

	Scope	Technology
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Title: **Kusile Engineering Land  
Surveying Professional  
Services**

Unique Identifier: **240-137101041**

Alternative Reference Number: **N/A**

Area of Applicability: **Engineering**

Documentation Type: **Scope**

Revision: **04**

Total Pages: **33**

Next Review Date: **N/A**

Disclosure Classification: **CONTROLLED  
DISCLOSURE**

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Date: 29/06/2022.....

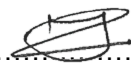
**Functional Responsibility**

  
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## 1 INTRODUCTION

A survey consultant is required at Kusile Power Station for the purposes of spatial integrity, progress assessment and quantity determination during the construction phase the Power Station.

In particular the network development, expansion, and monitoring maintenance of the reference control beacon system on which all site measurements for all contractors are based. This is a critical service since the accuracy of all measurements at site (from foundation layouts and imbeds to equipment positioning) depends on these control beacons as an additional scope to general surveys.

The accuracy deemed by Alstom and Hitachi is  $\pm 2\text{mm}$ . This resulted in the setting up of a complex system of beacons with an accuracy of below 2mm utilizing very high precision equipment. Each beacon has to be checked and compared with each other in a statistical model. The associated beacons require a constant check to verify contractors' queries as well as monitoring service from the survey consultant in order to ensure the accuracy of measurement and continuation of the Kusile Project construction.

## 1. SUPPORTING CLAUSES

### 1.1 PURPOSE

The purpose of this document is to define the scope of Works required for the Land Surveying Professional Services for Construction Activities at Kusile Power Station Project

#### 1.1.1 Applicability

This document is applicable to Kusile Power Station Project.

### 1.2 NORMATIVE/INFORMATIVE REFERENCES

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

#### 1.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] OHS ACT Occupational Health and Safety Act, 85 of 1993.
- [3] DSP 0024 Eskom Specification: Specification for security fences at distribution substations and buildings
- [4] National Water Act 36      National Water Act 36, 1998, Section 19 and Section 20.
- [5] 240-57127953      Execution of Site Preparation and Earthworks Standard
- [6] 240-57127955      Geotechnical and Foundation Engineering Standard
- [7] 240-56364545      Structural Design and Engineering Standard
- [8] 240-56364545      Structural Design and Engineering Standard
- [9] 240-84418186      Road Specification Manual
- [10] 240-85549846      Standard for Design of Drainage and Sewerage Infrastructure
- [11] 240-86973501      Engineering drawing Standard
- [12] 240-56356396      Eskom Earthing and Lightning Protection standard

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[13]	203-103437	Technical Document Submission and Review Work Instruction
[14]	240-76992014	Technical Documents and Records Management Work Instruction
[15]	203-770	Kusile Power station specification for structural concrete
[16]	240-49230111	HAZOP Analysis Guideline (Rev 1)
[17]	240-53114186	Technical Documents and Records Management Work Instruction
[18]	240 – 132735850	Kusile Engineering Change Management Work Instruction
[19]	240-53113685	Design Review Procedure
[20]	240-54179170	Technical Documentation Classification and Designation Standard
[21]	240 – 132735850	Kusile Engineering Change Management Work Instruction
[22]	240-76992014	Project / Plant Specific Technical Documents and Records Management Work Instruction
[23]	240-58552870	SmartPlant for Owner Operators (SPO) Documentation Metadata Standard
[24]	240-107305502	SmartPlant Data Take-On Standard
[25]	IEC 61355– 1:2008	Classification and designation of documents for plants, systems and equipment – Part 1
[26]	ISO 10007(2nd Edition)	Quality management — Guidelines for configuration management
[27]	240-61227631	Piping and Instrumentation Diagram (P&ID) Standard

### 1.2.2 Informative

Not applicable.

### 1.3 DEFINITIONS

Definition	Description
Consultant	The appointed person to perform the Works as set out in this document.
Employer	Eskom, or Eskom Kusile Power Station or representative
Engineer	A registered Professional Engineer or a registered Professional Engineering Technologist specialising in and having experience in the design for all works specified in this document.

