

	<p align="center">Scope of Works</p>	<p align="center">Generation</p>
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Title: **Kusile Power Station
Miscellaneous Building
Structures and
Modification Works**

Unique Identifier: **366-423660**

Alternative Reference Number: **N/A**

Area of Applicability: **Kusile Power Station**

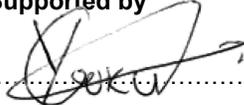
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<p>Compiled by </p>	<p>Functional Responsibility </p>	<p>Supported by </p>
<p>Thabani Mdlalose Lead Civil Discipline Engineer</p>	<p>Thabani Mdlalose Lead Civil Discipline Engineer</p>	<p>Yuvir Gokul Project EDWL</p>
<p>Date: 12/10/2023</p>	<p>Date: 12/10/2023</p>	<p>Date: 20/10/2023</p>
<p>Authorized by </p>		
<p>Tumiso Railo Project Engineering Manager</p>		
<p>Date: 20/10/2023</p>		

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1 INTRODUCTION

Due to conditions on-site, specific design changes are necessary to ensure that all designs meet the prescribed standards and Client's requirements. There is outstanding scope in numerous areas that needs to be completed in order to realise this objective.

This Technical specification deals with a portion of the outstanding scope on Kusile Power Station.

1.1 SCOPE

1.1.1 Purpose

This document shall outline the scope in order to appoint a construction, supervision and design Contractor to perform all applicable outstanding civil works at Kusile Power Station.

1.1.2 Applicability

This document applies to Kusile Power Station.

1.2 NORMATIVE/INFORMATIVE REFERENCES

1.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] Occupational Health and Safety Act No. 85 of 1993
- [5] 240-86973501 Engineering Drawing Standard
- [6] Construction Regulations, 2014
- [7] 240-53114026 Eskom Project Engineering Change Management Procedure
- [8] 240-53113685 Design Review Procedure
- [9] 240-128515850 Document Handover Specification
- [10] 240-56355754 Field Instrument Installation Standard
- [11] IP65 Standard Electric/electronic enclosures (transmitters, electrical boxes) and analysers
- [12] GGS 1427 Instrumentation Piping for Fossil and Hydro Power Stations
- [13] 240-56227443 Requirements for Control and Power Cables for Power Stations
- [14] 240-56355815 Junction Boxes and Cable Termination Standard
- [15] 240-56356396 Earthing and Lightning Standard
- [16] 240-56355731 Environmental Conditions for process control equipment
- [17] 366-164065 WWTP Lime and Soda Ash Offloading Facility, Engineering Change Report Kusile Power Station, Rev.1
- [18] 203-1239 Conceptual Architectural Design and Specifications for Structures and Other Buildings
- [19] 203-770 Specification for Structural Concrete
- [20] SSZ 45-17 Medupi Corrosion Protection Specification

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- [21] 203-1238 Kusile Technical Specification
- [22] 240-106628253 Standard for Welding Requirements on Eskom Plant
- [23] 240-56364545 Structural Design and Engineering Standard
- [24] 240-105658000 Supplier Quality Management: Specification
- [25] 203-770 Kusile Specification for Structural Concrete
- [26] SANS 10400 The Application of the National Building Regulations
- [27] SANS 2001 Series
- [28] SANS 50197-1 Standardized specification for Cement Part 1: Composition, specifications and conformity criteria for common cements.
- [29] SANS 1200 A Standardized specification for civil engineering construction Section A: General
- [30] 240-53114186 Document and Record Management Procedure
- [31] 240-132735850 Kusile Engineering Change Management Procedure
- [32] ISO 10007:2003 Guidelines for Configuration Management
- [33] ISO 10007:2003 Guidelines for configuration management
- [34] VGB-B 105 E KKS Guidelines
- [35] VGB-R 171e VGB Guideline - Supply of Technical Documentation for Fossil-fired
- [36] and Regenerative Powers Stations
- [37] 240-86973501 Engineering Drawing Standard Common Requirements
- [38] 240-4417997 Documentation Preservation Standard
- [39] 240-52843902 Engineering Terms and Abbreviation Standard for Eskom Power Plants
- [40] 240-71432150 Rev 2 KKS Plant Labelling and Equipment Descriptions Standard
- [41] 240-72273656 Power Generation Asset Criticality Classification Standard
- [42] SANS 1200 A: General
- [43] SANS 1921-1: Construction and management requirements for works contracts, Part 1: General engineering and construction works

