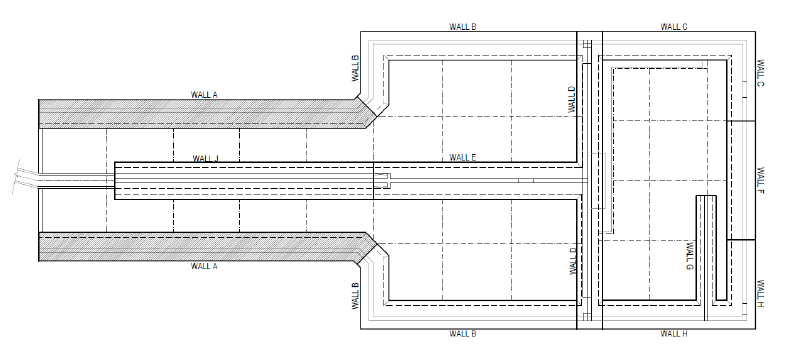


Figure 2: Radial Stacker East Tank- Plan

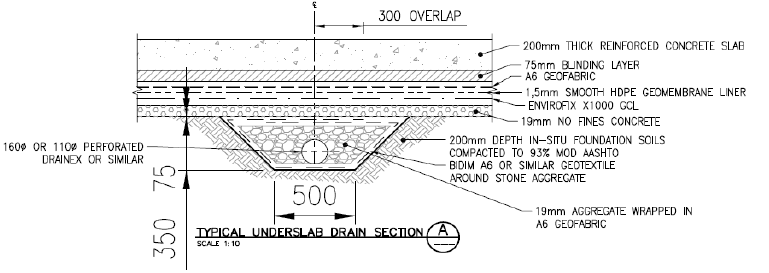


Figure 3: East Tank Liner and Underdrainage System

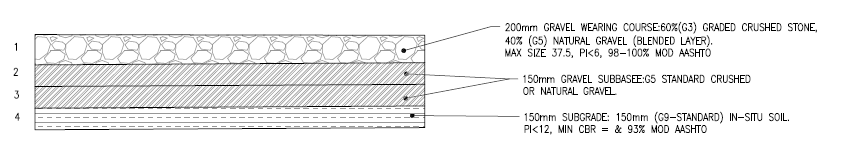


Figure 4: Typical Layer works

#### OLC 1&2 Drainage System:

The *Employer* requires the *Contractor* to conduct structural design for the collection sump to temporarily store dirty runoff from the identified footprint of the OLC 1&2 system. In addition, the *Employer* requires the *Contractor* to conduct the structural design for the crawl beam structure to be used for maintenance of the pumps as well as cleaning. Refer to Appendix A for the basic design drawings.

Further, the *Employer* requires the *Contractor* to conduct structural design of plinths to support the mounting of the Local Control Panels (LCPs) and the proposed dirty water pipeline to be used to pump dirty water from the collection sump to the Radial Stacker East Tank, and the agitation pipeline to be used at the collection sump for agitation.

### Mechanical Design

#### Transfer house 9 Drainage System

##### System Identification

* System Name Radial Stacker Drainage System
* KKS Code GME

##### Function

The system pumps ash laden water from the Radial Stacker sump tanks to the Ash Dump Dirty Water Drain, which flows to the Ash Dump Dirty Dam (ADDD)

##### Process Description

Refer to the Radial Stacker Drainage System Piping and Instrument Diagrams and operating and Maintenance Manual listed below respectively:

366-389543

366-246884

**Sump System**

The system includes the following major equipment and components:

* East Settling Tank (3596 m3 Gross Storage Capacity)
* Two (2) 105kW 100 percent capacity East Tank Submersible sump pumps
* Dedicated Controls Pump Controller
* Two (2) East Tank Jib Electrically Operated Cranes with horizontal and radial operation.
* Associated piping, valves, instruments, controls, and accessories

The East Radial Stacker Settling Tank (ST) comprises of two compartments, one operating, the other standby, and a pump sump. The outer walls are vertical concrete walls and the inner divider wall between the two compartments also as a vertical concrete wall. The East Radial Stacker ST receives discharges of dirty water and storm water run-off through a rectangular channel from the radial stacker slab and ash dump access road and associated grassed slopes. The Tank also receives ash water from the Overland conveyor (OLC) Drainage system. Each compartment is fitted with 4 hand-operated downward opening sluice gates at different levels, for release of clarified water depending on the depth of settled ash.

The tanks are sized to settle ash and store a 1:50 year 24 hour storm event from the slab, ash dump access road terrace and grassed slopes catchment. One compartment (redundant) shall be kept empty at all times and will used as required during a 1:50 storm event via manual intervention.

After suspended solids have been settled in the tanks, the settled water is released through sluice gates at different elevations to a pump well compartment and transferred from there by pump and pipeline to the Ash Dump Dirty Water Drain, which flows to the Ash Dump Dirty Dam (ADDD).

The Settling Tank is provided with pump sump compartment that will receive clarified, settled water decanted via the sluice gates from the ash settling compartments

During normal operating conditions, the pump sump will contain clarified water. Two submersible pumps are installed in a pump sump compartment (one operating, one standby) for delivery of the clarified storm water to the ADDD via pipeline and the existing ash dump dirty drain.

The sump level is monitored using an ultrasonic level sensor. The signal from the level sensor is sent to the controller to start and stop the sump pump. An automatic open/close valve will be used to supply agitation water to a series of agitation nozzles located inside the pump sumps

The Agitation line will form a ring inside the sump, surrounding the submersible pumps. The ring will consist of eight 3/8” eductor mixing type (or equivalent) agitation nozzles.

##### Basis for Design

The design pumping velocity is adequate to keep the fine ash particles in suspension. Normal operation is with one pump running and one pump on standby. However, both pumps can be operated in parallel at the same time to provide an increase in pumping capacity. This will be permitted either through (1) manual override should additional scouring be required or to provide more flow during 1:50 year storm event; or (2) in automatic operation when level Hi-Hi is reached with one pump already in operation.

All piping will be above grade. All piping is above grade and is supported by pipe supports. A rubber hose connects the pump discharge to the discharge piping so that the pumps can be removed from the sumps via a hoist without disconnecting the discharge piping. A ball check isolation valve is installed on the discharge piping of each sump pump. The Pumps will be submersible and hoisted from electrically operated Jib cranes.

##### System Operation

The submersible pumps are selected to be capable of conveying the ash/water slurry at the design velocity with one pump operating. The total head required for the sump pumps is determined by the piping and frictions losses and the elevation differences between the sump location and Dirty water canal. Should additional scouring velocity be required, two pumps can be simultaneously operated in parallel to achieve an increased flow/velocity through manual override operation as permitted by the pump Controller. Also, during a 1:50 year storm event both pumps will need to be manually operated. Additionally, the standby compartment will be used to provide a buffer during the peak inflows.

The Local comptroller panel (No DCS interface) will be used to control pump operation (Start/Stop) and the motorized block valve (open/Close) for the sump agitation based on sump level monitored by a level sensor.

The pump basin level is monitored using an ultrasonic level sensor. The signal from the sensor is sent to start and stop the sump pump. The controls are designed to equalize operating time on the two pumps by alternating which pump runs for each operation cycle. Local control panel located at the sumps allows operators to send pump start and stop requests and emergency stop commands.

Should the automatic block valve fail to operate, an audible and visual alarm signal will be sent to the local panel to alert an operator. However, pump operation will not be affected by the health of the automatic valve.

The total pump sump depth is 5.60 meters. On high sump level (3.15 m), the automatic block valve opens to allow agitation water to enter the ring header and, via spray nozzles, mix fly ash that has collected in sump pump basin. After three minutes of agitation, the automated block valve closes and a start signal is sent to the sump pump selected for primary duty. If the primary pump fails to start, trips, or if the sump level reaches a high-high level (4.0 m), the secondary pump starts.

When the sump level recedes to low level (0.5m), while the duty pump is running, the agitation system operates again to remix any solids that have settled out. The agitation stops after 3 minutes and a stop signal is sent to the operating sump pump(s).

#### OLC 1&2 Drainage System

##### System Identification

* System Name: Overland Conveyor Drainage System
* KKS Code: GME

##### Function

The system pumps ash laden water from the Overland Conveyor (OLC) sump to the Radial Stacker East Settling Tank

##### Process Description

Refer to the 366-389544, Overland Conveyor Drainage System Piping and Instrument Diagram.

The system includes the following major equipment and components:

1. OLC Sump (125 m3 Storage Capacity)
2. Two (2) 100 percent capacity Submersible sump pumps suspended from a fixed crawl beam by means of a manual hoist
3. Dedicated Controls Pump Controller
4. Associated piping, valves, instruments, controls, and accessories
5. Agitation System

The Overland Conveyor Sump receives inflow from the surrounding OLC catchment area via storm water channels. Two submersible pumps are installed in the sump (one operating, one standby) for delivery of the ash laden water to the East Radial Stacker settling tank via a pipeline.

The sump level is monitored using an ultrasonic level sensor. The signal from the level sensor is sent to the controller to start and stop the sump pump. An automatic open/close valve will be used to supply agitation water to a series of agitation nozzles located inside the pump sump

##### Basis for Design

The design pumping velocity is adequate to keep the fine ash particles in suspension. Normal operation is with one pump running and one pump on standby. However, both pumps can be operated in parallel at the same time to provide a small increase in pumping capacity. This will be permitted either through manual override should additional scouring is required or when level Hi-Hi is reached with one pump already in operation.

All piping will be above grade. All piping is above grade and is supported by pipe supports. A rubber hose connects the pump discharge to the discharge piping so that the pumps can be removed from the sumps via a hoist without disconnecting the discharge piping. A ball check isolation valve is installed on the discharge piping of each sump pump. The Pumps will be submersible and provided with guide rails and fixed manual hoisting beam structure.

##### System Operation

The submersible pumps are selected to be capable of conveying the ash/water slurry at the design velocity with one pump operating. The total head required for the sump pumps is determined by the piping and frictions losses and the elevation differences between the sump location and Dirty water canal. Should additional scouring velocity be required, two pumps can be simultaneously operated in parallel to achieve an increased flow/velocity through manual override operation as permitted by the pump Controller.

Each pump basin level is monitored using an ultrasonic level sensor. The signal from the sensor is sent to start and stop the sump pump. The controls are designed to equalize operating time on the two pumps by alternating which pump runs for each operation cycle. Local control station located at the sumps allows operators to send pump start and stop requests and emergency stop commands.

Should the automatic block valve fail to operate, an alarm signal will be sent to the local panel to alert an operator. However, pump operation will not be affected by the health of the automatic valve.

The total pump sump depth is 2.5 meters. On sump high level (2.20 m), the automatic block valve opens to allow agitation water to enter the ring header and, via spray nozzles, mix fly ash that has collected in sump pump basin. After two minutes of agitation or high-high level (2.25 m), whichever occurs first, the automated block valve closes and a start signal is sent to the sump pump selected for primary duty. If the primary pump fails to start, trips, or if the sump level reaches a high-high level (2.375 m), the secondary pump starts.

When the sump level recedes to low level (0.30 m), while the duty pump is running, the agitation system operates again to remix any solids that have settled out. The agitation stops after 2 minutes or when level recedes to low-low level (0.25 m), whichever occurs first and a stop signal is sent to the operating sump pump(s).

#### Mechanical Scope of Works

The work under these specifications shall include furnishing all materials and equipment, except for those items listed as being furnished by Others; providing all labour, supervision, administration and management; and supplying all construction equipment, materials and services necessary to perform the LPS construction and commissioning complete in accordance with the specifications, drawings and other contract documents. The Works shall include document submittals, inspecting, testing, transportation to site, receiving, unloading, storing, and tagging for all items that are specified to be furnished and installed by *Contractor*.

The Works under these specifications shall include, but not be limited to the following:

* Perform Detailed Design for Overland Conveyor Drainage System and sump agitation system
* Design, procure, installation and testing of jib cranes
* Perform Detailed Design for Transfer House 9 Drainage sump agitation system and pump support systems
* Erection and Commissioning for Overland Conveyor, Transfer House 9 Drainage pumping systems including the agitation systems and pump support structures.
* Pressure test all piping installed under this Contract as specified in the attached pipeline lists.
* Furnish all construction materials and services for the execution of the Works under this contract unless otherwise specified.
* Design, furnish and install Overland Conveyor submersible sump pumps,
* Design, furnish and install Transfer House 9 and Overland Conveyor systems accessories, pipe cleanouts, discharge elbows, check valves, waterproof junction boxes, slide rails and all other associated accessories.
* Receive, inspect, unload, store, protect, transport, provide preventive maintenance and install *Contractor*-furnished equipment and materials.
* Furnish, fabricate, clean, coat, erect, and test all *Contractor*-furnished piping. Fabrication drawings for piping, pipe supports, pipe racks, etc. shall be provided by the *Contractor*. The *Contractor’s* scope includes components: All piping; Pipe supports; Flanges and fittings; Piping accessories ; Valves including actuators; Supplemental support steel; Supplemental sleeper support steel; Nuts, bolts, and gaskets; Coating, pipe wrapping, and galvanizing;
* Grout, pour concrete, set, align and erect all *Contractor* furnished pipe supports including foundations, foundation bolts, and bolt sleeves, *Contractor* shall furnish and erect for all pipe support foundations, all grouting materials and the placing thereof.
* *Contractor* shall field performance test all systems. The system’s pumps shall be tested in single and parallel operation. *Contractor* shall furnish all labour, materials and test equipment inclusive of temporary piping, valves, instruments
* Submit Recommended spare part list
* Provide any special tools required for operation and maintenance of plant

Work not included under these specifications:

* Detailed Design for Radial Stacker Drainage. Refer to 366-246864

#### Codes and Standards

Please refer to Appendix C for Eskom specific standards and guidelines.

### Electrical Design

The *Employer* has developed a Basic Design for the electrical systems required to support the mechanical process plant as described in Section 2.2.3 of this document. This design is conveyed in the following subsections:

#### Electrical Supply System Description

The electrical reticulation system for the Transfer House 9 and OLC 1&2 Drainage System will be a simple extension of the existing Kusile Power Station common plant electrical reticulation. This will be by way of allocating feeders on existing LV Switchgear Assemblies. Since the designed plant encompasses redundant pumping systems, Four (two per board) independent supplies are provided for this plants. Spare feeder buckets and additional tier to each board have been identified to cater for the requirements of the new plant in question, from the respective existing 400V boards. Each feeder bucket will provide bulk power to a Local Control Panel located close to the sump area. These panels will provide local control capabilities as well as house the control gear required for operating and control of the pumping system. Power will be reticulated from Modified switchgear buckets to LCPs, pumps and associated auxiliaries.

##### Transfer House 9 Drainage System

The power supplies, for the TH9 systems, will be obtained from a newly furnished and installed additional switchgear tier on 400V 10 Year Ash Dump Substation Board 1 and 400V 10 Year Ash Dump Substation Board 2, which are housed at 10 Year Ash Dump Substation. Figure 5 below shows the high level electrical reticulation that will support this plant.

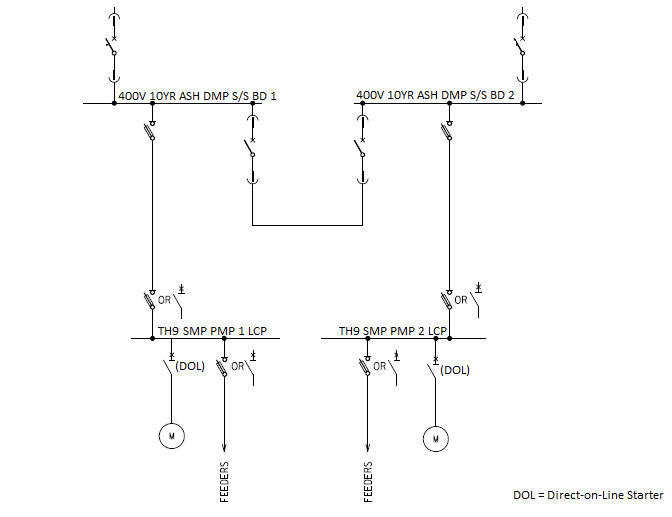
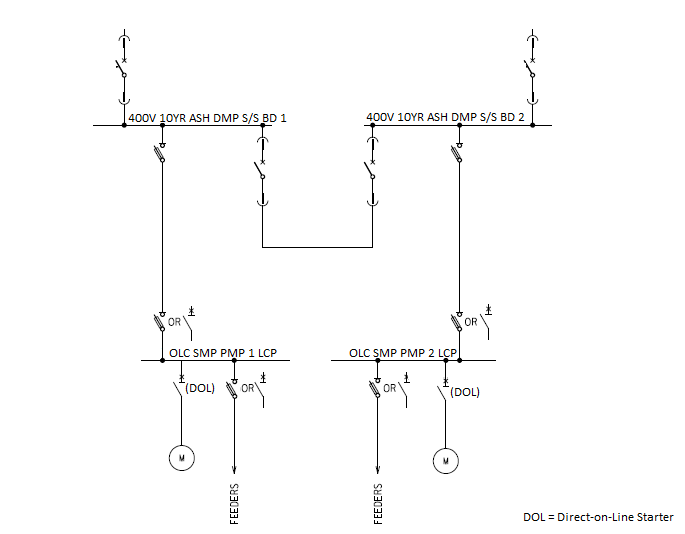


Figure 5: TH9 Drainage System Electrical Reticulation Overview

Note that the Transfer House 9 drainage system is referred to as the Radial Stacker drainage system in some of the design documentation. This is owing to the fact that the main source of run-off water to be drained is from the Radial Stacker slab.