#### 1.3.1 Disclosure Classification

– **Controlled Disclosure:** Controlled Disclosure to external parties (either enforced by law, or discretionary)

### 1.4 ABBREVIATIONS

• Abbreviation	• Description
LDE	Lead Discipline Engineer

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• Abbreviation	• Description
KKS	Kraftwerk-Kennzeichen System (Coding system)
VDSS	Vendor Document Submittal Schedule
ECSA	Engineering Council of South Africa
EDWL	Engineering Design Work Lead
KET	Kusile Execution Team
PDF	portable document format
SAGC	<i>South African Geomatics Council</i>
VDSS	Vendor Document Submittal Schedule

## 1.5 ROLES AND RESPONSIBILITIES

The following sections may contain specific functions within each of the following roles and responsibilities related to the execution of the works.

**The Consultant:** Performs works as per the scope of works.

**The Employer** provides the Eskom Standards and Procedures for the design, construction and commissioning of the plant.

**Lead Discipline Engineer:** The role of the Lead Discipline Engineering role is to manage the technical integrity of the design and be accountable for the management of the interfaces within their specific engineering domain

**Professional Surveying Team:** Provides Kusile Power Station Project with professional surveying services for the defined scope in line with SAGC guild lines. The services are to be provided to the Eskom Kusile Power Station Engineering representative.

**Kusile Construction Team:** Supervises construction activities performed by the Contractor

**Kusile Quality Team:** Ensure that the Employer's requirements as described or specified in Professional Services Contract are KET in full and verified as such to Employer satisfaction

## 2. 3. DOCUMENT CONTENT

- Professional services for minimum of two (2) Survey Consultant Team which comprises of one (1) Senior Survey Supervisor, one (1) Intermediate Surveyors and two (2) Assistant Surveyors
- The Survey Consultant Team will be required to perform its responsibilities in line with the KET working calendar. The Survey Consultant shall be available on request of the Project Engineering Manager to perform survey work.
- The Survey team shall adhere to all rules and regulations prescribed by the Employer and the KET Management which will be made clear during safety induction.
- The Surveyor team will provide Engineering support by performing on-site surveying for engineering assurance, engineering design, compilation of Quantity Surveyor progress reports and material volume reports.

## 2.1 DESCRIPTION OF WORKS/ WORKS INFORMATION

The Survey team will be required to perform and report on the following:

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- a) Topographical surveys
- b) Verification surveys on Contractor's survey work
- c) Design verification surveys for Project Engineering
- d) Volumetric verification surveys for costing and payment purposes
- e) The extension and maintaining of the survey control network
- f) Survey data processing for establishing as-built conditions
- g) Maintaining standardized survey processes and systems
- h) Routine monitoring on the following:
  - a. Demin Water Tanks,
  - b. Diesel Generator Building,
  - c. Water Treatment Lab ,
  - d. Workshop and Stores Building and
  - e. Dam Water Levels.
- i) Existing historic electronic information will be provided to the Survey Consultant at tender award, which shall be reviewed and used as a bases for further works where relevant

Typical as and when required requests from the various departments will be as follows, but not limited to:

- a) Balance of Plant Mechanical – Measure water levels at dams all over site on a weekly basis to assist with water management and control.
- b) Eskom Engineering – Wide variety of requests including as-built verifications, verifications on new designs and drawings as well as clashes where engineering integration is required.
- c) Projects Execution Team – Wide variety of requests including environmental spillage reports, surveys to support construction progress reports and surveys to support Kusile Site Services.
- d) Kusile Quality Team – Construction progress and survey reports.
- e) Kusile Quantity Surveyors – Volumetric surveys reports
- f) Monitoring and reporting on settlement of at-risk works

Survey work will be executed once a Survey Request form comprising of a list of Tasks to be performed is completed by the requester and approved by the LDE or the Project Engineering Manager. The *Employer* will issue a Consultant as and when required with an agreed Task Order consisting but not limited to the following:

- Task Schedule with detailed description of the work in the Task
- Price list of items in the Task Schedule
- Starting and completion dates for the Tasks
- Total of the Prices for the Tasks

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## **2 DESCRIPTION OF WORKS**

### **2.1 THE WORKS**

The scope of work activities for the survey consultant is as follows:

- ❖ Preparation of survey plans, topographic and detail surveys
- ❖ Checking of co-ordinates and levels of the bench marks
- ❖ As built survey of service and utilities that is electrical, mechanical, structures, pavements and roads.