1.2.2 Informative

- [1] 474-58 (Rev1): Document and Records Management
- [2] 0.90/137: Kusile Power Station Layout
- [3] NWS 1527: The Installation of Cables and Cable Racks At Power Stations
- [4] 240-43921804 Engineering Change Notice Diesel Gen (1)
- [5] 240-124865764 Engineering Impact Assessment Diesel Gen
- [6] 366-144268 Kusile Diesel Generator Structural Design Verification Report

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1.3 DEFINITIONS

1.3.1 Classification

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

1.4 ABBREVIATIONS

Abbreviation	Description
AWS	American Welding Society
ASTM	American Society for Testing and Materials
C&I	Control & Instrumentation
CADD	Combined Annotation Dependent Depletion
CIM	Communication Interface Memorandum
CPM	Critical Path Method
ECSA	Engineering Council of South Africa
EDMS	Electronic Document Management System
GA	General Arrangement
ISO	International Organization for Standardization
ITP	Inspection Test Plan
KKS	Kraftwerk Kennzeichen System
NDE	Non Destructive Examination
NDT	Non Destructive Testing
O&M	Operations and Maintenance
OHS	Occupational Health and safety Act
OPC	Ordinary Portland Cement
P&ID	Piping and Instrumentation Diagram
PDF	Portable Document Format
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
SANS	South African National Standards
SPF	Smart Plant Foundation
SPO	SmartPlant Owner Operator
URL	Uniform Resource Locator
VDSS	Vendor Document Submission Schedule
WTP	Water Treatment Plant
WWT	Waste Water Treatment
WWTP	Waste Water Treatment Plant

1.5 DECLARATION OF NATIONAL KEY POINT

The *Contractor* notes that the Site is a National Key Point and complies with the associated requirements of the National Key Point Act, 102 of 1980.

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2 SCOPE BREAKDOWN

2.1 AUXILIARY BAY UNIT 1-6 SAFETY BARRIERS

2.1.1 Description of the Works

The *Contractor's* scope of work consists of the following:

- Supply and the installation of safety barriers (hand railings) in accordance with *Employer's* handrail specification and marked-up drawings as per Appendix E.

2.1.2 Drawings issued by the Employer

The following is issued to the *Contractor* for information purposes:

Drawing number	Revision	Title
0.90/3542 S1	4	Aux Bay Unit 6 Level 20.6
0.90/3583 S1	3	Aux Bay Unit 5 Level 20.6
0.90/3624	2	Aux Bay Unit 4 Level 20.6
0.90/3665	5	Aux Bay Unit 3 Level 20.6
0.90/3706 S1	8	Aux Bay Unit 2 Level 20.6
0.90/3747	9	Aux Bay Unit 1 Level 20.6
366-423749	1	Standard Stair and Handrail Details

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2.2 AUXILIARY BAY LIFT BAY SEALS

2.2.1 Description of the *Works*

The *Contractor's* scope of work consists of the following:

- The Contractor is to design, supply and install 5m X 1m precast reinforced concrete lids/slabs. The purpose of the slabs is to seal the lifting bay during periods when the lift shaft is not in use (refer to Appendix F). The slabs should be easily removable.
- The design needs to consider the spatial restrictions in the general area and also needs to consider nominal imposed loads.
- Alternatives proposals are permitted as long as the aforementioned requirements are met.