##### OLC 1& 2 Drainage System

The power supplies, for the OLC Drainage System, will be obtained from the 400V 10 Year Ash Dump Substation Board 1 and 400V 10 Year Ash Dump Substation Board 2, which are housed in the 10 Year Ash Dump Substation. Figure 6 below shows the high level electrical reticulation that will support this plant.



**Figure 6: OLC Drainage System Electrical Reticulation Overview**

#### Electrical Design Documents

The *Employer’s* electrical design baseline, for the Kusile Power Station OLC Drainage systems, is conveyed in the following design documents.

Supply switchgear feeder designs:

* Single Line Diagram: 400V 10Yr Ash Dump S/S Board 1 – 0BHR-E1253
* Single Line Diagram: 400V 10Yr Ash Dump S/S Board 2 – 0BHR-E1254
* Schematic Diagram: 400V LV Switchgear: 400V AC CFS Fuse Feeder – 0.90/40040
* Refer to typical drawings: 0.90/2532; sht 21.

Cable routing and servitude designs:

* Site Electrical Roadway and Area Lighting Circuiting – 0UXB-E2601D
* Direct Buried Cable Route Area 82 – 0UXC-E2282
* Direct Buried Cable Route Area 83 – 0UXC-E2283
* Terrace Underground Facilities – Duct Bank Sections – 0UXC-S3970
* Kusile Power Station: Direct Buried Cables Typical Details and Section Cuts – 0UXC-E2290
* Terrace Underground Facilities – Site Misc Details and Sections – Typical 0UXC-S3371

All drawings from the *Employer’s* design for the *works* are provided as a design baseline for the *Contractor* to basehis designs on. It is the responsibility of the *Contractor* to notify the *Employer* of updates required on these designs in the event of discrepancies noted, construction clashes or process plant design changes during detail design.

See the “*Contractor’s* Design” section of this document for the design scope to be delivered by the *Contractor*.

#### Existing Plant Information

The *Employer* provides the following designs, of the existing plant, to assist the *Contractor* with development of the *Contractor’s* Designs:

* Raceway Composite/Racking Auxiliary Substation B - 0UBS-E3556A
* Auxiliary Substation B General Arrangement - 0UBS-G2701A
* Raceway Composite/Racking 10 Yr Ash Dump Substation – 0UBS-E3555
* General Arrangement 10 Yr Ash Dump Substation – 0UBS-G2703A
* Kusile Power Station Electrical Graphic Symbols - 0UXD-E0001
* Terrace Underground Facilities – Site Key Plan, General Notes & Legend - 0UXC-S3300
* Station Layout – 0UXB-S1001

All the above mentioned drawings from the *Employer* are provided for information purposes only. These are available in Appendix A.

### Control & Instrumentation

The *Employer* provides the following as input design information:

* LPS System Descriptions
* LPS Load Lists
* C&I specific standards and guidelines
* Relevant templates as necessary

#### Power Suppliers

The existing switchgear within the 10 Year Ash Dump Substation shall be used for the C&I plant. Refer to Section 2.2.4.1.

## *Contractors* Design

### Responsibility for Design

1. The *Contractor* takes full professional accountability and liability for all temporary *works* designs done by the *Contractor*.
2. A Level 4 schedule (schedule with defined activities) for the design scope highlighting all activities involved, major milestones and provision
3. The *Contractor* is responsible for the design of all temporary works required for the execution of the *works*.
4. The *Contractor* takes full professional accountability and liability for all designs of all temporary *works* required for execution done by the *Contractor*.
5. All designs, design reports and Construction drawings prepared by the *Contractor* are signed off by an ECSA Professionally registered Technologist or Engineer who takes full professional accountability for the designs.
6. The *Contractor* is mandated in terms of Construction Regulations 2014: Duties of Designer, 6(1) g to fulfil the duties described therein for the detailed designs done by the *Contractor*. Any risk associated with the *Contractor’s* design is highlighted to the *Employer* together with mitigation measures.
7. The *Contractor’s* design is required to be in accordance with all National Standards and Specifications referenced in this Works Information as well as the *Employer’s* Standards referenced in Section 8.
8. Any discrepancy or ambiguity between the *Employer’s* Specifications or requirements is immediately brought to the attention of the *Project* *Manager* for clarification.

### Civil & Structural Design

The *Employer* has conducted the detailed design for some of the permanent *works*. The *Employer* issues the detail design documents to the *Contractor* for implementation.

#### Transfer House 9 Drainage System

The *Contractor* produces and implements the detail designs for the concrete encased cable sleeves (duct bank) for routing cables under the OLC conveyor, as per the requirements outlined in section 2.3.4.4.4 Cabling and Racking.

The *Contractor* produces and implements the detail designs of the concrete plinths required for mounting of the Local Control Panels, discussed in Section 2.3.4.4.5, in the locations as indicated in drawing 0UXC-E2282. In addition, the *Contractor* produces and implements the detail designs for additional piping and concrete plinths pipe supports, see section 2.3.3.2.4.

#### OLC 1&2 Drainage System

The *Employer* issues the basic design documents to the *Contractor* for design and implementation.

The *Contractor* conducts structural design for the collection sump to temporarily store dirty runoff from the identified footprint of the OLC 1&2 system. In addition, the *Contractor* conducts the structural design for the crawl beam structure to be used for maintenance of the pumps as well as cleaning.

Further, the *Contractor* conducts structural design of plinths to support the proposed dirty water pipeline to pump dirty water from the collection sump to the Radial Stack East Tank, and structural design plinths to support agitation pipeline for supply of agitation water to the collection sump. The *Contractor* is required to conduct design of gravel access road for access to the collection sump for maintenance purposes; refer to [5] for the location and detail. The *Contractor* is responsible for implementation of the *works*. Further, the *Contractor* installs handrail at the proposed sump in accordance to the *Employer’s* handrail standard, refer to drawing 0.00/2901 rev 9.

### Mechanical Design

The *Contractor’s* Mechanical design shall include detailed design for the agitation system for the Transfer House 9 Sump.

#### Technical Scope of Work

The *Employer* has conducted a conceptual design of the *works.* The *Contractor* is required to confirm the *Employer’s* conceptual design and produce a detailed design for all required infrastructure.

The work under these specifications shall include design, furnishing all materials and equipment, providing all labour, supervision, administration and management; and supplying all construction equipment, materials and services necessary to perform the *works* in accordance with the specifications, drawings and other contract documents. The *works* shall include document submittals, inspecting, testing, and transportation to site, receiving, unloading, storing, and tagging for all items that are specified to be furnished and installed by *Contractor*.

The Overland Conveyor Drainage w*orks* under these specifications shall include, but not be limited to the following:

1. Furnish all construction materials and services for the execution of the Works under this contract unless otherwise specified.
2. Design, furnish, and erect all structural steel and lifting lugs required for piping and equipment erection. All temporary works shall be removed from site upon work completion.
3. Design, furnish and install pumps and level instrument and local controller panel to meet the requirements of the system operation.
4. Fabricate, furnish and Modify existing piping to supply agitation and floor/chute wash connections.
5. Furnish and install pump hoisting structure and duct foot connection for Overland Conveyor submersible pumps. Each pump shall be furnished with slide rails and guide brackets to allow their easy removal from the sumps. The pumps shall be shipped with the necessary accessories installed for rail travel. Connections shall be provided at the top of the pumps for lifting by Supplier provided means (chains, wire ropes, etc.)
6. Furnish and install all material and equipment for the Overland Conveyor drainage.

*Contractor* shall design, furnish, fabricate, clean, coat, erect, and test piping. Design drawings including piping isometrics and design lists which shall be provided by the *Contractor*. Fabrication drawings for piping, pipe supports, pipe racks, etc. shall be provided by the *Contractor*. *Contractor* required to field route and design supports for piping. *Contractor’s* scope includes the following components:

1. All piping including flexible pump discharge piping
2. Pipe supports and hangers
3. Flanges and fittings
4. Piping accessories
5. Valves including actuators
6. Supplemental support steel
7. Supplemental sleeper support steel
8. Nuts, bolts, and gaskets
9. Coating, pipe wrapping, and galvanizing

The Radial Stacker (Transfer House 9) w*orks* under these specifications shall include, but not be limited to the following:

1. Fabricate, furnish and modify existing piping to supply agitation water for Radial Stacker sump.
2. Design, furnish and install piping and accessories including agitation nozzles
3. Design, furnish and install level instrument and local controller panel to meet the requirements of the system operation.
4. Furnish and install all material and equipment for the radial stacker drainage

#### Technical Specification

##### Pump Performance and design requirements

Each sump pump shall be capable of pumping thick ash/gypsum slurry of up to 30% solids by weight without damage. The minimum and maximum liquid level in the sump will be as described on 2.2.3, respectively. Each pump must abrasion resistant impeller capable of running dry without damaging the pump.

Each pump shall be sized for the conditions on table below. The *Contractor* shall confirm pump duty upon final pipe routing. Catalogue cuts and manufacturer's specifications covering the sump pumps, Controls and accessories shall be submitted to the *Employer*.

Table 2: Pump and Motor Baseline

|  |  |
| --- | --- |
| **Pump Name** | **Radial Stacker Sump Pump** |
| Identification | 0 1GME72 AP001;  0 1GME72 AP002 |
| Total Head | 35.4 m |
| Capacity | 756m3/h |
| Maximum shutoff head, percent of rated  total head | 125% |
| Maximum solids diameter | 40mm |
| Motor maximum rated Power | 105 kW |
| Pump/Motor Enclosure rating | IP68 |
|  |  |
| **Pump Name** | **OLC Sump Pump** |
| Identification | 0 0GME73 AP001;  0 0GME73 AP002 |
| Total Head | 16.3 m (*Contractor* to confirm based on routing) |
| Capacity | 597 m3/h |
| Specific gravity at (30% solids) | 1.226 |
| Maximum shutoff head, percent of rated  total head | 125% |
| Maximum solids diameter | 40mm |
| Motor Maximum rated Power | 58 kW |
| Pump/Motor Enclosure rating | IP68 |

**Controls**

The Pump Controls shall be provided by the *Contractor*. Each sump pump shall be automatically controlled as detailed in section 2.2.3.

##### Materials

The following materials shall be used:

Table 3: Pump Material

| **Component** | **Material** |
| --- | --- |
| Motor enclosure | Cast Iron |
| Pump casing | 28% Chrome |
| Impeller | 28% Chrome |
| Shaft | 416 Stainless steel |
| Check valve | Cast Iron rubber lined, regrinding horizontal swing type with threaded or flanged ends |

**Electric Submersible pumps**

Electric Submersible pumps shall comply with the requirements of section 2.3.4.4.1.

Motors shall be arranged for vertical mounting integral with the driven equipment. Enclosure shall be waterproof submersible type. External surfaces shall be coated with moisture corrosion-resistant alkyd enamel or with polyester or epoxy paint or coating. Exposed motor parts exposed shall be of stainless steel or bronze of equivalent corrosion resistance. Metal-to-metal fits shall be coated with corrosion-resistant compound. Shaft and hardware shall be of corrosion-resistant material. The shaft shall be threaded for attaching the impeller.

Pre-lubricated sealed antifriction bearings with provisions for re-lubrication shall be furnished. Bearings shall be designed and fabricated to have an ABMA minimum L-10 life rating of not less than 130,000 hours under the load, speed, and thrust requirements for coupled service.

Rotors shall be dynamically balanced and coated with a corrosion-resistant polyester paint.

Routine tests shall be performed on each motor at the manufacturer's factory to confirm that there are no electrical or mechanical defects.

##### Field routed piping

Field routed piping, where required, shall be installed in a neat, rectangular form. Special attention shall be given to securing an orderly appearance. Piping shall be installed perpendicular or parallel to the major equipment, building structure, and floor levels.

Piping shall be installed in accordance with the following requirements:

1. Sketches of the proposed routing of piping not located on the drawings shall be submitted to the *Employer*. The *Employer’s* acceptance of these routings shall be obtained before the piping is erected.
2. Piping shall be installed with a minimum of 2.5 meters headroom over passageways and walkways.
3. Valves shall be installed in such a manner that they can be operated from the main operating floors or platforms without the use of ladders or special operating devices.
4. Piping shall not be installed above, or within a horizontal distance of 1 meter from, electrical equipment such as switchgear, switchboards, control panels, motor controls, contactors, communication equipment, batteries, battery chargers, and motor generators. Improperly located piping shall be removed and relocated.

##### Valve Installations

Excessive piping strains and bending moments on valves, especially Class 150 large steel gate valves

and butterfly valves, shall be avoided. Excessive strains and moments will result in distorted valve seats.

Valve disks and plugs shall be off the valve seats when welding valves into the lines. Check valves shall not be installed in vertical runs of piping unless they are specifically designed for vertical operation.

##### Piping

1. Radial Stacker Sump and OLC sump Agitation: Agitation Piping for the radial stacker will be routed from the existing below grade fire water system (Branch 00SGA67BR721). The *Contractor* shall make modification to the below grade HDPE pipe downstream on valve, 00SGA67AA531 to extend the water supply to the radial stacker sump and OLC sump. The pipe will be routed below grade to make a road crossing after which it will be routed above grade on plinths and steel supports. The above grade piping will be mild steel with a blind flange provision for future connection to other sumps. Pump discharge piping will be as per *Employer’s* detail design drawings on Radial Stacker Slab Upgrade – Detailed Design Report – 366-246864.
2. Overland Conveyor Sump Drainage: The OLC pump drainage piping from pump discharge common header will be routed above grade on steel supports and concrete plinths designed by the *Contractor*, alongside the agitation piping. Flanged cleanouts shall be installed to allow for blow through if there are any blockages in the pipeline.

All piping shall be identified as per 240-145581571, Standard for Identification of the Contents of Pipelines and Vessels

##### Testing

Materials and equipment tests shall be made by the *Contractor* as specified herein and as required by code requirements and applicable regulations. Materials, equipment, tools, instruments, blocking, bracing, bulkheads, blanking plates, and labour required to complete the tests shall be furnished.

Personnel performing the tests shall be qualified and experienced. Tests shall be performed as many times as necessary to assure proper quality of materials and workmanship. If any tests reveal unsatisfactory materials or workmanship, such materials or installation shall be repaired or replaced to the satisfaction of the *Employer*.

### Electrical Design

Unless stipulated otherwise below the Contractor adheres to the 240-55714363 Coal Fired Power Stations Lighting and Small Power Installation Standard for all electrical requirements within the works.

#### *Contractor’s* Design

The *Contractor* develops detailed designs for the following:

* The local control panels (LCPs), referred to in Section 2.2.4.1, that will house all switchgear/control gear which will be required to support the full functionality of the drainage system process.
* All the associated and additional power, control and protection cabling that will interface with the drainage system field equipment as defined by the process P&IDs.
* Modification/alteration of the exiting LV switchgear with an extension of a new board tie with the associated pump sump feeder buckets to suit application, The Contractor submits the certified detailed calculations, for all designs carried out by the Contractor, to the Project Manager for his/her acceptance prior to the start of construction.
* All terminal interfaces between the LCPs and field equipment
* A full Earthing and Lightning Protections System, as required. The Contractor provides the interconnection of the works area-earthing system to the overall station earth mat.
* Lighting installation for the TH9 and OLC settling tank area (*if required*).
* the Contractor is to design, furnish and install power & control cables from the LCPs to the associated electrical apparatus, and
* Contractor to design, furnish and install route main power supply cables required for the LCPs from switchgear to the LCPs.
* All interfacing works must be done by entities deemed certified competent by the OEM.