The scope of work for the survey consultant embraces the preparation of survey plans, topographic or detail and as constructed surveys and specifically the requirements and methodology for surveyors in adding to and maintaining coherent, consistent and accurate survey data over the entire site.

## **3 THE DETAIL DESCRIPTION OF THE WORKS CONSISTS OF:**

### **3.1 SUBMISSION SPECIFICATION**

#### **3.1.1 Control Beacons network**

Scope of work shall include all work associated with performing construction control beacons network survey including the setting out of new additional beacons. It will consist of network data collation, iterative calculation; generate results, interpretation of results as well as recommendations.

All high precision survey work shall be completed in conformance to normal professional mapping and surveying standards.

#### **Deliverables**

The following deliverables are required:

- ❖ Control beacons measured data.
- ❖ Control beacons calculations spread sheet
- ❖ Results interpretation and professional report
- ❖ Additional control beacons installation and verification
- ❖ Production of topographical data

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- ❖ As and when required and requested to do field survey checks/verification of contractors works e.g. anchor bolts
- ❖ Liaise with the onsite survey crew through KET representatives
- ❖ Skills and knowledge transfer
- ❖ Exercise due diligence surveys to resolve survey conflicts

### **3.1.2 Drawings**

Submitted drawings and information shall conform to the requirements as directed by the Kusile Project Field Engineer. The following units of measurement shall be adopted:

- (a) Linear measurements shall be in meters.
- (b) Vertical measurements shall be in meters.

### **3.1.3 Electronic copies**

- (a) One copy of digital data in 2D CAD DGN format (edited drawing for plotting)  
Including any surface triangulation supplied in 3D.
- (b) One copy of digital data in 3D CAD DGN format (3<sup>rd</sup> points and line work).
- (c) One comma delimited file (\*.csv) of survey pick up in point, Easting, Northing, RL, Filed Code Format.
- (d) One copy of CAD or final plot in PDF format.
- (e) All CAD externally referenced files will be submitted separately and also combined where possible.
- (f) Include any Cad plot files and shape files \*SHX files used.

## **3.2 METHODOLOGY**

### **3.2.1 Survey Control Network**

The employer shall make available copies of the latest established control networks plans on request by the consultant. The co-ordinates and levels of the benchmarks and station beacons depicted in the plans must be checked for the effects of subsidence and/or disturbance.

### **3.2.2 Vertical Control**

Where any unacceptable discrepancies in control marks due to land settlement, disturbances or other factors are apparent, a discrepancy report will be prepared by the surveyor and referred to Kusile Project Field Manager for resolution prior to setting out of any works or prior to any as-constructed or detail surveys are performed.

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### 3.2.3 Horizontal Control

The horizontal control for each project shall be based on the existing survey stations.

The surveyor may place additional survey stations if required and with prior approval from the site construction managers and include them in their job reporting on completion.

The surveyor shall establish (and confirm existing horizontal controls) reliable horizontal controls. When unacceptable discrepancies in control marks are apparent, this will be referred to Kusile Project Field Manager for resolution prior to setting out of any works or prior to any as-constructed or detail surveys are performed.

### 3.2.4 As-constructed Surveys

All as constructed drawings shall be surveyed in 3 co-ordinates: Easting, Northing and Elevation. As constructed survey providing a description, horizontal and vertical locations of the following services and features shall be obtained in accordance with the following requirements:

#### 3.2.4.1 Services and Utilities

The surveyor shall assist the Project Field Engineer to identify, locate and confirm correctness of the following services:

(a) Electrical and Mechanical services

- ❖ Electrical cables, both high voltage and low voltage
- ❖ Earth stakes
- ❖ Telecommunications cables
- ❖ Data cables Fibre optic cables
- ❖ Communications cables

(a) Hydraulic Services

- ❖ Water main drains
- ❖ Sewer pipes and sumps
- ❖ Storm water pipes
- ❖ Irrigation and sprinkler lines

(b) Other services

- ❖ Reclaimed water pipes
- ❖ Dedicated fire water pipes
- ❖ Compressed air
- ❖ Portable water lines

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When necessary the surveyor shall number the pipes and keep an accurate record of the services type, construction, size and filling at each location. Surveying should then be carried out at the earliest opportunity.