2.2.2 Drawings issued by the *Employer*

The following is issued to the *Contractor* for design and construct:

Drawing number	Revision	Title
0.90/3542 S1	4	Aux Bay Unit 6 Level 20.6
0.90/3583 S1	3	Aux Bay Unit 5 Level 20.6
0.90/3624	5	Aux Bay Unit 4 Level 20.6
0.90/3706 S1	8	Aux Bay Unit 2 Level 20.6
0.90/3747	9	Aux Bay Unit 1 Level 20.6

2.3 DIESEL GENERATOR BUILDING

2.3.1.1 Description of the *Works*

The *Contractor's* scope of work consists of the following:

- Supply and installation of vertical bracing to the masonry walls, as per the *Employer's* design.
- Installation of ring beams to external columns, as per the *Employer's* design (refer to Appendix G).
- Install bracing to interior masonry walls as per the *Employer's* design.

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- Due to congestion of the area and interfaces with existing infrastructure it is advisable that the Contractor do a site walk down.

Refer to the verification report 366-144268 Kusile Diesel Generator Structural Design Verification Report and 240-124865764 Engineering Impact Assessment Diesel Generation Building.

2.3.1.2 Drawings issued by the Employer

The following is issued to the Contractor for construction:

Drawing number	Revision	Title
0.90/40002	01	Diesel Generator Building 15 tonne Crawl Beams General Arrangement of Steelwork
0.90/40002	03	Diesel Generator Building General Arrangement of Steelwork Elevations
0.90/40002	03	Diesel Generator Building General Arrangement of Steelwork Roof Plan and Sections B-B to C-C
0.90/137	15	Kusile Power Station Layout

2.4 TUNNEL FIRE BARRIERS

2.4.1 Description of the Works

The Contractor's scope of work consists of the following:

- To supply and construct tunnel fire barriers in accordance with the Employer's design (refer to Appendix H). Refer to drawing 0.90/93230 Kusile Power Station Tunnel and finishes fire walls and doors key plan and Table below.

:

Cable tunnel fire door key and type of closing:

Door Number	Building	Description
58	Tunnel	Fire Wall
59	Tunnel	Door - Normally OPEN

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64	Tunnel	Fire Wall
65	Tunnel	Door - Normally OPEN
66	Tunnel	Fire Wall
70	Tunnel	Fire Wall
71	Tunnel	Fire Wall
72	Tunnel	Fire Wall
76	Tunnel	Fire Wall
77	Tunnel	Door - Normally OPEN
78	Tunnel	Fire Wall
81	Tunnel	Fire Wall
82	Tunnel	Fire Wall
83	Tunnel	Door - Normally OPEN
84	Tunnel	Fire Wall
88	Tunnel	Fire Wall
89	Tunnel	Fire Wall

2.4.2 Drawings issued by the *Employer*

The following is issued to the *Contractor* for construction:

Drawing number	Revision	Title
0.90/24127 Sheet 1	4	Auxiliary Bay Unit 1 Tunnel Smoke Detection Layout

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0.90/24127 Sheet 2	3	Auxiliary Bay Unit 2 Tunnel Smoke Detection Layout
0.90/24127 Sheet 3	3	Auxiliary Bay Unit 3 Tunnel Smoke Detection Layout
0.90/24127 Sheet 4	3	Auxiliary Bay Unit 4 Tunnel Smoke Detection Layout
0.90/24127 Sheet 5	3	Auxiliary Bay Unit 5 Tunnel Smoke Detection Layout
0.90/24127 Sheet 6	3	Auxiliary Bay Unit 6 Tunnel Smoke Detection Layout
0.90/93230 S1	4	Kusile Power Station Tunnel and finishes Fire walls and Doors key plan
0.90/93228 S1	7	Tunnel Fire wall 2
0.90/93229 S1	7	Tunnel Fire wall 3
0.90/93227 S1	7	Tunnel Fire wall

2.5 WWTP FILTER PRESS WALL COATING

2.5.1 Description of the Works

Kusile's Wastewater Treatment Plant (WWTP) has 3 filter press solid bunkers (figure below) and 2 centrifuge salts bunkers that where hazardous waste produced by the plant is discarded into. In order to protect these concrete bunkers from chemical attack the concrete surfaces need to be lined with appropriate epoxy coatings.

Epoxy coatings applied to these bunkers at the moment are not fit for purpose and need to be replaced. The epoxy coating would need to withstand a vast temperature range and also be able to withstand the elements.