All designs are submitted to the *Project Manager* for review and acceptance before implementation.

#### *Contractor’s* Scope of Work

The *Contractor* is responsible for the implementation of the all designs as described in the *Employer’s* and *Contractor’s* Design Sections (2.2.4 and 2.3.4). The *Contractor* furnishes, installs, tests and commissions all the electrical equipment required for the full functioning of the designed systems. The *Contractor* produces manufacturing and construction ITPs for each electrical equipment/system that forms part of the *works,* and submits these to the *Employer* for approval before commencing with manufacturing, construction and testing activities for the respective equipment/systems.

All *works* in the *Contractor’s* scope are implemented in accordance to the requirements of the codes and standards as documented in Appendix C.

#### Battery Limits

The Contractor’s scope of work includes but unrestricted to furnish, design, installation and commissioning of the electrical field LV switchgear, main power cables, earthing, lighting, LCP and downstream electrical apparatus.

#### Specification of the Electrical Systems

##### Electric Submersible pumps

##### Electrical submersible pump sizes are to be as required by the defined processes requirements on table 2 section 2.3.3.2.1. All Electrical submersible pumps are rated at 3ph 400V. The submersible pumps are provided for the application of being submerged in the sump along with the pump.

##### Auxiliary DC Power

The control systems that will come with the pumping system is envisaged to be a complete system which will cater for all its power requirements, from the 400/230V AC interface that will be provided at the LCPs. The *Contractor* provides any DC power conversion equipment that may cater for special power requirements as required.

##### Earthing and Lightning Protection

Lightning Protection System Earthing

The *Contractor* assesses and determines the requirements for the lightning protection of the East Settling tank and OLC sump structures, based on a lightning protection risk assessment as per SANS 10313:2018. Should a lightning protection system inclusive of an earth mat be required, the *Contractor* designs, furnishes, installs and tests the full lightning protection systems, for both these structures, as per the requirements of SANS 60325-3.

The *Contractor* submits the lightning protection risk assessment to the *Project Manager,* for acceptance, before concluding on this scope.

Earthing and Lightning Protection for Control and Instrumentation (C&I) Equipment

The C&I field equipment, and cabling that form part of the *works* may suffer significant exposure to lightning strikes due to the remote locations they will be installed in.

To mitigate the effects of this, the *Contractor* ensures provides earthing, lightning, and surge protection systems that meet the following requirements:

* All C&I system equipment are earthed to the station earth point provided at Kusile Power Station.
* All metal instrument casings are properly earthed (grounded) to the earth mat to avoid any electromagnetic interference which may arise from portable RF transmitters, cell phones and other equipment used on the plant.
* All earthing required to eliminate any interference are provided with the installation. Earthing is provided on all installations such that in the event of a lightning strike, the strike is conducted effectively to earth (i.e. a grounding system shall be established).
* All field cables are earthed (grounded). The cables are earthed at one end or both ends depending on the interference signal and complies with an overall recognized earthing arrangement.
* To protect the C&I system equipment from damage due to the effects of lightning, lightning and surge protection is included for all loops (circuits) where there is exposure to potential lightning strikes.
* Stands and racks within the field are earthed separately to the boxes or panels installed on the stands/racks.
* All network cables that are internal to a panel can be either shielded twisted pair (STP) or unshielded twisted pair (UTP). All network cables external to a panel are shielded twisted pair (STP) and are adequately grounded to prevent cross-talk and interference.
* The lightning protection zone (LPZ) shall be established. Surge protection devices are used to effectively maximize the LPZ rating.
* For equipment located outside buildings, additional surge protection devices are deemed necessary.
* For surge protection devices that are installed on the field instrumentation side, the relevant transmitter and surge protection device are provided for in a common protection box. An equipotential bonding connection is provided for between the surge protection device and the transmitter.
* Where two or more circuits or systems are to communicate with each other and their grounding has different potentials, adequate galvanic isolation is used.

All Earthing and Lightning Protection systems that form part of the *works* comply with the requirements of the Eskom 240-56356396 standard.

##### Cabling and Racking

The plant cabling and racking follows the recommendations of applicable SANS standards, and meet requirements of Eskom Standard 240-56227443.

Preliminary sizing and design of the main power supply cables required for the LCP has been done and a corresponding LV cable schedule has been developed as conveyed in Appendix B. Sizing and design of the main power supply cables required for the LCP has been done and a corresponding LV cable schedule has been developed as conveyed in Appendix B, the Contractor is to design, furnish and installs power & control cables from the LCPs to the associated electrical apparatus, Contractor to pull an route above-mentioned main power supply cables required for the LCPs from switchgear to the LCPs, Contractor to conduct assessment on the cable field routing an further submit overall cabling an racking design to the Project Manager for acceptance.

The *Contractor* produces As-built drawings, from the *Employer’s* drawings, detailing

##### Switchgear

Contractor to perform switchgear feeder bucket modification as per section 2.2.4.1 Electrical Supply System Description.

##### Lighting

The *Contractor* providesan area lighting system through two suitably sized high mast lights for night time plant operations that may be required in and around the East settling tank as well as the OLC drainage sump. To save cost, short mast poles are mounted on the tank structures.

The lighting installation and associated accessories meet the requirements of the Eskom 240-55714363 standard.

### Control & Instrumentation

#### General Requirements

* The sump pumps shall be automated and protected using specialised field equipment used for drainage plants.
* The *Contractor* supplying the drainage sump pumps shall also supply and install the C&I equipment to control and monitor the pumps.
* The C&I system supplied shall be equipped with local alarming and indication on occurrence of abnormal conditions.

#### Design Input Requirements

The *Contractor* shall use the following as input design documentation for completion of his designs:

* LPS System Description (refer to sections **Error! Reference source not found.** and 2.2.3.2)
* LPS Load List refer to Appendix A

#### Design Output Requirements

The *Contractor* shall supply the following as part of his design (as a minimum):

* Cable schedules
* Location diagrams
* Wiring diagrams
* Power supply and distribution drawing
* Panel layout drawings
* Plant schedules: drive & actuator schedule, instrument list, panel interface list
* Licenses to be provided
* Testing and commissioning to be carried out

#### Design Standardisation Requirements

The *Contractor* shall adhere to the following in order to standardise his design with that which exists at Kusile Power Station:

* C&I Standards and Guidelines
* Control and operating philosophies (including system descriptions)

The *Contractors* design shall adhere to all relevant C&I standards, guidelines, and best practices already used at Kusile Power Station. This will include (but not limited to): field related standards, environmental conditions standards, KKS standards, lightning protection standards, cabling standards, and alarm standards. Refer to Appendix C for a complete list of applicable standards.

#### Operating Strategy Requirements

The control system provided for the sump pumps shall be a locally operated system. No interface shall exist between the existing DCS at Kusile Power Station and the sump pump controllers. All operation shall be achieved via Local Control Panels.

The operating and control of the new plant shall not hinder the existing operating and control philosophy of the existing plant.

Abnormal conditions shall be assisted with appropriate indications and alarms in order to assist the local operator to control the plant to a safe state.

#### Operational Technology Requirements

The following requirements shall be adhered to:

* Only wired communication technology (i.e. hardwired) shall be used.
* Local mode of operation will be employed as per the operating philosophy of the plant.
* Controllers supplied shall be dedicated for the specific plant function and shall not be shared for other plant functions, i.e. the sump pump set shall have a dedicated controller.
* The latest technology shall be used that meets Eskom’s standards.
* Expandability and spare capacity shall be adequately addressed for future use.
* The controllers installed shall include the capacity to perform a certain degree of self-diagnosis.

#### Local Control Requirements

The Local Control Panels shall adhere to the following minimum requirements:

* The panels shall contain all required push buttons, switches, and lights, in order to fully operate the sump pumps in local mode.
* The panels shall be externally powered via switchgear situated in the 10 Year Ash Dump Substation. Refer to Section 2.2.4.1 for further details.
* The panels shall be suitable to the environmental conditions of the area where the panels are installed.
* The pump status shall be shown including running, tripped and stop indicators.
* The status of all alarms from the pump system shall be shown.
* A local storage system shall be installed as part of the pump controllers that will allow for the storage of events and alarms in a database for up to 7 days.

#### Field Equipment Requirements

##### General Requirements

* The field related standards as specified in Appendix C shall be followed for all field equipment installations.
* All field equipment shall operate over an ambient temperature range of: -10°C to 70°C.
* All field equipment shall be installed in a suitable location ensuring that it operates in an environment within the parameters stipulated by the manufacturer.
* The field equipment shall be designed for operation in the ash environment that it shall be installed in.
* The panels and their electrical connections shall be rated IP 66 as minimum.
* All IP ratings shall be as per SANS 60529.
* Additional protection hoods and enclosures shall protect those devices situated outdoors or in adverse environments.
* The equipment layout shall be such that when mechanical work is performed, no C&I equipment is damaged.
* All device installations shall be done in accordance to the manufacturer’s specification or installation guide.

##### Cabling and Wiring

* The 240-56227443 - Requirements for Control and Power Cables for Power Stations standard shall apply for control and power cabling.
* All field cabling entering enclosures shall be bottom entry.
* Cable block diagrams shall be provided by the *Contractor* as part of Detailed Design.

##### Cable Routing and Racking

* The cable route shall be provided such as to not hinder any existing equipment or structures within the plant. Direct buried cables shall be used for this project. All direct buried cables shall be suitably armoured.
* Separate cable racks shall be used for power and instrument cables.
* Cable rack covers shall be used in dust prone areas and outside plant areas for protection.
* No crossing of cables within racks shall be accepted.

##### Environmental Conditions

The following standards shall be adhered to:

* 240-56355731 Environmental Conditions for Process Control Equipment Standard
* 240-56355541 Control System Computer Equipment Habitat Requirements Guideline

The following requirements shall be met:

* New C&I equipment panels shall be rated IP 66 as a minimum.
* The equipment panel doors shall be adequately sealed via a rubber sealer.
* No C&I equipment and field instrumentation shall be placed within the plant if it is not rated for the hazardous environment.
* The controller panels shall be designed to prevent ingress of dust, grit, rain water, wash-down water or other foreign matter to all parts where such ingress shall be detrimental to its operation.
* The controller panels shall be equipped with on-board surge protection.

#### Power Supply and Power Distribution

* Power for the C&I system shall be from the switchgear installed within the 10 Year Ash Dump Substation. Refer to Section 2.2.4.1 for further details.
* The *Contractor* shall supply a power supply and distribution drawing as part of his design deliverables.

#### Maintenance Strategy Requirements

The *Contractor* shall develop a maintenance concept and strategy after detailed design is established. This shall cover the following:

* Recommended spares holding
* Required maintenance schedule of C&I equipment over the life of the plant
* Required level of on-site repairs
* Overall maintainability requirements, including special tools required

The maintenance strategy shall align with existing philosophies followed at Kusile.

#### Expandability Requirements

The C&I design shall conform to the following expandability requirements:

* 20% unused terminals in the field boxes.
* 10% spare installed terminals in the field boxes.

#### Life Expectancy Requirements

* All new equipment and control components installed shall be supported and maintainable for a minimum of 15 years.
* The latest power plant proven technology shall be provided for the new C&I system.
* No unproven technology shall be provided.
* All control equipment shall be available in South Africa as commercially- off- the-shelf (COTS) products.

### Equipment Required to be Included in the Works

The *Contractor* is required to provide lifting facilities (hoist/crane) and all other equipment required for the execution of the complete *works*.

### As-built Drawings, Operating Manuals and Maintenance Schedules

The operating & maintenance manuals are to be detailed enough to operate, maintain, dismantle, reassemble, adjust and repair plant & equipment.

#### As-built and/or Red-line Drawings

As-built drawings to be submitted for designs performed by the *Contractor* while Red-line drawings to be submitted for designs performed by the *Employer*.

1. The *Contractor* is to provide “As-built” and “Red-line” drawings based on the shop drawings embodying all modifications made during construction. The “As-built” and “Red-line” drawings are to include general arrangement and sections of all plant and equipment including isometrics and P&ID’s or PFD’s. Safety, instrumentation, control and operation drawings are to also be included “As-built” and “Red-line” drawings indicating the intended functioning, capacity data and control functioning of all systems.
2. The “As-built” and “Red-line” drawing will indicate all relevant plant coding and labelling. The determination of these codes and labels will be done in accordance the documents listed in Works Information.
3. Two hard copies and a DGN file softcopy of “As-built” drawings are to be submitted to the *Employer* for approval.
4. Two hard copies of “Red-line” drawings are to be submitted to the *Employer* for approval.

### Temporary Works

The *Contractor* is responsible for the design of all temporary works and is mandated in terms of Construction Regulations 2014: Duties of Designer, 6(2) a – d, to fulfil the duties described therein for the temporary works designs done by the *Contractor* eg. Formwork.

## Other Requirements of the *Works*

### Documentation and Configuration Management

#### Document identification

All documents supplied by the *Contractor* are subject to the *Project Manager’s* acceptance. The language of all documentation is required to be in English. 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*. Drawing numbers are assigned by the *Employer* as drawings are developed.

#### Document Submission

All project documents must be submitted to the delegated *Employer’s* Representative 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 documents as electronic (CD or USB) and hard copies and both copies must be delivered to the *Employer’s* Representative with a transmittal note.

In addition, the *Contractor* adheres to the following standards:

* Project / Plant Specific Technical Documents and Records Management Work Instruction (240-76992014)

##### Drawings Format and Layout

1. The creation, issuing and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 - Engineering drawing Standard.
2. Drawings issued will be a minimum of one hardcopy and an electronic copy.
3. Drawings issued may not be “Right Protected” or encrypted.

### Quality Management

Refer to Appendix G for the Quality Requirements

# Construction

The *works* described in this scope include the following

## General

The *Contractor*:

1. Adheres 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 Safety, Health, Environment and Quality (SHEQ) Policy 32-727 and Waste Management Procedure, as well as the plan from KWS for all *works*.
2. Submits a comprehensive Method Statement of the entire *works* to the *Project Manager* for acceptance prior to the start of the *works*
3. Submit a project specific safety file to the *Employer* for acceptance, prior to the start of the works.
4. Submit a detailed level 4 schedule for the *works* to the *Project Manager* for acceptance after contract award.
5. Manage his access to the working areas and the site to ensure none of the existing plant that is not in the scope is damaged during removal of the middle tier fence.
6. Manage his activities on Site to ensure that no interference takes place between his work and that of others.
7. Continuously monitor the condition in demolition areas and surrounding areas for any hazardous substances and in such case, the *Contractor* is required to take necessary precautionary measures.
8. Complete "Contract Activities Daily Reports".
9. Liaise with the *Project Manager* regarding utilities and telephone facilities required for his Site establishment.
10. Identifies a registered waste disposal site, for dumping of waste, which must be approved by the *Project Manager.*
11. Maintain and promote labour harmony on the Site and in the working environment.
12. Immediately report any potential labour disharmony to the *Project Manager*.
13. Not recruit or employ any personnel from the *Employer* and Others, without prior acceptance of the *Project Manager*.
14. Provides temporary environmental controls for all construction and production activities to prevent contamination, from the battery limits of the project area, for the *Project Manager’s* approval.

### Surveying and Setting Out

1. The *Contractor* is responsible for the complete surveying and setting out of the *works* including establishment and protection of any benchmarks required to complete the *works.*
2. The *Contractor* is required to consult the Surveyor-General’s office to obtain information on available registered beacons near the area to use for the establishment of any required benchmarks close to the *works.*
3. The *Contractor* is required to submit as-built and/or red-line data and drawings of the completed *works* to the *Project Manager* upon handover. As-built drawings are submitted in PDF and native CAD (.DGN) formats.
4. The *Contractor* is responsible for the verification of all survey data relating to setting out and to immediately inform the *Project Manager* of any discrepancies as soon as these are discovered.
5. Note that the new slab is to be constructed in the same position as the old slab; therefore, *Contractor* should take note of the setting out point prior to demolition of the slab.
6. The final position of the sump is to be determined by the *Contractor* with the ideal location indicated on the issued drawings.

### Scanning for Underground Services

1. Geophysical scanning is done by the *Contractor* to locate sub-surface utilities both metallic and non-metallic prior to any excavations.
2. The type of Geophysical scanning employed is at the discretion of the *Contracto*r, taking note of the required output. The *Contractor* therefore considers the working environment prior to selection of test methodology and equipment.
3. The *Contractor* considers possible signal interferences which may be experienced by the geophysical scanning equipment caused by equipment, and services stray current in and around the areas.
4. Scanning is required to be conducted to a minimum depth of 3 m.
5. The *Contractor* submits the results of the scanning to the *Project Manager* and indicates and possible services which may interfere with the *works*.