#### **3.2.4.2 Existing Services**

Where the surveyor's work exposes or interacts with existing services, the surveyor shall locate and record the details of all such features and services and submit as built data.

#### **3.2.5 Surface and Above Ground Features**

Survey information about the surface and above ground features shall be obtained in situ immediately after each part of the work is complete.

##### **3.2.5.1 Structures above ground but not limited to:**

- (a) Buildings, concrete slabs and buildings detail
- (b) Fences and gates
- (c) Pits, manholes and inspection points
- (d) Headwalls and drainage structures
- (f) Services markers
- (g) Roads and general signage

##### **3.2.5.2 Pavements and new road works, including:**

- (a) Finished pavement surfaces (pavement layers and excavations as and when required by the Project Filed Engineer).
- (b) Roads, kerbing (including back of kerb, water table invert and edge of bitumen).
- (c) Side drains, embankment and open drains.
- (d) Site perimeter fence.
- (e) Contractors laydown areas

### **3.3 SURVEY CONSULTANT SUPPORT REQUIREMENTS:**

- a) The Consultant provides as and when required e full time SAGC Registered Surveyors with two Assistant Surveyors.
- b) The Consultant mobilized this team on request within twenty four hours in order to ensure availability of the complete surveyor functions (in case of sick leave, leave, emergency, etc.). The

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back-up standby Senior Surveyor the same credentials as the full time Surveyor must have be available when the need arises.

- c) The Consultant's Survey Supervisor plans, organizes and manages the surveying activities in order for the required services to be delivered efficiently and cost-effectively.
- d) The Consultant provides survey equipment as indicated below. All survey equipment must have a valid calibration certificate and shall be provided to the Employer.
- e) The Consultant's Survey Supervisor must be able to perform survey works at heights and in confined spaces when necessary. The Consultant's Survey Supervisor will be required to attend working at heights and working in confined spaces training which will be arranged by the Employer.
- f) The Consultant's Survey team must produce medical certificates indicating "fit for work" at tender award state and on an annually bases thereafter.
- g) The Consultant's Survey team must attend ad hoc project meetings and training.
- h) At end of Contract, the Consultant shall provide all survey data records to the Employer on an external hard drive. All information generated during the course of the Contract, remains the property of the Employer.

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#### **4 EQUIPMENT REQUIREMENTS:**

The Consultant equips the surveying team with the following listed suitable surveying equipment to perform their surveying duties for the duration of the Contract:

1. Prism less Total Stations Full Time x 1 (accuracy of 1mm or less)
2. Electronic Level x 1 (System Reading to 4 decimal places)
3. RTK GPS Base and Rover x 1
4. Model Maker 15 or later with at least one dongle on site.
5. Laptop and 1 external hard drive

#### **5 EMPLOYER REQUIREMENTS ARE:**

- ❖ The Employer requires the Contractor to provide personnel with appropriate and suitable skills to perform the work.
- ❖ The Employer requires that the works is performed within budget and agreed time schedule.
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile environmental plan.
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile safety and safety plan.
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile quality plan.
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile emergency preparedness procedure
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile traffic management plan
- ❖ The Employer requires the Contractor adopt and comply with the Kusile access control procedure
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile vehicle access control procedure
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile security operating plan
- ❖ The Employer requires the Contractor to adopt and comply with the Kusile security action plan

#### **6 COST MANAGEMENT**

- ❖ The Contractor shall manage all costs applicable to the works in conjunction with the Employer's inputs.

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- ❖ All changes or issues resulting in changes to the prices or replacement value of the various outputs managed by the Contractor shall be discussed and agreed upon with the Employer prior to being implemented.