The *Contractor's* scope of work consists of the following:

- Remove existing coatings applied to concrete surfaces in the above mentioned 5 bunkers.

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- Prepare concrete surface and apply the products specified (refer to Appendix I).

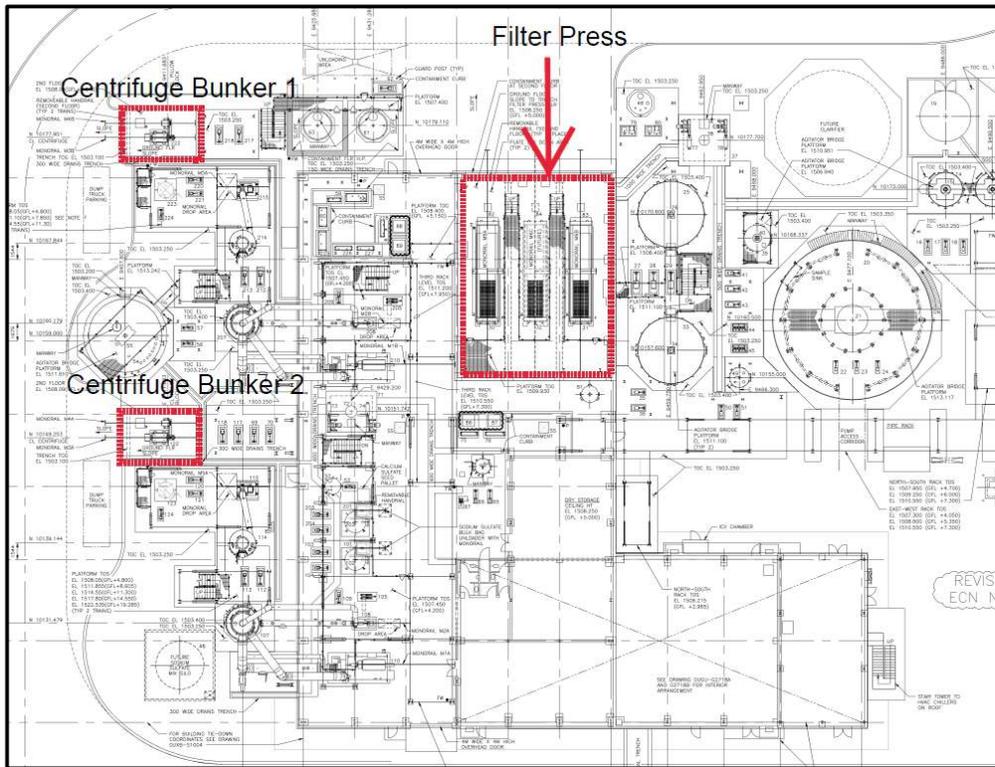


Figure 1: Filter Press Location

2.5.2 Drawings issued by the Employer

The following is issued to the Contractor for information:

Drawing number	Title
0.90/95652 Rev 6	WASTEWATER TREATMENT PLANT-FDNS PLATE FILTER PRESS ENCLOSURE - PLANS
0.90/95653 Rev 5	WASTEWATER TREATMENT PLANT-FDNS PLATE FILTER PRESS ENCLOSURE – SECTIONS & DETAILS
0.90/100893 Rev 2	WASTEWATER TREATMENT PLANT-FDNS NORTH CRYSTALLIZER CENTRIFUGE PLANS, SECTIONS, & DETAILS

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0.90/100894 Rev 3	WASTEWATER TREATMENT PLANT-FDNS SOUTH CRYSTALLIZER CENTRIFUGE PLANS, SECTIONS, & DETAILS
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2.6 LIME AND SODA ASH OFFLOADING FACILITY

2.6.1 Description of the Works

The *Contractor's* scope of work consists of the following:

- Procurement of all required construction material for the *Works*
- Construction of the lime and soda ash offloading facility.