## Construction and Erection

1. The *Contractor* is responsible for the construction of the *works*, including all temporary works and design thereof, and all associated services in accordance with the detailed drawings and specifications.
2. The *Contractor* is responsible for furnishing and execution of *Employer* and *Contractor* designed *works*.
3. The *Contractor* disposes of all demolition waste at a licenced waste disposal site to be accepted 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 to be submitted to the *Employer*.
4. The *Contractor* submits the construction methodology for the *works* to the *Project Manager* for acceptance prior to the commencement of the *works*.

### Geotechnical Information

The *Contractor* is required to conduct a geotechnical investigation of the site to confirm the soil conditions for the design. The *Contractor* is fully responsible for ensuring that the founding material and level thereof fully meets all the requirements of the approved detail design.

* + - * 1. **Transfer House 9 Drainage System**

Cut to stockpile approximately 30m3 for backfilling purposes (G7 or better) or cut to spoil the remainder based on the outcome of the classification of the material for sump walls.

**Tests on Soil Samples**

Below is a list of tests that the *Contractor* shall perform on soil samples:

* Identification tests - Atterberg Limits and Sieve analysis.
* State tests - In situ Moisture content
* Compaction tests - Moisture/density relationship at Modified AASHTO compaction effort and California Bearing Ratio (CBR)

**Laboratory Testing**

All laboratory testing is conducted in accordance with the latest standard methods and procedures as outlined by the appropriate authorities (B.S/ Euro Code equivalent, A.S.T.M, A.A.S.H.T.O, I.S.R.M, S.A.B.S / S.A.N.S).

The *Contractor* is responsible for the transportation of all samples to the laboratory as well as the testing thereof.

Any other field testing that may be required in support of the objectives of the design must be carried out with notification to the *Employer’s* geotechnical/civil engineer.

**Foundation for Sump**

* The *Contractor* shall excavate to the required dimensions as per detailed design specifications and drawings.
* Rip & recompact 150mm thick layer at bottom of excavation to 95% Mod AASHTO density (MAD) at 0 to +2% of Optimum Moisture Content (OMC).
* Conduct Dynamic Cone Penetration DCP testing on the compacted surface to confirm bearing capacity of 150 kPa after compaction.
* Thereafter place blinding as per drawing details.

**Stormwater Trenches**

* The *Contractor* shall excavate to the required dimensions as per detailed design specifications and drawings.
* Rip & recompact 150mm thick layer of the existing soil to 95% Mod AASHTO density (MAD) at 0 to +2% of Optimum Moisture Content (OMC).
* Where backfill is required, the *Contractor* shall provide suitable material to be approved by the *Employer’s* geotechnical/civil engineer.
  + - * 1. **OLC 1&2 Drainage System**

Similar to Transfer House 9 Drainage system on section 3.2.1.1.1, however, cut to stockpile quantity differs (approximately 75m3).

### Excavations and Associated Water Control

#### Dealing with water

1. The *Contractor* is pole for all risks and costs associated with water, whether from a local water course, an underground spring or any other source or cause.
2. The *Contractor* takes all precautions and properly deal with and dispose of all water to ensure that:

* The works are kept sufficiently dry at all times for their proper execution;
* There is minimum deleterious impact on the environment and adjacent properties; and
* There is minimum damage, inconvenience or interference arising from flood waters.

1. The *Contractor* is responsible for the construction of sumps, furrows, drains, oil separators, slurry trenches, cut-off trenches and any other temporary works as may be necessary to deal with water.
2. The *Contractor* provides, operates and maintains in sufficient quantity such pumping equipment, well points, pipes and other equipment as may be necessary.

#### Excavations

1. Surface works and excavations are protected against the ingress of surface water and the *Contractor* takes whatever precautions may be required.
2. The *Contractor* takes all necessary steps to ensure that any water entering any surface excavation does not endanger the stability of the surface excavation, or that water entering such surface excavation does not erode any portion of the excavation.
3. The *Contractor* ensures that no concentration or accumulation of water occurs either within or around or above the area of any open excavation which may affect the safety of the excavation.
4. The *Contractor*, where possible, maintains excavations such that ponding of rain water is prevented by suitably sloping surfaces and the construction of channels and sumps.
5. Where excavations are not self-draining, the *Contractor* constructs sumps and installs pumps of adequate capacity to keep the water level in such sumps 0.5 m below the lowest excavated surfaces for as long as required for construction of the works. Diesel powered standby pumps are readily available in case of breakdowns.
6. The responsibility of the *Contractor* for the safety and care of the excavations includes taking the following measures:

* The *Contractor* excavates the sides of excavations which are not positively supported to slopes which will remain stable;
* The sides of excavations which are not cut to a stable slope are properly and adequately supported to the extent necessary to ensure stability during the period of construction and the excavation is then backfilled unless otherwise indicated on the Drawings;
* The *Contractor* is responsible for the installation and subsequent removal of all necessary sheeting, timbering, strutting, shoring and the like to secure the excavations, to prevent any movement of adjacent ground and to ensure the safety of workmen and freedom from damage to adjacent structures.

#### Materials facilities and samples for test and inspections

1. The *Contractor* provides all Materials, facilities and/or samples required for tests and inspections.
2. The *Employer* reserves the right to call for samples of equipment offered to inspect the workmanship as the work proceeds and either accept or reject the equipment or workmanship. The *Employer’s* acceptance of the design, material and workmanship does not transfer liability from the *Contractor* to the *Employer*. The *Contractor* remains fully liable to provide a complete and proper working plant.
3. The *Contractor* must allow for control samples of the following which are to be accepted by the *Employer* and are to be held in the site office to establish the quality standards:
4. Control sample of piping to establish the pipework quality standard
5. Control sample of welded, and bolted to establish the structural connection quality standard

### Miscellaneous Materials and Services

##### Miscellaneous materials and services not otherwise specifically called for shall be furnished by the *Contractor* if required in accordance with the following:

* Erection tools, special tools, and test equipment required for erection, testing, startup, and operation of the equipment, including shipping costs to and from the jobsite.
* Construction services, storage facilities, and utilities specified herein as *Contractor*-furnished.
* Other miscellaneous materials and services required to complete the work that is not specifically indicated herein as *Employer*-furnished.
* Distribution of construction power and temporary lighting (from *Employer* supplied 400V power source), including designing, furnishing, erecting, maintaining, and removing the construction power distribution system
* Holes in columns for safety cable, in accordance with OHSA.
* Supply all fit-up bolts, gaskets, welding electrodes, welding rod, backing rings and other fasteners for attachment of or joining of equipment and materials.
* Supply, install and remove all temporary guying, bracing, rigging, attachments, and supports.
* Survey and lay out the work from the *Employer’s* or Project Field Manager's designated control points.
* Provide detailed erection procedures for any lift over 25 tons to the *Employer* fifteen (15) working days prior to the lift.
* Furnish and install equipment base expansion and epoxy anchors.
* Furnish and install levelling blocks, soleplates, thrust blocks, matching blocks, and shims.
* All welding materials and consumables required for attachment of equipment, piping, or structural steel furnished under these specifications.
* Protection of existing underground utilities, foundations, buildings, and equipment.
* Solvents and cleaning materials.
* Hazardous Material Safety Data Sheets (MSDS) for all materials supplied by *Contractor*.
* Construction consumables.
* Supply, surface preparation and application of painting and galvanizing of all *Contractor*-furnished piping and structural shall be in accordance with Eskom Standard SSZ\_45-17 Corrosion Protection of Medupi Power Station Corrosion Protection Specification.
* Touchup prime and touchup finish paint all furnished painted piping, piping attachments and accessories, and structural steel members. *Contractor* shall furnish all materials required for surface preparation and painting. No touchup galvanizing will per permitted except to exposed threads after assembly or per *Employer* review and approval. Materials shall be re-dipped if touch up galvanizing is required.
* Restoration of *Contractor* damage to the site.
* Furnish and install symbolic safety signs per SANS 1186 for *Contractor* installed equipment.
* Maintenance of accurate as-built drawings for all erection work and delivery of final as-built drawings to the *Employer*.
* Attendance at coordination meetings at the site at a time selected by the *Employer* to discuss matters relative to the execution of this contract.
* Initial and final fill of oils, greases, and other lubricants to equipment installed by the *Contractor*.
* Grout, pour concrete, set, align and erect all furnished pipe support foundations that are to be installed under this contract, including foundations, foundation bolts, and bolt sleeves, Contractor shall furnish and erect for all pipe support foundations all grouting materials and the placing thereof.

## Commissioning

The *Contractor* submits all drawings and relevant paperwork including, but not limited to:

* Commissioning procedure and plan
* Commissioning check-sheet
* Calibration certificates
* Commissioning report including test results

*Contractor* shall be responsible for commissioning and start-up activities for the pumping and agitation systems installed by the *Contractor*, including, but not limited to, planning, all craft labour and supervision.

*Contractor* shall pressure test all piping installed; Furnish, install and remove all pressure testing materials, equipment, valve kits, caps, blanking plates and blind flanges. Furnish testing and checkout of equipment furnished and/or erected under this specification

Flushing fluids and hydro testing water may be disposed of on-site as directed by the *Employer*.

### C&I Commissioning Requirements

The new C&I system shall be tested and commissioned using the existing strategies at Kusile. The standard that shall be followed is: IEC 62381: Automation Systems in the Process Industry – Factory Acceptance Test (FAT), Site Acceptance Test (SAT), and Site Integration Test (SIT). Namely, the following activities will be carried out:

* FAT – Factory Acceptance Testing
* SIT – Site Integration Testing
* Cold Commissioning
* Hot Commissioning
* Final Acceptance Testing

A testing procedure and plan shall be developed and carried out during the testing and commissioning phase of the project. Defects shall be noted and addressed by the relevant parties. Commissioning the entire control loop shall also be done using commissioning procedures that will be developed within the testing and commissioning phase of the project.

# COMMON REQUIREMENTS

## Documentation

The documentation requirements cover the various engineering stages, from the design stage through fabrication, installation, testing and commissioning and most importantly for the operating, maintenance and training stage of the project. The *Contractor* shall ensure that the Technical Documents and Records Management Work Instruction (240-53114186) are used for any documentation requirements.

The *Contractor* is responsible for the compilation and the supply of the documentation during the various project stages and to provide the documentation programme 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 Submission Schedule (VDSS).

### Document Identification

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:

Package/System name, sub-system if applicable

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

### 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.

### Document Submission

*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). The VDSS is revisable and changes shall be discussed and agreed upon by all parties and properly documented.

*Contractor* documents submittals are provided in accordance with the Vendor Document Submittal Schedule (VDSS) which is included in Appendix D. The VDSS shall indicate the format of documents to be submitted. Eskom shall be responsible for the management of the schedule i.e. to create a document register that shall be used to track submission progress of documentation by the *Contractor* as per the committed dates on the VDSS.

*Contractor* documents all documentation that will be sent to the *Employer* in the Master Document List (MDL) as provided by the *Employer* in Appendix E. All documentation, including reports, manuals, etc. is in the English language.

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.

### Transmittals

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 Organisation
* Recipient Name
* Recipient E-Mail
* Recipient Organisation
* Disclosure Classification
* Date received
* Quantity of documentation referenced on the transmittal
* Number of copies
* Format/medium submitted (e.g. paper, DVD, etc.)
* Sender signature
* Recipient signature, once submitted, to acknowledge receipt

1. 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 Section 4.1.7
2. 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>.
3. The *Contractor* shall follow a structured method of communication as defined within Communication Interface Memorandum (CIM) for any correspondence
4. 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>.
5. 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

1. 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.*

The hard copy prints shall be submitted to the address indicated for Technical Documents in the Supplementary Terms and Conditions of this Contract. The *Contractor* shall submit hard copies and one electronic copy for every submittal.

The *Contractor* submits documentation to the Eskom Representative as well as the Project’s Documentation Centre in the following media:

* 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 USB, 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.

### Drawings

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 (.dwg/.dgn) and PDF format as per 240-86973501.

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. 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 Sub *Contractors*. 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.

### Drawing Submittal

All documents and records management will be performed according to Project/Plant Specific Documents and Records Procedure. 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 as-built 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.

### 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, furthermore all Information in connection with similar Works, including, whether or not specified in the Contract and 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

The *Contractor’s* Staff will maintain a master set of redlined as-built drawings. The *Contractor* will provide drawing mark-ups as work is completed. The Engineer and the *Contractor* will ensure that all appropriate information is transferred to the field record copy of drawings. Engineer and the *Contractor* will check the "As-Built" for completeness and accuracy. Final "As-Built" will be distributed in accordance with the Project Instructions Manual (PIM). The scope of supply of Information from the *Contractor* shall include drawings, documents, lists and data according to the types defined in Table 3 below (this list is not limited to below and may include additional information):

Table 3: Typical Document Requirement List (As-built) (where applicable)

| **Document Group** | **Description of document type (includes information data sets)** |
| --- | --- |
| General | Equipment arrangement drawings  Piping & Instrument Diagrams (P&ID’s)  Material handling flow diagrams  Engineering and procurement schedule  Equipment list  Isometric Drawings  Valve list  Pipeline list  Hanger list  3D model  Interface list  Equipment specifications & data sheets  Drawings and data for all equipment and material  Installation, Operation, and Maintenance (IOM) Manuals  Spare parts list  Factory Acceptance Test (FAT) report etc.  Databooks |
| Quality Assurance | Quality assurance manual  Quality control plans  Quality control reports  Weld summary index  Material traceability certificates  Manufacturing test reports  Manufacturing Non-Conformance Reports (NCR’s) |
| Civils & Structures | Site Layout  Geotechnical Investigation Report  Building arrangement and floor layouts  Structural drawings  Architectural drawings  Structural analysis and design report  Foundation drawings  Structural support drawings  Access Platform/Walkway Drawings  Etc. |
| Construction | Transportability study/report (including heavy haul study)  Site management plan (QA, Safety, Environmental etc.)  Construction schedule  Site storage requirements for major equipment  Construction test records (hydrotest, concrete strength, pile integrity test, etc.)  Maintenance records for all equipment while stored on site  Constructability report  Etc. |
| Commissioning | Commissioning schedule  Test & Evaluation Master Plan (TEMP)  Commissioning procedures  Commissioning database  Performance test procedure  Performance test reports  Field test reports and certificates  Etc. |
| Operations | Operating procedures  Plant operational documentation  Plant tech specs  Incident & upset mitigation procedures  Operating scenarios (for C&I control purposes)  Etc. |
| Logistic Support | Maintenance concept  Plant maintenance documentation  ISI plan/program  Spare parts assessment  Plant RAM analysis  Equipment access and removal paths assessment  Fault finding diagrams  Etc. |
| Training | Training plan  Training manuals and instructions  Etc. |
| Safety & Protection | Fire hazard analysis  Waste management plan  Etc. |
| Design Analyses | Reliability model and analysis  Transient / Transition Analysis  Flow dynamics analysis  Thermo-hydraulic analysis  Pipe Stress Analysis  Maintainability analysis  FMECA / FMEA analysis  HAZOP analysis  3D model interference checks  Etc. |
| Electrical | Motor list  Electrical load list  Circuit list  Raceway list  Single line diagram  Protection schematic diagram  Electrical load flow and fault studies report  Cable block diagrams  Cabling routing and cable racking layout diagrams  Cable termination diagrams  EMC and earthing standards report  Earthing layout drawings  Lighting layout drawings  Etc. |
| C&I | Alarm and set-point schedule  Instrument schedule  Instrument data sheets  Mechanical hook-up drawings  Electrical hook-up drawings  Cable Schedule  Termination Schedules  Junction Box GA and Internal Layout  Junction Box and Instrument location drawings  Instrument Stand GA  Maintenance Manuals and procedures  Operating and Control Philosophies  Functional Logic diagrams  Field device calibration certificates  Level measurement installation report |

In addition to the official documentation submittals listed in Appendix E 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*.

### Design Review Documentation

The Engineer reviews the *Contractor’s* submitted documents. The *Contractor* shall ensure adherence to the Works Information and that a technically sound design approach is incorporated. Specific information required from the *Contractor* during tender phase and as part of the Works is set-out in the VDSS, in Appendix D Each document submitted to the Engineer requires a transmittal note (refer to *Employer’s* template 240-71448626 for minimum metadata requirements) from the *Contractor*. The *Contractor* includes interpretation of results in every report compiled. All project documents shall be submitted to the Engineer in accordance with Project / Plant Specific Technical Documents and Records Management Work Instruction (240-76992014).The *Contractor* is required to submit documents as electronic and hard copies and both copies must be delivered to the Engineer with a transmittal note.