## 7 RISK MANAGEMENT

- ❖ The Contractor ensures that all risks are managed to enable the successful execution of the works.
- ❖ Any risk that occurs during any phase of the works shall be brought to the Employer's attention in writing immediately. A risk register shall be kept for the duration of the works.
- ❖ The Employer reserves the rights to perform quality audits at any time during the execution of the works.

## 8 MEETING REQUIREMENTS

The Contractor shall attend progress meetings on site (Kusile power station) which will be arranged by the Employer. These meetings shall facilitate a medium through which the Employer and Contractor exchange information and establish progress.

## 9 HEALTH AND SAFETY ARRANGEMENTS

Refer to document named "SHE Specification"

## 10 COMMON REQUIREMENTS

### 10.1 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* ensures that the Technical Documents and Records Management Work Instruction (240-76992014) 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 provides the documentation programme linked with the milestone dates. Documentation and drawings are programmed for delivery to meet the milestone dates and in accordance with the agreed VDSS.

#### 10.1.1 Document Identification

The Contractor ensures that a document has the following minimum attribute on the cover page:

- Title of the document

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- 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

### **10.1.2 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.

### **10.1.3 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

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- 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)

#### 10.1.4 Document Headers

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

#### 10.1.5 Naming of files

The Contractor complies 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.FileExtension)

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

(YYYYMMDD\_DocType\_DocumentTitle\_UniqueIdentifier\_Revision.FileExtension)

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

#### 10.1.6 Document Submission

The *Contractor's* engineering program to 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 VDSS . The VDSS is revisable and changes are discussed and agreed upon by all parties and properly documented.

The *Contractor* documents submittals are provided in accordance with the Vendor Document Submittal Schedule (VDSS) which is included in Appendix 12. The VDSS indicates the format of documents to be submitted. The *Employer* is responsible for the management of the schedule i.e. to create a document register that is used to track submission progress of documentation by the *Contractor* as per the committed dates on the VDSS.

*Contractor* documents all documentation that is sent to the *Employer* in the Master Document List (MDL) as provided by the *Employer* in Appendix 12. All documentation, including reports, manuals, etc. is in the English language.

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

#### 10.1.7 Transmittals

1. All document exchange is 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, External Hard Drives, etc.)
  - Sender signature
  - Recipient signature, once submitted, to acknowledge receipt
2. If a transmittal is in response to an Eskom communication via transmittal, the Eskom Transmittal Number is referenced in the transmittal response and provided in addition to the meta-data required in Section 0.
3. The Contractor follows a structured and standard definition for Transmittal Descriptions, i.e. a subject line convention of **YYYYMMDD – <Contract & Package Number> – <Vendor> – <Short Description> – <Sender Initials>**.
4. **The Contractor follows a structured method of communication as defined within Communication Interface Memorandum (CIM) for any correspondence**
5. The Contractor follows a structured and standard definition for email subjects i.e. a subject line convention of **YYYYMMDD – < Package File Number> – > – <Email Subject line>**.
6. The Contractor selects the purpose for transmittal in line with the standard Eskom Selection Criteria:

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- Issued for Approval
- Issued for Award
- Issued for Basic Design
- Issued for Commissioning
- Issued for Concept Design
- Issued for Consideration
- Issued for Construction
- Issued for Detail Design
- Issued for Document Review
- Issued for Handover
- Issued for Information
- Issued for Installation
- Issued for Manufacturing
- Issued for Procurement
- Issued for Review
- Issued for Tender

7. Issuing of documents with different transmittal purposes is done separately and is not combined into one transmittal. This ensures fast and efficient processing of incoming and outgoing transmittals and information exchange.

Electronic technical data submittals are 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] used for electronic file submittals is made available upon Contract award.)

*In case of email submission, the Contractor should note that if a single file to be transmitted is over 20MB in size, then the document is uploaded on Zendto portal.*

Notification to Employer's Representative that submittals have been posted to Zendto is 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 are submitted to the address indicated for Technical Documents in the Supplementary Terms and Conditions of this Contract. The following prints are submitted unless otherwise indicated in the Schedule of Submittals:

Submittal Description	Copies Required
Performance Curves	2
Design Data	2
Test and Inspection Data	2
Drawings	2

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

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

### 10.1.8 Drawings

The creation, issuing and control of all Engineering Drawings is in accordance to the latest revision of 240-86973501 (Engineering Drawing Standards – Common Requirements) supplied as part of the enquiry documents. All drawings are issued to the Employer in both native CADD format (.dwg/.dgn) and PDF format as per 240-86973501 (Engineering Drawing Standards – Common Requirements).