2.6.2 Drawings issued by the Employer

The following is issued to the *Contractor for construction* (refer to Appendix J):

Drawing number	Revision	Title
0.90/71631	9	Kusile Power Station – Site Finishing – Site Plan – Area 8D
0.90/71632	4	Kusile Power Station – Site Finishing – Site Ancillary Roadworks – Area 8D
0.90/73971	3	Kusile Power Station – Wastewater Treatment Plant – FDNS Key Plan
0.90/95573	6	Kusile Power Station – Wastewater Treatment Plant – FDNS Silos and Reaction Tanks Plans, Sections, & Details
0.90/20093	10	Kusile Power Station – Terrace Underground Facilities – Site Plan – Area 14
0.90/157594	0	Kusile Power Station – Wastewater Treatment – Silos and Reaction Tanks Plans, Sections & Detail
0.90/137	01	Kusile Power Station Layout

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2.7 AUX BAY UNIT 6 FIRE WALL

2.7.1 Description of the Works

The *Contractor's* scope of work consists of the following:

- To supply and construct 2-hour fire rated wall in accordance with the *Employer's* design (refer to Appendix K). The fire wall is located at the Aux Bay unit 6, 0m level between grid line 76 and 78 on the Turbine side.

2.7.2 Drawings issued by the Employer

The following is issued to the *Contractor for construction* (refer to Appendix K):

Drawing number	Revision	Title
0.90/3537	1	Kusile Power Station – Aux Bay Unit 6 – Level 0.000
0.90/3543	1	Kusile Power Station – Aux Bay Unit 6 – Section C-C East Elevation

2.8 BOILER FUEL OIL PUMP HOUSE BUILDING

2.8.1 Description of the Works

The *Contractor's* scope of work consists of the following:

- To supply and seal all pipe and cable entry openings (see figures 2 & 3) in the Boiler Fuel Oil Pump House Building using a 2-hour fire-rated Pyro-Cote KBS panels in two layers of 50mm or any similar product.
- The panels are to be wedged in between the cable trays and into the channel frames.
- The panels are to be custom fitted in between pipes and structural walls.
- All panels to be sprayed with KBS coating or similar product after installation to seal around cables, pipes, or any other openings.
- All installed panels are required to be weatherproof.

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Figure 2: Typical Cable Tray entry



Figure 3: Typical Pipe entry

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2.8.2 Drawings issued by the Employer:

The following is issued to the Contractor for construction (refer to Appendix L):

Drawing number	Revision	Title
B114115-50-45- ID09-00001-AM	13	Kusile Power Station: Fuel Oil Plant Pump House Building – Architectural Layout Plan

3 GENERAL

1. The *Contractor* is responsible to provide the Works.
2. The *Contractor* 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 National Building Regulations and SANS 10400 for all *works*.
3. The *Contractor* provides all labour, gear and tools, vehicles, rigging tackle, temporary works/ scaffolding, consumables, bulk mixing plant, Equipment and cleaning materials required to provide the Works. The *Contractor* supplies/ procures Plant and Material, fabrication, manufacturing, shop detailing, handling, transportation, storage, testing, delivery, off-loading and erection/construction, disposal of debris and finishing complete in every detail of works. The Contractor constructs any works that can be reasonably inferred from this Employer's specifications and drawings unless otherwise stated.
4. No deviation from this Technical Specification and its referenced documents is permissible without documented acceptance from the Project Manager. The Contractor includes a list of exceptions and/or clarifications in the form of Appendix as part of his tender. This list of exceptions and/or clarifications includes the section deviated from as reference number, the requirement in question and a detailed explanation of the deviation. In the event of conflicts or discrepancies between any of the specifications, the *Contractor* notifies the *Project Manager* for resolution in writing.
5. The *Contractor* ensures that all units are in Metric Units.
6. Where the referenced codes and standards contain recommendations in addition to the *Employer's* requirements, the recommendations are considered as requirements and are followed, by the *Contractor*, unless stated otherwise. The *Contractor* implements the requirements from the *Employer's* specifications for cases where the *Employer's* specifications are more stringent than what is provided in a code or standard.
7. The use of any codes/standards not specifically identified in the *works* is subject to acceptance by the *Project Manager*. The *Contractor* supplies such codes/standards to the *Project Manager* for verification, prior to acceptance or rejection of the *Contractor's* design. The *Project Manager*, before reviewing the *Contractor's* design, is entitled to request such standards for acceptance. The Contractor redesigns the works at his own cost if the Contractor, in his design, adopts standards that have not been accepted by the Project Manager.
8. The Contractor Submits a comprehensive method statement of the entire works to the Project Manager for acceptance prior to the start of the works.