### Documentation Recording

The *Contractor* shall develop, document and maintain the Master Document List (MDL) with all the required metadata which will be submitted to the *Employer* in the monthly basis for tracking purposes irrespective of whether there are updates or not. The MDL shall include a list of drawings and documents and shall contain the following minimum information for each document:

* Date of submission
* Transmittal number
* Transmittal title
* Document description

Document number (both *Contractor* and *Employer*)

* Document Type
* Revision number
* Document Approval Status
* Document Authorisation Status (i.e. Accepted With Comments, Not Accepted with Comments, Accepted)
* Transmittal Reason for Issue

In addition, the *Contractor* shall adhere to the following standards:

* Project / Plant Specific Technical Documents and Records Management Procedure (240-53114186).
* SmartPlant for Owner Operators (SPO) Documentation Metadata Standard (240-58552870)
* SmartPlant Data Take-On Standard (240-107305502)

### Documentation Requirements

All documents supplied by the *Contractor* shall be subject to Eskom’s approval. For consistency, it is important that all documents used within the project follow the same layout, style and formatting as described in the Project Plant Specific Technical Document and Records Management Procedure (240-53114186). Documents such as QCP’s, Method Statements and other documents impacting the work shall be approved by the *Employer* at least 3 working days prior to commencement of the Works.

Each revision of a document or drawing shall be accompanied with a list of the comments made by the *Employer* on the previous revision if applicable and the response/corrective action taken by the *Contractor*. Changes shall be recorded in a revision table contained in each drawing/document.

Documents and drawings shall indicate the *Employer’s* number as allocated by the *Employer*. The *Contractor* may have his own internal document or drawing number on the document or drawing, but where reference is made among documents, the *Employer’s* number shall be used as the reference number.

The *Contractor* shall compile a complete data book for all work done during manufacturing, construction and commission containing the following as a minimum if applicable:

1. Scope of work
2. Approved “As built” drawings (CADD format)
3. Design calculations
4. Approved QCP / ITP
5. Inspection reports
6. Pipe ovality reports if applicable
7. As built drawings (isometric drawings and P&IDs)
8. Material summary that gives full traceability between components used, drawings and material certificates
9. All material certificates for pipes, fittings and all components used.
10. Pressure test certificate and the calibration certificates of the gauges used.
11. Pressure test procedures
12. The manufacturer’s/repairer’s certificate as defined in PER.
13. All CAR’s and corrective actions
14. Operating Philosophy including all alarm and trip values
15. Parts catalogue
16. Maintenance manual
17. Storage, packing and transportation instructions

### Data Books

The *Contractor* compiles data Books progressively for all manufacturing and construction/erection inspection, operating manuals and test records and documents for every piece of Plant worked on. The *Contractor* submits data books to the *Engineer* for their review for all Plant and Materials and work undertaken with the applicable requirements and specifications.

## General Requirements

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 Sub-*Contractors*. It shall not apply to drawings developed by manufacturers for equipment and material such as valves, instruments, etc. Drawing numbers shall be assigned by the *Employer* as drawings are developed.

The project name shall be listed on all drawings, including 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* shall retain project design calculations and information for the entire life cycle of the plant and shall provide these to the *Employer* on prior written notice at any time notwithstanding the expiry or termination of the contract.

The Contactor will be responsible for all the associated statutory certification for all “free issued” equipment.

# CONFIGURATION MANAGEMENT REQUIREMENTS

The *Contractor* supplies a comprehensive configuration management program in accordance to ISO 10007 (2nd Edition) to ensure that plant structures, components and computer software conform to approved design requirements. However a project specific Configuration Management Plan document will be developed which will be aligned to ISO 10007. In addition, the Works as-built physical and functional characteristics shall be accurately reflected in selected documents and databases, including those for design, procurement, construction, operation, testing and training. The configuration program shall be applicable for use throughout all phases of the project life cycle, including management of spare parts, replacement parts and product upgrades, and shall form part of deliverables for hand-over to the *Employer* for use during the operation and maintenance phases of the plant.

## PLANT IDENTIFICATION

### Plant Coding

Plant Coding shall be undertaken by the *Contractor* and all codes shall be reviewed and accepted by the *Employer*.

Plant coding will be done by the *Contractor* and the *Employer* will review all the codes. The KKS system shall be used by the *Contractor* for classifying and designating both plant and their associated documents. All technical documentation as per “Technical documentation classification and designation standard – 240-54179170” shall contain a KKS code as part of the documentation identification relevant to the plant equipment. All plant (Process, electrical, C&I and Civil) shall be coded to KKS breakdown level 3. The KKS code shall contain break down level 1, break down level 2 and breakdown level 3. Omission of any break down level shall not be permitted. The system shall be applied from the concept stage until project closeout. The rules specified in the VGB guidelines will be used but all rules specified in Eskom documents will take precedence.

Detailed nameplate or label list with the service legends and including the KKS Code shall be prepared by the *Contractor* and submitted to the Project Manager for review and comment before commencing manufacture of the labels. All maintainable plant equipment and components shall be labelled including pipework.

The rules for applying the KKS and the KKS codes are contained in the Eskom Standard 240-93576498 and in the publication KKS power plant classification (B105e) 5th Edition 2003 published by Verlag VGB PowerTech Service GmbH (Essen) , and the KKS Applications: Guideline and explanations A,B1-4 (B106e).

The *Contractor* shall use Eskom –specific interpretations of the KKS standards, which will be reviewed and agreed on after Contact Award. The following variations relating to 240-93576498 are noted.

* Breakdown level 3 component code - not used in P&ID’s and PFUP’s, only used by control hardware supplier
* Breakdown level 0: will be shown as a general remark on the P&ID not on the individual KKS number
* F0-level is not used, FN level is free - no general decoding system

The *Contractor* shall code all plant within scope of supply according to the KKS Classification System to Breakdown Level 3 where possible. The relevant KKS codes thus allocated shall appear on all plant related documentation, drawings, lists and correspondence.

The *Contractor* shall be responsible for ensuring the accuracy, completeness and consistency of the designations in all documents. This applies both to designations within documents (plant designations) and of Documents (documents designations). The *Contractor* shall submit these for the Engineer’s approval.

A list of the KKS designations allocated shall be drawn up by the *Contractor* for each scope of delivery. Methods of KKS designation, list formulation and submission format shall be proposed by the *Contractor* and agreed by the engineer.

The *Contractor* shall, as soon as possible after the contract has been placed, provide the engineer with the following:-

Outline drawings or diagrams showing the *Contractor’s* reference

* Coding for systems and equipment
* In respect of items procured by the *Contractor* from another
* Manufacture or vendor, the *Contractor* shall provide the name of
* The actual manufacturer and his coded drawing or reference
* Numbers and relevant technical data for identification purposes

The *Contractor* shall as a minimum ensure the following documentation is coded and provided to the *Employer* prior to finalisation:

Civil:

* site layouts
* building layouts
* building sectional layouts
* building floor plans per level
* underground services layouts
* cable rack & support
* building lists (including room equipment lists)

Mechanical:

* Piping and Instrumentation Diagrams (P&IDs)
* interface list
* process flow diagrams (PFDs)

Electrical:

* Single line diagrams
* Electrical board general arrangements (GA)
* Cable schedule

C&I:

* C&I Architecture Drawings
* C&I Cubicle GA Drawings
* Cable Block Diagrams
* remote control station lists
* Cable Schedules
* Termination Schedules

The *Contractor* shall then be required to include allocated codes to all other designs and related documentation. It is also the responsibility of the *Contractor* to consistently apply the KKS codes throughout the rest of the technical documentation which shall include, but not limited to:

* load schedules
* board parts lists
* cable block diagram
* termination diagram
* drive & actuator schedules
* instrument schedules
* alarm lists, loop diagrams
* signal lists
* schematic diagrams
* termination diagrams
* Logic diagrams, etc.

The *Contractor* shall ensure that all documentation is coded prior submission to *Employer* for review.

### Plant Labelling

New labels shall be provided for all plant, material and equipment provided as part of the Works. The *Contractor* manufactures and installs labels according to 240-71432150 - KKS Plant Labelling and Equipment Descriptions Standard.

Labelling of components inside electrical and C&I panels shall be done by the *Contractor*. Coding and labelling of components inside electrical and C&I panels shall be done by the *Contractor*.

Any abbreviations to plant descriptions shall be prepared in accordance to 240-109607332 - The Abbreviation Standard for Labelling of Plant at Power Stations. VGB Detailed nameplate or label lists with the service legends and including the KKS Code shall be prepared by the *Contractor* and submitted to the *Employer* for review and comment before commencing the manufacture of the labels.

# DESIGN REVIEWS AND CHANGE MANAGEMENT

## Design Reviews

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, in Appendix D

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 contract requirements and is finalised 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). 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:

* Design Freeze Review
* System Integrated Design Review
* Pre-Commissioning Review
* Acceptance testing Review
* Handover Review

The *Contractor* conducts 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.

## Engineering Change Procedure

All Design change management shall be performed in accordance to the latest revision of the Kusile Engineering Change Management Work Instruction (240-132735850) and the *Employer* shall ensure that *Contractor* is provided with latest revisions of this procedure. Any uncertainty regarding this procedure should be clarified with the *Employer* and clarification updates should be reflected in updated versions of this procedure. All design reviews will be conducted according to the Design Review Procedure (240-53113685).

## Handover

Apart from any statutory data packages required, the *Contractor* also compiles and supplies a data package of the relevant drawings, test certificates etc. to the *Employer’s* Representative for acceptance.

* Concrete 7 day and 28 day cube test results
* Slump test results
* Concrete mix designs including all required test results e.g. aggregate test results
* Pile Integrity Test Results (if required)
* Pile Load Test Results (if required)
* Foundation Certificate
* Welding procedure specifications
* Welder qualifications
* Non-destructive weld test results
* Weld test certificates
* Steel grade certificates
* Bolt grade certificates
* Hydrostatic tests of the pipe and tank
* Pre-concrete and post concrete surveys
* As-built data and drawings of the completed Works upon handover. As-built drawings are submitted in PDF and DWG formats
* Structural Certificate signed by the *Contractor’s* Professionally Registered Engineer confirming that structure has been constructed in accordance with the design

Detailed handover requirements will be as per the requirements defined in the Kusile Project “240-128515850 - Documentation Handover Specification”. As a minimum the *Contractor* will provide the *Employer* with the back-ups and information to completely replicate the *Contractor’s* SmartPlant instance on the *Employer’s* environment. Any uncertainty regarding this process should be clarified with the *Employer*.

SPEL and SPI Data will be captured as defined by the both the Electrical and Control & Instrumentation Centre of Excellence, respectively, during contracting phase. All terminations will be captured as per the *Employer’s* data template.

Refer to Appendix F for complete requirements.

The *Contractor* shall use the documentation list to compile the MDL.

# SPECIFICATIONS FOR THE WORKS

Refer to Appendix C for the Eskom Standards and Guidelines (i.e. SANS Standards, International Standards and etc.).

The *Contractor* is required to adhere to the latest revisions of Eskom Standards, SANS Standards and mentioned specifications.

### Particular Specifications

#### General

The following codes are required to be complied to:

* SANS 1200 A: General
* SANS 1921-1: Construction and management requirements for works contracts, Part 1: General engineering and construction works

The table below indicates particular specifications pertaining to SANS 1200 A and must be read in conjunction with the code.

| **Clause** | **Particular Specification** |
| --- | --- |
| **5.1** | **Survey** |
| 5.1.1 | **Add:**  The *Contractor* is responsible for the complete surveying and setting out of the *works* including the establishment of any beacons and benchmarks required to complete the works.  The *Contractor* is required to consult the Surveyor-General’s office to obtain information on available registered beacons near Kusile Power Station to use for the establishment of any required benchmarks close to the *works*. |
| **6.2** | **Degrees Of Accuracy** |
| 6.2 b) | Degree of accuracy II is applicable to the *works*. |

#### Site Clearance

The following codes are required to be complied to:

* SANS 2001 BS1: Site Clearance
* SABS 2001 C: Site Clearance (Only Clause 8 – Measurement and Payment)

The table below indicates particular specifications pertaining to SANS 2001-BS1 and must be read in conjunction with the code.

| **Clause** | **Particular Specification** |
| --- | --- |
| **4.1** | **Areas to be cleared and grubbed** |
| 4.1.1 | The designated areas are also as shown on the Drawings. |
| **4.2** | **Clearing** |
| 4.2.1 | Activity numbers 1, 5, 6, 8, 9 and 10 will apply. |
| 4.2.1 | The reusable material comprises of topsoil and is to be stacked as specified below in clause 4.9 |
| 4.2.3 | Use of masonry units is not permitted. |
| **4.4** | **Disposal of material** |
| 4.4.1 | Materials from clearing and grubbing operations are to be disposed of at a disposal site accepted by the *Project Manager*. Disposal certificates are required to be kept on record by the *Contractor*. |
| 4.4.1 | Combustible material is required to be disposed of as follows:  Cleared combustible material is to be taken to an accepted waste disposal site.  Disposal certificates are to be kept on record by the *Contractor*. |
| 4.4.4 | The material which is to be reused is to be stacked at a site proposed by the *Contractor* which is accepted by the *Project Manager*. |
| **4.9** | **Conservation of topsoil** |
| 4.9 | Topsoil together with grass and other suitable vegetation are to be removed and placed in stock piles not higher than 1.5m |
| **Variations** | |
| Cl 4.9 | Add the following  Topsoil stripping is to be scheduled for the dry season, as far as possible. |
| Cl 4.9 | Add the following  Topsoil is handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify. |

#### Earthworks (General)

The following codes are required to be complied to:

* SANS 2001 BE1: Earthworks (General)
* SANS 1200 D: Earthworks (Only Clause 8 – Measurement and Payment)
* SANS 1921-5: Construction and management requirements for works contracts, Part 5: Earthworks activities which are to be performed by hand

The table below indicates particular specifications pertaining to SANS 2001-BE1 and must be read in conjunction with the code.

| **Clause** | **Particular Specification** |
| --- | --- |
| **3.1** | **Classification for Excavation Purposes** |
| 3.1 | This Sub-Clause is deleted and the following classifications of material applies:  Hard Material  Material which cannot be excavated except by drilling and blasting, or with the use of pneumatic tools or mechanical breakers and; boulders exceeding 0,1m3 are to be classified as hard material. Where more than 40% of any material (by volume) consists of boulders each exceeding 0,1m3 in size, the material is classified as hard material.  Soft Material  All material not classified as hard material is classified as soft material  NOTE: Should the *Contractor* consider that any material to be excavated can only be removed by explosives, he is required to submit a written request to the *Project Manager* for his ruling. Failing such a request, the excavations are deemed to be in soft material.  The decision of the *Project Manager* as to the classification of the material is final and binding and any objection to the classification is to be made in writing before the excavations have been backfilled. |
| 4.1.5.1 | Topsoil is conserved |
| 4.2.2.1.3 | Sides off excavations are not used as formwork |

#### Concrete Works (Structural)

The following codes are required to be complied to:

* SANS 2001 CC1: Concrete Works (Structural)
* SANS 1200 G: Concrete (Structural) (Only Clause 8 – Measurement and Payment)

The table below indicates particular specifications pertaining to SANS 2001-CC1 and must be read in conjunction with the code.