Drawings are 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 fully completes and certifies drawings for compliance with the Contract requirements. Drawings comprise a title block entries that clearly indicate the drawing is certified.

Each submitted drawing is project unique and is 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 is clearly identified on the drawings. If standard drawings are submitted, the applicable equipment and devices furnished for the project is clearly marked.

Transmittal letters identifies which Schedule of Submittals item (by item number) is satisfied by each drawing or group of drawings. The transmittal letter includes the manufacturer's drawing number, revision number, and title for each drawing attached. Each drawing title is unique and descriptive of the specific drawing content. Transmittal letters for resubmitted drawings includes 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 are assigned by the Employer as drawings are developed.

The project name is listed on all drawings, including manufacturers' drawings. Tag numbers and equipment names are 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 is in the English language. The units of measure are 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.

### 10.1.9 Drawing Submittal

All documents and records management are performed according to Project/Plant Specific Documents and Records Procedure. Any uncertainty regarding this is clarified with the *Employer*. The *Contractor* complies with all minimum document metadata as specified in Technical Documentation Classification and

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Designation Standard (240-54179170).

The *Contractor* uses Smartplant Owner Operator (SPO) for documents and records management. *Contractor* submits 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 are in such a form which enables importing such data, documents and drawings, including 3-dimensional drawings, seamlessly into the Intergraph SPF (Smart Plant Foundation) system. Hard copy submittals are required for the IOM Manuals and final as-built submittals.

Transmittal letters are provided with each document submittal. The transmittal letter includes the *Contractor* drawing number, revision number, and title for each drawing attached. Each drawing title is unique and 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 is 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 are submitted with all numerical values in metric units.

#### 10.1.10 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 Works Information and for the operation, maintenance and support of the Works during its entire operational phase until disposal and decommissioning.

The *Contractor*, during the progress of and upon completion of the Works, supply the Information required in terms of the Contract and all such Information as may usually be supplied in connection with similar Works, including, whether or not specified in the Works Information, 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 maintains a master set of redlined As-built drawings. The *Contractor* provides drawing mark-ups as work is completed. The Employer and the *Contractor* ensures that all appropriate information is transferred to the field record copy of drawings. The *Project Manager* and the *Contractor* checks the "As-built" drawings for completeness and accuracy. Final "As-built" are distributed in accordance with the Project Instructions Manual (PIM). The scope of supply of Information from the *Contractor* includes drawings, documents, lists and data according to the types defined in Table 1 below (this list is not limited to below and may include additional information):

**Table 1 Typical Document Requirement List (As-built)**

Document Group	Description of document type (includes information data sets)
General	

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Document Group	Description of document type (includes information data sets)
Quality Assurance	Quality assurance manual Quality control plans Quality control reports
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 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.
Logistic Support	Maintenance concept Plant maintenance documentation Etc.
Training	Training plan Training manuals and instructions Etc.
Design Analyses	Maintainability analysis 3D model interference checks Etc.

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Document Group	Description of document type (includes information data sets)

In addition to the official documentation submittals listed in Appendix 12, the *Contractor* provides additional information for review and design coordination as requested by the *Employer* from time to time.

The *Contractor* uses 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 are 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* are supplied in a format specified by the *Employer*.

The *Employer's* Representative reviews the *Contractor's* submitted documents. The *Contractor* ensures 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 12. Each document submitted to the *Employer's* Representative 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 are submitted to the *Employer* 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 designated *Employer's* Representative with a transmittal note.

#### 10.1.11 Documentation Recording

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

- Date of submission
  - Transmittal number
  - Transmittal title
  - Document description
- I. 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* adheres to the following standards:

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- 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)

#### 10.1.12 Documentation Requirements

All documents supplied by the *Contractor* are subject to the *Employer's* acceptance. For consistency, it is important that all documents used within the project follow the same layout, style and formatting as described in the Technical Documents and Records Management Work Instruction (240-53114186). Documents such as QCP's, Method Statements and other documents impacting the work are accepted by the *Project Manager* at least 3 working days prior to commencement of the Works.