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9. The Contractor submits a project specific safety file to the Project Manager for comments/ acceptance.
10. The Contractor submits a detailed level 3 schedule for the works to the Project Manager for acceptance after contract award.
11. The Contractor take all necessary precautions to ensure that none of the existing plant that is not in the scope of works is damaged during execution of the works.
12. The Contractor store salvaged components elevated off the ground to protect from ingress of dust and rainwater, etc.
13. The Contractor manages his access to the Working Areas and the Site.
14. The Contractor manages his activities on Site to ensure that no interference takes place between his work and that of others.
15. The Contractor completes "Contract Activities Daily Reports".
16. The Contractor liaise with the Project Manager regarding utilities and telephone facilities required for his Site establishment.
17. The Contractor liaise with the Contracts / Project Manager regarding the location of waste disposal sites and rubbish dumps.
18. The Contractor maintain and promote labour harmony on the Site and at the working environment.
19. The Contractor immediately reports any potential labour disharmony to the Contracts Manager / Project Manager.
20. The Contractor shall not recruit or employ any personnel from the Employer, Subcontractors and Others, without prior acceptance of the Contracts Manager / *Project Manager*.

4 CONTRACTOR'S DESIGN

The *Contractor* assumes full responsibility for the design that is specified in the aforementioned sections of the *Works* which specifically call out the Contractor to take design accountability. Where the *Employer* has provided design requirements and a contradiction occurs, the most stringent requirement applies. This is also to be highlighted to the Employer for consideration.

The *Contractor's* design includes the work which, although it may not be expressly noted, can reasonably be inferred from the Works Information, including temporary works.

It is the *Contractor's* responsibility to provide design and construction which is fit for purpose, in accordance with sound engineering principles and prudent industry practice. The *Contractor* and his subcontractors perform the *Works* in compliance with legislation, rules and regulations, applicable national and international engineering codes, environmental standards, other applicable standards, statutory requirements and this Works Information.

If the *Contractor* considers that additional plant and/or materials are necessary for the operation of the Plant or the *Employer's* design, the *Contractor* submits his proposals, including cost and time implications, to the *Project Manager* for acceptance. The *Contractor* only proceeds with the implementation of his proposal once acceptance from the *Project Manager* is received.

Where the *Contractor* requires additional information to design or install certain components of the Plant or the *Employer's* design, the *Contractor* notifies the *Project Manager* of the *Contractor's* requirements a week before continuing with the *Works*.

The *Project Manager* may review, but will not accept, the *Contractor's* work to check compliance with the Technical Specification, the responsibility to ensure compliance remains with the *Contractor*. The *Contractor* supplies as-built information and drawings of all components he designed to the *Employer* prior to handover.

The *Contractor* is responsible to provide site supervision for all works designed by the *Contractor*. The *Contractor* ensures that the construction is carried out in accordance to the *Contractor's*

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design and his construction drawings.

The *Contractor* submits the certified detailed calculations, for all designs carried out by the *Contractor*, to the *Project Manager* for his acceptance prior to the start of construction.

Design calculations include, at minimum, the following:

- Design philosophy
- Assumptions made with regard to the design (verified and unverified)
- Design criteria/ parameters used;
- List of applicable codes and literature that was used in the design
- Design results and calculations for all elements;
- Software input and output files including design models.
- Materials used; and
- Submit an Operation and Maintenance Manual, where applicable;
- Submit multidisciplinary detailed design drawings for the full scope of work, capturing all necessary details;
- Submit results of all further investigation including the raw data and result of any testing/investigations and recommendations based on findings.