| **Clause** | **Particular Specification** |
| --- | --- |
| **4.2** | **Materials** |
| 4.2.1 | Cementitious binders |
| 4.2.1.1 | Cement is to comply with the relevant requirements of CEM1-42.5N, Ordinary Portland Cement in accordance with SANS 50197 |
| 4.2.3 | Aggregates |
| 4.2.3.1 (b) | The coarse aggregate nominal size is to be specified as follows:  Cover to rebar < 25 mm – 13.2 mm diameter  Cover to rebar >= 25 mm – 19 mm diameter |
| 4.2.3.4 | Plums are not permitted |
| * 4.2.3.5 | * The following tests are required:  1. drying shrinkage on fine and coarse aggregates; 2. drying shrinkage of concrete; 3. flakiness index of the stone; 4. alkali-aggregate reaction. |
| 4.2.4 | Admixtures, air-entrainment agents and curing agents |
| 4.2.4.1 | The use of admixtures is permitted, provided that the results of trial tests which demonstrate their suitability and the following are made available:   1. The trade name of the admixture, its source and the manufacturers’ recommended method of use. 2. Typical dosages and possible detrimental effects of under and over doses. 3. Whether compounds are likely to cause corrosion of the reinforcement or deterioration of the concrete. 4. The average expected air content of freshly mixed concrete containing an admixture that causes air to be entrained when the admixture is used at the manufacturer’s recommended dose. |
| 4.2.6 | Grade of concrete |
| 4.2.6 | The grade of concrete is required to be as follows, unless otherwise stated on the Drawings.   1. Class 15 MPa/ 19 mm for Blinding/Mass Concrete (28 days), 2. Class 35 MPa/ 19 mm for Structural Concrete (28 days). 3. Class 35 MPa/ 13.2 mm for Screed/Topping |
| 4.2.7 | In general, one of the following types of non-shrink grout are required to be used:   1. Cement-based non-shrink grout, not less than 50 MPa; 2. Special proprietary non-shrink or expansive grout, not less than 50 MPa. |
| **4.3** | **Formwork** |
| 4.3.1 | General |
| 4.3.1.5 | Earth cuts may not be used as forms for vertical surfaces |
| 4.3.1.8 | The formed surfaces are as follows:   1. Foundations (below 150 mm from finished floor level) – Rough finish is acceptable. 2. All concrete from 150 mm below finished floor level which receives an additional finish – Smooth finish is required 3. Off-shutter exposed concrete (not receiving any further finishes) – Smooth special finish is required. |
| **4.4** | **Reinforcement** |
| 4.4 | * Add the following:  1. All reinforcement is stamped with a SANS quality assurance mark |
| 4.4.1.3 | Bars may not be hot bent |
| 4.4.2.2 | Welding of bars is not permitted |
| 4.4.3 | Cover |
| 4.4.3.1 | Cast in-situ concrete cover is required to be:   1. 50 mm or as shown on the Drawings |
| **4.5** | **Holes, chases and fixing bolts** |
| 4.5.1 | Fixtures to be embedded in the concrete are attached as shown on the Drawings. |
| **4.6** | **Embedded items** |
| 4.6.3 | Pipes, conduits and ducts |
| 4.6.2.1 | The type and location of pipes are as specified on the Drawings. |
| **4.7** | **Quality of Concrete** |
| 4.7.1.1 | 1. *Contractor* submits to the *Project Manager* full details and samples of all materials which he proposes to use for making concrete at least 28 days before the concreting of the works is due to commence. |
| 4.7.3.2 | Pumping of concrete is permitted. |
| 4.7.4 | Chloride and sulphate content |
| 4.7.4.1 | Efflorescence on exposed concrete surfaces is not permitted |
| 4.7.6 | Prescribed-mix concrete |
| 4.7.6.1 | The mix proportions for the prescribed mix are as determined by the *Contractor* for the required grade based on test results using the cement, fine and coarse aggregate available. Mix designs and the mix test results are to be submitted to the *Project Manager* for acceptance prior to the commencement of work on site. |
| 4.7.10 | * Add the following: * A layer of blinding concrete of 50 mm minimum thickness is required to be placed under foundations, sumps and trenches * A polyethylene sheet with a minimum thickness of 375 microns is required under ground slabs |
| 4.7.10 | Placing |
| 4.7.10.11 | Plums are not permitted. |
| 4.7.10.15 | Pumping of concrete is permitted. |
| 4.7.12 | Joints |
| 4.7.12.1 | Construction joints |
| 4.7.12.1.1 | Construction joints are not permitted, unless where shown on the Drawings. |
| 4.7.12.2.3 | All angled corners are chamfered 25 mm x 25 mm, unless such other larger size is detailed on the Drawings. |
| 4.7.12.1.4 | Where construction joints are shown on the Drawing, the follow is required:   * Proprietary bonding compounds between old and new concrete is permitted. |
| 4.7.12.4 | Sealing of joints |
| 4.7.12.4 | Joints are sealed as shown on the Drawings. |
| 4.7.19.3 | * *Contractor* submits a detailed procedure for acceptance by the *Project Manager* on how he intends to carry out the repairs of structural concrete defects |
| 4.7.22 | * For concrete pour records, the *Contractor* submits a detailed Quality Control Plan to the *Project Manager* for acceptance. * In addition the *Contractor* supplies the *Project Manager* with two copies of these records each day covering works carried out the preceding day. |
| **5.1** | **Testing** |
| 5.1.1.4 | * Six 150 mm cube samples taken from each batch or place of concrete deposition, three cubes are tested at 7 days and three at 28 days. * Strength at 7 days is required to be at least two thirds of 28 day strength. |
| 5.1.1.8 | The test for the percentage of alkali-aggregate is to be ASTM C289 – Potential reactivity of aggregate (chemical method) or alternative method accepted by the *Project Manager*. |
| * 5.1.3.3 | * Add the following: * …, unless no more than three batches of concrete is being mixed. |
| **5.2** | **Tolerances** |
| 5.2.1.1 | * Tolerances on all concrete work is required to be a level II degree of accuracy as specified in SANS 2001-CC1 with and is to be carefully maintained throughout the construction. |
| Table 11 | Add the following under “Location of holding-down bolts”:   * 3) The permissible deviation between any two bolts that share the same base-plate is limited to 2mm for bolt sizes up to and including M24, and 3mm for bolts larger than M24 |
| **Variations** | |
| Cl 4.7.8.2 | * Add the following: * Should “ready-mixed” concrete be used, the uninterrupted supply of the correct volume to Site should be guaranteed. |
| Cl 4.7.8.2 | * Add the following: * The *Project Manager* may permit production of concrete at a central production facility other than on the Site of construction and reserves the right to inspect for acceptance of these central production facilities. The *Contractor* is responsible for conducting all control testing. |
| 4.7.10 | * Add the following: * Concrete may not be placed before the *Project Manager’s* acceptance has been given in writing and a minimum written notice period of 24 hours prior to pouring is required for each part of the structure. |
| CL 4.7.12.1.1 | Add the following:  Joint positions are in accordance with the drawings or as authorised in writing by the *Project Manager*. |

#### Additional Requirements and Specifications

* All concrete work is required to be in accordance with SANS 2001-CC1 and SANS 10100-2 unless otherwise stated.
* All concrete surfaces and cast-in items is required to be inspected and accepted by the *Project Manager* in writing before casting of concrete may commence.
* The *Contractor* is required to obtain written acceptance from the Project Manager for the use of any add-mixture or the use off ready mixed concrete, to pump concrete, or to use cement or cement blends other than Ordinary Portland Cement (OPC)
* Compaction of concrete is required to be done by means of mechanical vibrators only.
* 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.
* All concrete is required to have a maximum water/cement ratio of 0.45 with a minimum cement content of 420 kg/m3
* 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.

#### Structural Steelwork

The following codes are required to be complied to:

* SANS 2001 CS1: Structural Steelwork
* SANS 1200 H: Structural Steelwork (Only Clause 8 – Measurement and Payment)
* SANS 10162-1: The structural use of steel
* SANS 50025-2: Hot rolled products of structural steels – Part 2- Technical delivery conditions for non-alloy structural steels
* SANS 1700: Fasteners
* BS EN 10210-2: Hot Finished Structural Hollow Sections of Non-Alloy and Fine Grain Structural Steels

The table below indicates particular specifications pertaining to SANS 2001-CS1 and must be read in conjunction with the code.

| **Clause** | **Particular Specification** |
| --- | --- |
| **4.1** | **Materials** |
| 4.11 | Add the following:   * All structural steelwork is required to be grade S355JR |
| 4.1.4.1 | * Electrodes for electric welding are required to be E7018 |
| 4.1.5.1 | * Ordinary bolts to be grade 8.8 with class 8 nuts, as a minimum |
| **4.2** | **Drawings** |
| 4.2.4 | Fabrication drawings (shop detailing) |
| 4.2.4 | The following clause is added:  “Fabrication drawings are to be prepared by the *Contractor*. These are issued to the *Project Manager* for acceptance in the form of two paper prints and in “PDF” electronic format. The *Contractor* may not commence with fabrication until written acceptance from the *Project Manager* is received.” |
| 4.2.4.2 | Attachments to facilitate erections may not remain as part of the permanent structure. |
| 4.2.4.7 | Connections to allow movements are as shown on the Drawings. |
| **4.3** | **Workmanship (General)** |
| 4.3.6 | Holing |
| 4.3.6 | The following clause is added:  “Flame cutting of holes is not permitted.” |
| **4.6** | **Workmanship - Erection** |
| 4.6.5 | * On site welding is not permitted |
| **5.3** | **Non-destructive testing of welds** |
| 5.3.3 | * Fillet welds are required to undergo magnetic particle inspection (20 % of welds) |
| 5.3.4 | * All butt welds and full penetration welds are required to undergo ultrasonic non-destructive testing (100 % of welds) |
| **Variations** | |
| Cl 5.2 | Add the following:  Properly documented evidence of previous qualification of welders are acceptable. |
| **Additional Clauses** | |
| 1 | All materials are to be new and as specified in this document and on the relevant Drawings. |
| 2 | Materials not listed in this specification or on the relevant Drawings are not permitted. |
| 3 | In the event of any specified steel not being available, the *Contractor* advises the *Project* *Manager* in writing. The *Project* *Manager* is to reply in writing on alternative materials and / or sections. |

##### Additional Requirements and Specifications

* All dimensions are required to be verified on site by the *Contractor* before any fabrication of steelwork commences.
* All welding is required to be conducted by coded welders. Supporting documentation is also required to be submitted to the *Project Manager* for acceptance. All welding is required to comply with AWS D1.1 and 240-106628253 - Standard for Welding Requirements on Eskom Plant.
* All welds are required to be inspected using visual aids.
* The *Contractor* is required to supply all bolts, washers, nuts etc. for the structural steelwork.
* Welded connections are required to be welded all around with a minimum of 6 mm fillet welds unless otherwise stated on the Drawings. Butt welds are required to be full penetration welds.

##### Structural Steelwork (Sundry Items)

The following codes are required to be complied to:

* SANS 1200 HA: Structural steelwork (sundry items)

The table below indicates particular specifications pertaining to SANS 1200 HA and must be read in conjunction with the code.

| **Clause** | **Specification Data** |
| --- | --- |
| **Variations** | |
| Cl 5.1.2 | Add the following:  The said shop details and other drawings are to be submitted in duplicate to the *Project Manager* for acceptance at least 10 working days prior to fabrication. |
| Cl 5.2.10 | Add the following:  Where no corrosion protection system is specified, open grid flooring is to be hot dipped galvanised. |
| Cl 7.1 | Add the following:  Test certificates and cast analysis certificates are to be supplied to the *Project Manager* by the *Contractor*. |

#### Corrosion Protection of Structural Steel

The following codes are required to be complied to:

* SANS 1200 HC: Corrosion Protection of Structural Steel
* 240-106365693: Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings
* SANS 10064: The preparation of steel surfaces for coating
* SANS 121: Hot dip galvanized coatings on fabricated iron and steel articles

The table below indicates particular specifications pertaining to SANS 1200 HC and must be read in conjunction with the code.

| **Clause** | **Specification Data** |
| --- | --- |
| **Variations** | |
| * Cl 5.3 | * Add the following: * All burrs and sharp areas are to be removed by: * Chamfering or * Ground to a smooth radius of at least 1mm. |
| * Cl 5.4.1 | * Add the following: * The method of cleaning and preparing the substrate of steelwork prior to the application of the coating system is to be in accordance with the applicable provisions of SANS 10064 |
| Cl 5.4.3.1. b) | * Add the following: * Dry abrasive blast cleaning: * Blast cleaning media is not recycled. * Wet abrasive blast cleaning * Wet abrasive blast cleaning is to be carried out as indicated on the Drawing. |
| * Cl 5.7 | * Add the following: * The coating system is to be hot-dip galvanising which is carried out in accordance with SANS 121:2011. |

#### Earthworks for Buried Pipelines & Prefabricated Culverts

The following code are required to be complied to:

* SANS 2001 DP1: Earthworks for buried pipelines & prefabricated culverts

The table below indicates particular specifications pertaining to SANS 2001 DP1 and must be read in conjunction with the code.

|  |  |
| --- | --- |
| **Clause** | **Specification Data** |
| 4.2.6.2 | The requirements of 4.2.6.2 shall apply to the subsoil pipes and outlet pipes. |
| **Additional Clauses** | |
| 1 | Construction, measurement and payment is to be in accordance with SANS 1200 LB. |

#### Stormwater drainage

The following codes are required to be complied to:

* SANS 1200 DK: Gabions and Pitching.
* SANS 2001 DP5: Stormwater Drainage
* SANS 1200 LE: Stormwater Drainage (Only Clause 8 – Measurement and Payment)

The table below indicates particular specifications pertaining to SANS 2001 DP5 and must be read in conjunction with the code.

| **Clause** | **Particular Specification** |
| --- | --- |
| **4.1** | **Materials** |
| 5.3.1 | Stormwater drainage, including manholes, is to be tested in accordance with the requirements of SANS 2001-DP4.  The following tests are to be carried out:  a) a water test;  c) Water drop down test.  Visual internal inspection is required. |

#### Roads (General)

The SANS 1200 M: Roads (General) shall be complied with for the gravel road *works*.

#### Electrical Works

The *Contractor* applies the requirements of the Generation Plant General Electrical Specification (474-11542), as applicable to the *Contractor’s* scope of work, when executing the Works.

# Drawings Issued by the *Employer*

Refer to: Drawings Issued by the *Employer*

# Authorisation

This document has been seen and accepted by:

| Name | Designation |
| --- | --- |
| Devan Reddy | Gx – Civil |
| Pat Mnguni | KET – Civil TL |
| Mduduzi Zulu | KET – BMH |
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# Revisions

| Date | Rev. | Compiler | Remarks |
| --- | --- | --- | --- |
| December 2021 | 0.1 | N Tshabalala | Draft Document |
| May 2023 | 1.0 | N Tshabalala | Approval |

# Development Team

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

* Nhlanhla Tshabalala
* Richie Sibiya
* Tiyani Malwandla
* Preshen Moodley
* Devan Reddy
* Vusi Lubisi
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# Acknowledgements

* N/A

1. : Drawings Issued by the *Employer*

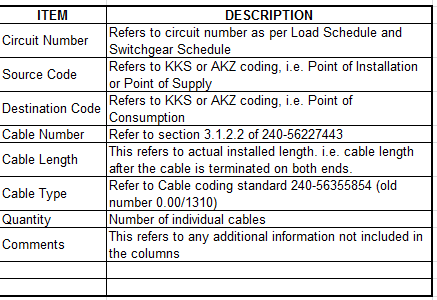
Table 4: Radial Stacker (Transfer House 9) Drawings

|  |  |  |  |
| --- | --- | --- | --- |
| **Document Number** | **Document Title** | **Revision** | **Status** |
| 366-246864 | Radial Stacker Slab Upgrade – Detailed Design Report | 3 | For Tender |
| 366-389543 Sheet 1 | Piping & Instrumentation Diagram – Radial Stacker Drainage | 0 | For Tender |
| 366-238306 | Radial Stacker Upgrade - General Arrangement | 1 | For tender |
| 366-238312 | Radial Stacker Upgrade – East Settling Tank - General Arrangement | 1 | For tender |
| 366-238313 | Radial Stacker Upgrade – East Settling Tank - Plan & Sections | 1 | For tender |
| 366-238314 | Radial Stacker Upgrade – East Settling Tank – Inlet Channel Details & Typical Sections | 1 | For tender |
| 366-238315 | Radial Stacker Upgrade – East Settling Tank – Subsoil Drainage, Floor & Wall Joint Plan | 1 | For tender |
| 366-238316 | Radial Stacker Upgrade – East Settling Tank – Spillway Layout & Typical Sections | 0 | For tender |
| 366-238325 | Radial Stacker Upgrade – East Settling Tank – New Access Gravel Road | 1 | For tender |
| 366-238326 | Radial Stacker Upgrade – East Settling Tank – Subsoil Drainage Outlet Pipe | 1 | For tender |
| 366-238327 | Radial Stacker Upgrade – East Settling Tank – Pipe Culvert Under Ash Dump Access Road | 1 | For tender |
| 366-238329 | Radial Stacker Upgrade – East Settling Tank – Delivery Pump Station Layout & Details | 1 | For tender |
| 366-238330 | Radial Stacker Upgrade – East Settling Tank – Delivery Pump Station Sections & Details | 1 | For tender |
| 366-238331 | Radial Stacker Upgrade – East Settling Tank & Sluice Gate – Typical Sections & Details | 1 | For tender |
| 366-238332 | Radial Stacker Upgrade – Radial Stacker Slab – General Site Plan | 1 | For tender |
| 366-238333 | Radial Stacker Upgrade – Radial Stacker Slab Sluice Gates - Plan & Typical Sections | 1 | For tender |
| 366-238334 | Radial Stacker Upgrade – North Access Ramp - Plan & Typical Sections | 1 | For tender |
| 366-238335 | Radial Stacker Upgrade – South Access Ramp - Plan & Typical Sections | 1 | For tender |
| 366-238328 | 2018 Radial Stacker Upgrade - East Settling Tank 300nb Overland Piping Plan and Long Section | 0 | For tender |
| 366-238337 | 2018 Radial Stacker Upgrade - East Settling Tank Thrust Anchor Block Setting Out Arrangement | 0 | For tender |
| 366-262850 | 2018 Radial Stacker Upgrade - East Settling Tank  Jib Crane Base Concrete and Reinforcement Details | 2 | For tender |
| 0.90/39236 | Terrace- Ash Handling Overland Link Conveyors-1350 Belt OLC1 & OLC2-Civil Outlines-Sheet 2 | 1 | Information only |
| 0.90/45883 | Terrace- Ash Handling Overland Link Conveyors-1350 Belt OLC1 & OLC2-Tail End & Graded Section | 1 | Information only |
| 366-391267 | Radial Stacker LPS Load List | 0 | For Tender |
| 366-393316 | Equipment List – Radial Stacker Drainage | 00 | For Tender |
| 366-393317 | Instrument List - Radial Stacker Drainage | 00 | For Tender |
| 366-393318 | Pipeline List - Radial Stacker Drainage | 00 | For Tender |
| 366-393319 | Valve List – Radial Stacker Drainage | 00 | For Tender |