Each revision of a document or drawing is 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 are recorded in a revision table contained in each drawing/document.

Documents and drawings 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 is used as the reference number.

The *Contractor* compiles 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
- 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

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### 10.1.13 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 *Employer's Representative* for their review for all Plant and Materials and work undertaken with the applicable requirements and specifications.

## 10.2 GENERAL REQUIREMENTS

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 is not applicable to drawings developed by manufacturers for equipment and material such as valves, instruments, etc. Drawing numbers are assigned by the *Employer* as drawings are developed.

The project name is 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 is the English language. The unit of measure is 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.

## 11 DESIGN REVIEWS AND CHANGE MANAGEMENT

### 11.1 DESIGN REVIEWS

The *Employer* reviews the *Contractor's* 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 12

After a contract is established, the *Contractor* proceeds in the detail design phase. Each document requires a transmittal note from the vendor. *Employer's* review cycle is in-line with NEC contract requirements and is finalised during contract negotiations with the *Contractor*. Appendix 12

lays out the specific documents requiring *Employer's* acceptance 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:

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

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The *Contractor* conducts design reviews as per the *Contractor's* official design review procedure. *Contractor* further takes note of the *Employer's* 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.

## **11.2 ENGINEERING CHANGE PROCEDURE**

All Design change management are performed in accordance to the latest revision of the Kusile Engineering Change Management Work Instruction (240 – 132735850) and the *Employer* ensures that the *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 are conducted according to the Design Review Procedure (240-53113685).

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## 12 APPENDICES

### 12.1 VENDOR DOCUMENT SUBMITTAL SCHEDULE

Vendor Document Submittal Schedule												
Item	Submittal Items	Calendar Days	Project Stages									
			Procurement Specification for Subcontractors	Contract Award	Order	Design Freeze	Manufacturing and Assembly	Factory Acceptance Testing (FAT)	Factory Release	Delivery	Installation	Site Acceptance Testing (SAT)

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**12.2 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

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## 12.3 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

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Sub Chapter	Documents for Final Handover
	4.3	4.3	Commissioning Certificate
Project Execution			

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Sub Chapter	Documents for Final Handover
	Civil	5.4.1	Contractor Application for Eskom's Inspection of the Works/Part of the Works
		5.4.2	Data Pack (e.g. Material Certificates, Qualifications, NDE and Welding Documentation, Isometric Drawings, Cutting Instructions, Factory Design Review Reports, C&I Loop checks, etc.)
		5.4.3	Partial/final Inspection certificate
		5.4.4	Defects Notification Certificate/Clearance
		5.4.5	Safety and Housekeeping Certificate
		5.4.6	Safety Clearance Certificate
		5.4.7	Completion Certificate
		5.4.8	Defects Certificate
		5.4.9	Take over Certificate
		5.4.10	Specific Requirements
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

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Sub Chapter	Documents for Final Handover
	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	<b>Special Tool List</b>
		10	<b>Insurance Cover (90 Days Notification Period)</b>
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 Handover	13.1	13.1	Provisional

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Sub Chapter	Documents for Final Handover
	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)

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### 13 AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Gareth Macintosh	Civil Technical Lead
Calvin Langley	Civil Lead Discipline Engineer Design
Tumiso Railo	Kusile Project Engineering Manager

### 14 REVISIONS

Date	Rev.	Compiler	Remarks
November 2018	0	Ayo Jimoh	Final Copy
February 2019	1	Ayo Jimoh	Final Copy
October 2020	2	Tshepo Sathekge	Updating Scope of Work
April 2021	3	Tshepo Sathekge	Addressing comments
June 2022	4	Ayo Jimoh	Updated to match new strategy

### 15 DEVELOPMENT TEAM

All Technical Evaluation Team Members were involved with the development of this document.

### 16 ACKNOWLEDGEMENT

Thanks to all who have contributed to this strategy and the constructive way in which knowledge and information have been shared and provided.

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