Table 5: Overland Link Conveyor 1&2 Drawings

|  |  |  |  |
| --- | --- | --- | --- |
| **Document Number** | **Document Title** | **Revision** | **Status** |
| 0.00/2901 | Standard Stair and Handrail Details | 9 | Information only |
| 366-395476 sheet 1 of 1 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – General Arrangement | 0 | For tender |
| 366-395477 sheet 1 of 1 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – Sections and Details | 0 | For tender |
| 366-395478 sheet 1 of 2 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – Sump Concrete Layout | 0 | For tender |
| 366-395478 sheet 2 of 2 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – Sump Concrete Sections and Details | 0 | For tender |
| 366-395479 sheet 1 of 2 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – Sump Reinforcement Layout | 0 | For tender |
| 366-395479 sheet 2 of 2 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – Sump Reinforcement Sections and Details | 0 | For tender |
| 366-395480 sheet 1 of 2 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – Sump Crawl Beam Steel Layout | 0 | For tender |
| 366-395480 sheet 2 of 2 | Kusile Power Station – Overland link Conveyor 1& 2 Drainage – Sump Crawl Beam Steel Sections and Details | 0 | For tender |
| 366-389544 Sheet 1 | Piping & Instrumentation Diagram - Overland Conveyor Drainage | 0 | For Tender |
| 366-390764 | OLC LPS Load List | 01 | For Tender |
| 366-392406 | Equipment List – OLC Drainage | 00 | For Tender |
| 366-392407 | Instrument List - OLC Drainage | 00 | For Tender |
| 366-392408 | Pipeline List - OLC Drainage | 00 | For Tender |
| 366-392409 | Valve List - OLC Drainage | 00 | For Tender |
| 0.90/39236 | Terrace- Ash Handling Overland Link Conveyors-1350 Belt OLC1 & OLC2-Civil Outlines-Sheet 2 | 1 | Information only |
| 0.90/45883 | Terrace- Ash Handling Overland Link Conveyors-1350 Belt OLC1 & OLC2-Tail End & Graded Section | 1 | Information only |

1. : Electrical Power Cable Schedule



1. : Eskom Standards And Guidelines

Table 7: Eskom Standards and Guidelines

|  |  |
| --- | --- |
| **Code** | **Description** |
| SANS 60794-1-1 | Optical Fibre Cables Part 1-1: Generic Specification – General |
| SANS 61312 | Protection Against Lightning Electromagnetic Pulse |
| IEC 62381 | Automation Systems in the Process Industry – Factory Acceptance Test (FAT), Site Acceptance Test (SAT), and Site Integration Test (SIT) |
| IEC 62382 | Electrical and Instrumentation Loop Checks |
| VGB B 105e | KKS Identification System for Power Stations |
| VGB B 106e | KKS Application Explanations |
| SANS 60529 | Degrees of Protection Provided by Enclosures (IP Code) |
| SANS 10142-1 | The Wiring of Premises – Low Voltage Installations |
| 240-56355731 | Environmental Conditions for Process Control Equipment Used at Power Stations Standard |
| 240-56355541 | Control System Computer Equipment Habitat Requirements Guideline |
| 240-56355754 | Field Instrument Installation Standard: Field Installation Requirements |
| 240-56355815 | Field Instrument Installation Standard: Junction Boxes and Cable Termination |
| 240-56227443 | Requirements for Control and Power Cables for Power Stations |
| 240-56356396 | Earthing and Lightning Protection Standard |
| 240-55714363 | Coal Fired Power Stations Lighting and Small Power Installation Standard |
| 200-11757 | Earthing and Lightning Protection Concept |
| 240-52844017 | System Reliability, Availability and Maintainability Analysis |
| SPF 200-4190 | The Application of KKS Plant Coding Standard |
| 240-128515850 | Documentation Handover Specification. |
| 203-79326 | Kusile Engineering Change Management Work Instruction |
| 240-53113685 | Design Review Procedure |
| 240-71432150 | KKS Plant Labelling and Equipment Descriptions Standard |
| 240-86973501 | Engineering Drawing Standards – Common Requirements |
| 240-54179170 | Technical Documentation Classification and Designation Standard |
| 240-76992014 | Project / Plant Specific Technical Documents and Records Management Work Instruction |
| 240-53114186 | Project / Plant Specific Technical Documents and Records Management Procedure |
| 240-109607332 | Abbreviation Standard for Labelling of Plant at Power Stations |
| 240-93576498 | Eskom KKS Standard |
| PGZ 45-25 | Eskom FMECA Guideline |
| SANS 10143 | Building Drawing Practice |
| IEC 61355– 1:2008 | Classification and designation of documents for plants, systems and equipment – Part 1 |
| [VGB-B 105 e](https://www.vgb.org/vgbmultimedia/VGB_B+105+e+Content-p-4407.pdf) | KKS Power Plant Classification (B105e) 5th Edition 2003 Published by Verlag VGB PowerTech Service GmbH (Essen) |
| ISO 10007(2nd Edition) | Quality management — Guidelines for configuration management |
| 240-56364537 | Design of Steel Structures |
| 240-56364545 | Structural Design and Engineering Standard |
| 240-57127953 | Execution of Site Preparation and earthworks |
| 240-57127955 | Geotechnical and Foundation engineering standard |
| 240-84418186 | Roads Specification Manual |
| 240-85549846 | Standard for Design of Drainage and Sewerage Infrastructure |
| 240-91244751 | Specification for Geotechnical Investigations Standard |
| 240-92460850 | Geotechnical Standard for CSY and ADF Site Investigation |
| DIN 4024 PART 1 | Machine foundations, flexible structures that support machines with rotating elements |
| DIN 4024 PART 2 | Machine foundations, rigid foundation for machinery with periodic excitation |
| SABS 471/ SANS 50413 & SANS 50196 | Portland cement (ordinary, rapid hardening and sulphate resisting) |
| SANS 10100-1 | Structural use of concrete |
| SANS 10160 | Basis of structural design |
| SANS 10161 | Design of foundations for buildings |
| SANS 10162 | The structural use of steel |
| SANS 1024 | Welded Steel Fabric for Reinforcement of Concrete |
| SANS 10400 | The Application of the National Building Regulations |
| SANS 10409 | Design, Selection and Installation of Geomembranes |
| SANS 1083 | Aggregates from natural sources - Aggregates for concrete |
| SANS 121:2011 | Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods |
| SANS 1526 | Thermoplastics Sheeting for use as a Geomembrane |
| SANS 1700 | Fasteners |
| SANS 1921-3 | Construction and management requirements for works contracts, Part 3: Structural steelwork |
| SANS 2001-BE1 | Construction works Part BE1: Earthworks (general) |
| SANS 2001-BS1 | Construction works Part BS1: Site clearance |
| SANS 2001-CC1 | Construction works Part CC1: Concrete works (structural) |
| SANS 2001-CC2 | Construction works Part CC1: Concrete works (minor works) |
| SANS 2001-CS1 | Structural Steelwork |
| SANS 50196 Series | Methods of testing cement |
| SANS 50197-1 | Cement Part 1: Composition, specifications and conformity criteria for common cements |
| SANS 50197-2 | Cement Part 2: Conformity evaluation |
| SANS 5831 | Presence of chlorides in aggregates |
| SANS 5861-2 | Concrete tests - Sampling of freshly mixed concrete |
| SANS 5862-1 | Concrete tests - Consistence of freshly mixed concrete - Slump test |
| SANS 5863 | Concrete tests - Compressive strength of hardened concrete |
| SANS 5864 | Concrete tests - Compressive strength of hardened concrete |
| SSZ\_45-17 | Corrosion Protection of Medupi Power Station Corrosion Protection Specification |
| SANS 1921-3:2004 | Construction and management requirements for works contracts, Part 3: Structural steelwork |
| SANS1921-5 | Construction and Management of works contracts: Part 5,Earthworks activities to be done by hand |
| The National Water Act (Act No. 36 of 1998) | The National Water Act (Act No. 36 of 1998) |
| 240-106365693 | Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings |
| COLTO Green Book | Standard Specification for Road and Bridge Works 1998 |
| 203-770 | Kusile specification for structural concrete works |
| CR 2014 | Construction Regulations 2014 |
| SANS 50025-2 | Hot rolled products of structural steels – Part 2- Technical delivery conditions for non-alloy structural steels |
| 240-145581571 | Piping shall be identified as per 240-145581571, Standard for Identification of the Contents of Pipelines and Vessels |
| 240-56356376 | On-Site Commissioning for Low Pressure Systems Standard |
| 240-105020315 | Standard for Low Pressure Valves |
| 240-123801640 | Specification for Low Pressure Pipelines Standard |
| 240-105020315 | Standard for Low Pressure Valves |
| 240-108079430 | Power Plant Water Systems Design Guideline |
| 240-89147446 | Instrument Piping for Fossil, Hydro, Renewable and Aero- Derivative Power Plants Standard |
| 240-106365693 | Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings |
| 240-101712128 | Standard for the Internal Corrosion Protection of Water Systems, Chemical Tanks and Vessels and Associated Piping with Linings |
| SANS 1123 | Pipe Flanges |
| SANS 719: 2011 | Electric welded low carbon steel pipes for aqueous fluids (large bore) |
| SANS 62-1 | Steel Pipes Part 1: Pipes suitable for threading and of nominal size not exceeding 150 mm |
| SANS 719 | Electric welded carbon steel pipes for aqueous fluids (large bore) |
| SANS 4427-2 | Plastic piping systems-Polyethylene (PE) pipes and fittings for water supply. Part 2: Pipes |
| SANS 4427-3 | Plastic piping systems-Polyethylene (PE) pipes and fittings for water supply |
| ASME B31.3 | Process Piping |
| 240-145581571 | Standard for Identification of the Contents of Pipelines and Vessels |
| 240-86973501 | Engineering drawing Standard |
| 240-56356396 | Eskom Earthing and Lightning Protection standard |
| 240-66920003 | Documentation Management Review and Handover Procedure for Gx Coal Projects |
| 240-76992014 | Project / Plant Specific Technical Documents and Records Management Work Instruction |
| 7.1/PR/03 | Camden Power Station KKS and Labelling Specification |
| SANS 10142-1 | The wiring of premises Part 1: Low-voltage installations |
| SANS 10198 Series | The selection, handling and installation of electric power cables of rating not exceeding 33 kV |
| NMP 45-7 | Application of KKS Plant Coding |
| N.PSZ 45-45 | KKS Key Part Fossil Power Station |
| Alpha KKS 01 Rev 2 | KKS Plant Labelling and Descriptions Standard |
| 240-56356411 | Fire Barrier Seals for Electrical Cable Installations |
| SABS 471/ SANS 50413 & SANS 50196 | Portland cement (ordinary, rapid hardening and sulphate resisting) |
| SANS 50196 Series | Methods of testing cement |
| SANS 50197-1 | Cement Part 1: Composition, specifications and conformity criteria for common cements |
| SANS 50197-2 | Cement Part 2: Conformity evaluation |
| SANS 1083 | Aggregates from natural sources - Aggregates for concrete |
| SANS 2001-BE1 | Construction works Part BE1: Earthworks (general) |
| SANS 2001-BS1 | Construction works Part BS1: Site clearance |
| SANS 2001-CC1 | Construction works Part CC1: Concrete works (structural) |
| SANS 2001-CC2 | Construction works Part CC1: Concrete works (minor works) |
| SANS 2001-CS1 | Construction works Part CS1: Structural steelwork |
| SANS 2001-DP5 | Construction works Part DP5: Stormwater drainage |
| SANS 1200 A | Standardized specification for civil engineering construction Section A: General |
| SANS 1200 D | Standardized specification for civil engineering construction Section D: Earthworks |
| SANS 1200 HC | Standardized specification for civil engineering construction Section HC: Corrosion protection of structural steelwork |
| SANS 1200 M | Standardized specification for civil engineering construction Section M: Roads (general) |
| SANS 1200 ME | Standardized specification for civil engineering construction Section ME: Subbase |
| SANS 1200 MF | Standardized specification for civil engineering construction Section MF: Base |
| SANS 5831 | Presence of chlorides in aggregates |
| SANS 5861-2 | Concrete tests - Sampling of freshly mixed concrete |
| SANS 5862-1 | Concrete tests - Consistence of freshly mixed concrete - Slump test |
| SANS 5863 | Concrete tests - Compressive strength of hardened concrete |
| SANS 5864 | Concrete tests - Compressive strength of hardened concrete |
| The most current edition of the ASME Code for Pressure Piping, B31.3, Process Piping, including all addenda thereto | Materials for piping and application of piping materials |
| ASME B36.10M | Sizes, schedule numbers, and dimensions of carbon steel and alloy steel pipe, and stainless steel pipe schedules not covered by ANSI B36.19M |
| ASTM A530 | Wall thickness tolerances for carbon steel and alloy steel pipe |
| ANSI/AWWA C151/A21.51 | Manufacturing standard for mechanical joint and push-on joint ductile iron pipe |
| ANSI/AWWA C115/A21.15 | Manufacturing standard for flanged ductile iron pipe |
| ASME B16.9 and ASME B16.28 | Butt weld fitting manufacturing standard |
| ASME B16.11 | Socket-weld and threaded forged steel fittings manufacturing standard and minimum pressure class ratings |
| In accordance with Technical Supplemental Specification Q400 | Steel castings for pipe system components |
| ASME B16.1, Class 125 | Cast iron fittings for use with plastic lined or rubber lined pipe |
| ANSI/AWWA C110/A21.10 | Ductile iron fittings for use with plastic lined or rubber lined pipe |
| EN 288 | Welding specification |
| BS 2971 | Class II welding |
| Paragraph 104.3 of ANSI/ASME B31.1 | Welding adapters |
| JIS B 2311-82 | Mild steel pipe fittings |
| ASME B16.1 | Manufacturing standard for cast iron fittings for use with lined steel pipe |
| ANSI/AWWA C110/A21.10 | Manufacturing standard for ductile iron fittings for use with lined steel pipe |
| ANSI/AWWA C153/A21.53 | Manufacturing standard for cast iron and ductile iron flanged fittings |
| ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.1 | Manufacturing standards for mechanical joint and push-on joint ductile iron and cast iron fittings |
| ANSI/AWWA C153/A21.53 | Petroleum asphaltic coatings for cast iron and ductile iron pipe fittings |
| ANSI/AWWA C104/A21.4 | Cement linings for cast iron and ductile iron pipe fittings |
| ASME B16.22 | Braze joint fittings for use with copper tubing |
| ASME B16.5 | Steel flange construction requirements |
| ANSI/AWWA C115/A21.15 | Cast iron and ductile iron flange construction requirements |
| ASME B16.21 | Compressed fibre gaskets and rubber gaskets |
| ASME B16.20 | Ring joint gaskets |
| ASME B16.5 | Flange bolting requirements - alloy steel bolting |
| ASME B16.1 | Flange bolting requirements - carbon steel bolting |
| ASME B18.2.1 and ASME B18.2.2 | Carbon steel bolting dimensional standards |
| PFI Standard ES-5, Articles 4.2.1 and 4.2.2 | Cleaning interior surface of carbon steel pipe |
| PFI Standard ES-29 (sand or silica bearing blasting materials are not allowed) | Abrasive shot blast cleaning |
| No. 85 of 1993 | Occupational Health and Safety Act |
| Pressure Equipment Regulations | Pressure Equipment |
| SANS 14 | Cast iron fittings threaded to ISO 7-1 |
| SANS 62 | Steel Pipe up to 150 NB |
| SANS 121 | Hot Dip Galvanised Coatings on Fabricated Iron and Steel Articles Specification and Test Method |
| SANS 191 | Cast Steel Gate Valves |
| SANS 394 | Radiographic Examination |
| SANS 664 | Cast Iron Gate Valves for Waterworks |
| SANS 665 | Cast Iron Gate Valves for General Purpose |
| SANS 719 | Electric welded low carbon steel pipe 200 NB and above |
| SANS 1056-2 | Ball Valves Part 2: Heavy Duty Valves (Not fire-safe) |
| SANS 1056-3 | Ball Valves Part 3: Light Duty Valves (Not fire-safe) |
| SANS 1109 | Pipe Threads Where Pressure Tight Joints are Made on the Threads |
| SANS 1123 | Steel Pipe Flanges |
| SANS 1186 | Symbolic Safety Signs |
| SANS 1551 | Check Valves |
| SANS 1700 | Fasteners |
| SANS 1808-31 | Water Supply & Distribution System Components Part 31: Automatic Control Valves |
| SANS 1849 | Butterfly Valves for General Purpose |

1. : Vendor Document Submittal Schedule

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

1. : Master Document List

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Kusile Power Station | | | | | | | | | | | | | |
| **DRAWINGS AND SPECIFICATION SCHEDULE** | | | | | | | | | | | | | | |
| **Contractor 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** | **Document status** |

1. : Documentation Requirements After 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 |
| **Final System**  **Design Package** | **2C** | **2.38** | Functional Descriptions (Control) |
| **2A** | **2.39** | Alarm Response Procedures |
| **2C** | **2.40** | Control System Functional Specification/Design |
| **2B, 2C, 2D, 2E, 2F** | **2.41** | Design Philosophy |
| **2A** | **2.42** | Material, Mass & Energy Balance Diagrams |
| **2C** | **2.43** | Control System IT Architecture |
| **2C** | **2.44** | Plant Protection Logics |
| **2B** | **2.45** | Safety Studies |
| **2B** | **2.47** | Plant System/Process Description |
|  |  | Technical Tender Evaluation Reports |
|  |  | Functional Descriptions (Control) |
| **Operating and Maintenance Documentation** | **3.6** | **3.6** | Maintenance Instructions |
| **3.7** | **3.7** | Operating Instructions |
| **3.8** | **3.8** | Commissioning/Shutdown Procedures |
| **3.9** | **3.9** | Storage and Handling Instructions |
| **3.10** | **3.10** | Installation, Operating & Maintenance Manuals (IOM's) |
| **3.11** | **3.11** | Datasheets and Product Brochures |
| **3.12** | **3.12** | Licences & Approvals (Regulatory, Statutory) |
| **Commissioning Documentation** | **4.1** | **4.1** | Commissioning Procedure / Manual |
| **4.2** | **4.2** | Handover Certificate |
| **4.3** | **4.3** | Commissioning Certificate |
| **Project Execution** | **Mechanical** | **5.1.1** | *Contractor* Application for Eskom's Inspection of the Works/Part of the Works |
| **5.1.2** | Data Pack (e.g. Material Certificates, Qualifications, NDE and Welding Documentation, Isometric Drawings, Cutting Instructions, Factory Design Review Reports, C&I Loop checks, etc.) |
| **5.1.3** | Partial/final Inspection certificate |
| **5.1.4** | Defects Notification Certificate/Clearance |
| **5.1.5** | Safety and Housekeeping Certificate |
| **5.1.6** | Safety Clearance Certificate |
| **5.1.7** | Completion Certificate |
| **5.1.8** | Defects Certificate |
| **5.1.9** | Take over Certificate |
| **5.1.10** | Specific Requirements |
| **5.1.11** | KKS and Labelling Certificate |
| **C&I** | **5.2.1** | *Contractor* Application for Eskom's Inspection of the Works/Part of the Works |
| **5.2.2** | Data Pack (e.g. Material Certificates, Qualifications, NDE and Welding Documentation, Isometric Drawings, Cutting Instructions, Factory Design Review Reports, C&I Loop checks, etc.) |
| **5.2.3** | Partial/final Inspection certificate |
| **5.2.4** | Defects Notification Certificate/Clearance |
| **5.2.5** | Safety and Housekeeping Certificate |
| **5.2.6** | Safety Clearance Certificate |
| **5.2.7** | Completion Certificate |
| **5.2.8** | Defects Certificate |
| **5.2.9** | Take over Certificate |
| **5.2.10** | Specific Requirements |
| **5.2.11** | KKS and Labelling 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 |
| **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 |
| **Test and Statutory Certificates** | **6.1** | **6.1** | Factory Acceptance Test (FAT) |
| **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 |
| **6.8** | **6.8** | Erection Check Sheet |
| **6.9** | **6.9** | Protection and Optimising Test Certificates |
| **6.10** | **6.10** | Fire Protection Certificate |
| **6.11** | **6.11** | Other Safety Valves, Ventilation, Boiler Statutory Tests, Transformer Impact Recording, Boiler Registration Certificate, Type Test Certificates) |
| **6.12** | **6.12** | Synchronisation Tests |
| **6.13** | **6.13** | Grid Code Compliance Certificate |
| **6.14** | **6.14** | Defect List |
| **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 |
|  |  | **9** | **Special Tool List** |
|  |  | **10** | **Insurance Cover (90 Days Notification Period)** |
| **Plant out of Normal Status Approved** | **11.1** | **11.1** | Approved Out of Normal Status |
| **11.2** | **11.2** | Out of Normal Status (Pending Approval) |
| **Training** | **Competency Declarations** | **12.1** | Training Manual |
| **12.2** | Proof of Training |
| **12.3.1** | Plant Safety Regulations |
| **12.3.2** | High Voltage (HV) Regulations |
| **12.3.3** | PFFR |
| **12.3.4** | Other |
| **Provisional Hand over Certificate** | 13.1 | 13.1 | Provisional |
| 13.2 | 13.2 | Pending Approval |
| 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 |
| **Other** | 15.1 | 15.1 | Factory Acceptance Tests • Signed Protocol Release Report |
| 15.2 | 15.2 | Shipment and Transportation -  • Transportation test results • Transportation PQP |
| 15.3 | 15.3 | Other Documentation and Reports • Design assumptions • Trade-offs |
| 15.4 | 15.4 | Design Software • Software listing • Load Flows • Fault studies • Cable Routing software • CAD software data files • Simulations |
| 15.5 | 15.5 | Correspondences • Engineering Instructions (EI's) |

1. : Quality Requirements
   1. **overview**
2. 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:
3. Ensuring that the *Contractors* Quality Management System (QMS) is set up and maintained
4. Quality Assurance
5. Quality Control

These are broad areas each with numerous requirements.

1. 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. **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

[10] 240-56246601 “Personnel and Entities Performing Welding Related Special Processes on Eskom Plant”

[11] 240-83539994 “Standard for Non-Destructive Testing (NDT) on Eskom Plant”

[12] Pressure Equipment Regulations (PER)

[13] SANS 347 “Categorization and conformity assessment criteria for all pressure equipment”

* 1. **quality management system requirements**

1. The *Contractor* shall comply with the either the Category 1 or the Category 3 quality requirements specified below. This category will be determined during the contracting phase.
2. Category 1 - The *Contractor* shall ensure that a Quality Management System is setup and fully maintained during the entire duration of the contract. The *Contractor* shall submit a copy of the latest ISO 9001 certificate or certificate applicable. The QMS shall comply with the latest ISO 9001 standard or any applicable certificate of quality management system (latest applicable revision) and the Contractor shall comply with the requirements of 240-105658000 “Supplier Quality Management: Specification”. Compliance to Category 1 requirements is mandatory.
3. Category 3 - 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 to Category 2 requirements is mandatory. The following documents (approved copies) shall be submitted:
4. Quality Management System manual or a document that have defines and describes the QMS and its scope
5. Quality Policy
6. Quality Objectives
7. Control of documented information
8. Records required by ISO 9001 standard (List of Records)
9. Internal audit procedure
10. Control of non-conformity outputs
11. Nonconformity and Corrective action procedure
12. Documented information for Control of Externally Provided Processes, Products and Services Processes, Products and Services
13. Information for roles, responsibilities and authorities
14. 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.
15. The *Contractor* shall comply with all requirements specified in section 3.1 of the Supplier Quality Management Specification.
16. 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.
17. The *Employer* also has the right to carry out assessments and audits on the *Contractor’s* sub-contractors at planned intervals.
18. 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*.
19. The *Contractor* shall address all audit findings to the satisfaction of the *Employer* within a time frame acceptable to the *Employer*.
    1. **quality assurance requirements**
20. The *Contractor* shall ensure that Quality Assurance is performed at all levels and phases of work carried out for the *Employer*.
21. 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.
22. 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. **quality control requirements**
23. 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*.
24. The *Contractor* shall ensure that Quality Control is performed at all levels and phases of work carried out for the *Employer*.
25. The *Contractor* shall comply with all requirements specified in section 3.4 of the Supplier Quality Management Specification [1].
26. 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.
27. 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*:
28. 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.
29. 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.
30. The QCPs and ITPs show each activity/requirement of the Works Information.
31. 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.

1. 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.
2. 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.
3. 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. **Inspections**
4. 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.
5. The *Contractor* conducts all inspections in accordance with the accepted QCP / ITP.
6. The *Contractor* provides suitably qualified personnel to conduct on-and-offsite inspections
7. The *Contractor* ensures that all Works are inspected and approved before the *Employer* is invited for the inspections.
8. 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.
9. 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.
10. Damages as a result of 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.
11. 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.
    1. **quality plan**
12. The *Contractor* shall submit a Quality Plan within 30 days of contract award for acceptance by the *Employer*.
13. The *Contractor* shall comply with all requirements specified in sections 3.2, 3.3 and 3.4 of the Supplier Quality Management Specification.
14. 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. **quality documentation requirements**
15. For all products and services, the *Contractor* shall submit the following quality documents as a minimum:
16. Data book Index (which is in line with technical requirements)
17. Method statement (describing how work will be executed)
18. Equipment list
19. Drawings
20. ITPs, QCPs and check sheets
21. Inspection notifications accompanied by their inspection report
22. Updated onsite, off site and offshore inspection schedules
23. Inspection and or factory acceptance test dates as applicable
24. Inspections completed / outstanding.
25. Inspection and test reports
26. Weekly and monthly contract quality progress report
27. Materials used
28. Material certificates
29. Data sheets
30. Equipment list
31. 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
32. Quality Plan (as earlier described)
33. Non-conformance and Defects registers and reports
34. 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

1. 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*.
2. The *Contractor* shall submit 2 hard copies of data books and one software copy (on a DVD/CD).
3. Components may only be released for delivery to site once the H1 data book(s) has been accepted by the *Employer* if applicable.
4. Commissioning may only commence once the H2 data book(s) has been accepted by the *Employer* if applicable.
5. 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*.
6. Failure of the *Contractor* to submit data book(s) and obtain the *Employer’s* approval at 100 % work completion shall prevent payment.
7. Failure of the *Contractor* to submit H1 data book(s) and obtain the *Employer’s* approval prior to construction will prevent payment.
8. Failure of the *Contractor* to submit H2 data book(s) and obtain the *Employer’s* approval prior to Commissioning will prevent payment.
9. Failure of the *Contractor* to submit H3 data book(s) and obtain the *Employer’s* approval prior to takeover will prevent payment.
10. 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.
11. 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.
12. The *Contractor* shall specify the review status and discipline on the transmittal when transmitting data books to the Employers Doc control.
    1. **contract execution**
13. Correspondence shall be directed to the *Employer*, and periodic quality review meetings shall be convened by *Employer* with the *Contractor*.
14. The mandatory quality review meetings are to be convened by the nominated project quality manager or his/her representative for the *Contractor*.
15. Quality Management employee’s responsibilities shall include but are not limited to the following:
16. Implementation of the QMS on site
17. Administration of QA/QC systems on site
18. Verification of approval status of Subcontractor’s QCP and procedures
19. On-and -offsite inspections
20. Co-ordination, inspection and verification of the *Employer’s* intervention points
21. Review of *Contractor* testing and inspection documents (procedures, test results)
22. Weekly and monthly progress reporting on quality performance
23. The *Contractor* shall comply with section 5 of the Supplier Quality Management Specification.
24. 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.
    * 1. **Quality** Reporting
25. 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:
26. A register of Nom-conformance reports and defects
27. Updated QCP / ITP register
28. QA monthly report summary
29. Planned and completed local and foreign inspection dates
30. Completed and outstanding Inspections
31. Audit findings report
    1. **supplier quality performance monitoring phase**
32. 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*.
33. The monitoring shall be carried out periodically by the *Employer* or at predetermined intervals during the execution of a contract.
34. The monitored key performance areas include the following:
35. Quality
36. Delivery
37. Design
38. Cost
39. Management system
40. Subsequent key performance indicators associated with these areas will include the following:
41. Nonconformity monitoring
42. Audit and assessment evaluation scoring
43. Management system compliance and accreditation
44. Achievement of delivery targets as per contractual agreements
45. Process improvements
46. Corrective and preventive action response and closure
    1. **Preservation, shipping and transportation to be addressed**
47. The *Contractor* is responsible for ensuring that all products are preserved in their appropriate manner as described in their specifications or in Eskom preservation, shipping and transportation procedures as applicable.
48. The *Contractor* shallsubmit the preservation, shipping and transportation procedures to the *Employer* for review and acceptance.
49. The *Employer* may choose to witness the packaging, loading and offloading of the products depending on their criticality, this will be indicated in the intervention points on the QCP / ITP document.
50. The *Contractor* shall ensure that all storage requirements for products are properly implemented to preserve the products against adverse conditions, deterioration, damages, etc. Storage and preservation procedures for the different products must be submitted to the *Employer* for review and acceptance.
51. The *Employer* may request to inspect the stored products at any given point during the storage period of the product.
52. Requirements for preservation, shipping and transportation are addressed in 240-105658000 [1].
    1. **general quality requirements**
53. The *Contractor* shall comply with all requirements specified in section 6 of the Supplier Quality Management Specification.
54. 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.
55. All planning Quality Assurance and Quality Control documents shall be submitted for approval by the *Employer* within 30 days of contract award.
56. 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).
57. The *Contractor* shall ensure that all defects and NCRs are addressed correctly and timeously.
58. Defects and NCRs shall be closed within a time frame or period specified or accepted by the *Employer.*
59. 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.
60. 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.
61. The Contractor’s quality manager keeps a register of all NCRs and Defect notifications issued.
62. Deviations from the Contract are treated as a non-conformance.
63. Records of NCRs and Defect notifications are kept and form part of the data book records.
64. 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.
65. The Contractor is accountable for the quality of the output and liable for any failures.
66. 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.
67. 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*.
68. 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.
69. The *Contractor* shall ensure that no inspections are missed and all schedules are observed.
70. The *Contractor* shall comply with all relevant Eskom governance documents (codes, standards etc.) whether specified in this contract or not.
71. The *Contractor* shall make use of an Authorised Certification Authority such as SABS to certify *Contractor* QMS if applicable.
72. The *Contractor* shall make use of Recognised International Accreditations such as SANAS which accredits the Authorised Certification Authority if applicable.
73. The quality requirements shall be met by the contractor and all sub-contractors.
74. The *Contractor* shall ensure that all measuring and test equipment is calibrated at all times and proof thereof must be readily available.

Penalties to be communicated to the contract manager to be included in contract terms (contract data and agreements)

1. To ensure reduction of non-conformances, the Employer will implement a penalty to the value of R50 000.00 for every five (5) NCRs issued during the contract period.
2. To ensure reduction of defects, the Employer will implement a penalty to the value of R50 000.00 for every five (5) defects issued during the contract period.
3. 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.
4. Damages as a result of 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.
5. 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.