The *Contractor's* designs are accepted by a professionally registered engineer, registered with the Engineering Council of South Africa (ECSA). The *Contractor* is mandated in terms of Construction Regulations 2014: Duties of Designer, 6(1) g to fulfil the duties described therein. Any risk associated with the *Contractor's* design is highlighted to the *Employer* together with mitigation measures. These risks are included in the risk register.

4.1 USE OF THE *CONTRACTOR* DESIGN

All documentation, as specified in this Works Information, forms part of the *Works* and is supplied to the *Project Manager* by the *Contractor*. The *Employer* reserves the right to issue the *Contractor's* design or drawings to other contractors for purposes pertaining to Kusile Power Station. The *Employer* has total rights to use the design as the *Employer* requires. The *Contractor* notes that all drawings and other documentation supplied to the *Employer* become the property of the *Employer* upon completion of the *Works*.

4.2 PROFESSIONAL ENGINEERING CERTIFICATION

The *Contractor's* professional engineer who is registered with the Engineering Council of South Africa **provides design certification for all his designs and where stipulated in this report as well as Professional certification for all construction work** in accordance with SANS 10400-A, declaring the design and construction "fit for purpose" in terms of the relevant design codes and the OHS Act.

Where the *Contractor* is appointed for both design and construction monitoring, the *Consultant* is required to provide a 2-part certification:

- The first certificate is issued after the completion of the design (as above),
- The second certificate is issued upon completion of the construction in accordance with SANS 10400-A, declaring that the construction was carried out in accordance with the approved design and the OHS Act.

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A professional structural engineer who is registered with the Engineering Council of South Africa (ECSA) provides both certifications.

4.3 GENERAL LIST OF APPLICABLE STANDARDS

All references to standard/codes/publications are to be the latest issue of each, together with the latest additions and/or amendments thereto, as of the date of contract, unless otherwise indicated. This list is not all-inclusive and does not relieve the *Contractor* from complying with all applicable codes.

Table 1: List of applicable standards for structural design

Code	Description
240-56364545	Structural Design and Engineering Standard
240-56364535	Architectural Design and Green Building Compliance Manual
240-85549846	Standard for Design of Drainage and Sewerage Infrastructure
240-53113685	Design Review Procedure
GGP0448	Eskom Pressure Testing Standard
SANS 2394	General reliability of structures
SANS 10085	The design, erection, use and inspection of access scaffolding Part 1: Steel access scaffolding
SANS 10104	Hand railing and balustrading (safety aspects)
SANS 10163	The structural use of timber
SANS 10243	The design, manufacture and erection of timber trusses
SANS 10326	Structural bearings – the design of bridge bearings
SANS 10329	The design and construction of sectional steel tanks for storage of liquids at or above ground level
SANS 13822	Basis for design of structures – Assessment of existing structures
SANS 14399	High strength structural bolting
SANS 14713/ ISO 14713	Protection against corrosion of iron and steel in structures – zinc and aluminium coatings – guidelines
ANSI/AWS A5.18/A5.18M	Specification for carbon steel electrodes and rods for gas shielded arc welding
EN 10025	Hot rolled products of structural steels
Red Book	Southern African Steel Construction Handbook
Yellow Book	Structural Steel Detailing
Green Book	Structural Steel Connections

5 EMPLOYER'S DESIGN

1. The extent of the *Employer's* design is as described in the *Employer's* drawings.
2. The *Contractor* carries out all *Works* as indicated in the drawings issued by the *Employer*.
3. The *Employer* has no design responsibility for the *Contractor's* portion of the *Works*.
4. The *Contractor* brings to the *Project Managers* attention, any changes that are required to the *Employer's* design. All changes proposed by the *Contractor* are motivated and submitted as a

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mark-up of the *Employer's* design documents for acceptance by the *Project Manager*. The engineering change process is used to update the *Employer's* design.

5. The design remains the property of the *Employer*.

6 DRAWINGS

6.1 LIST OF APPLICABLE STANDARDS

All references to standard/codes/publications are to be the latest issue of each, together with the latest additions and/or amendments thereto, as of the date of contract, unless otherwise indicated. This list is not all-inclusive and does not relieve the *Contractor* from complying with all applicable codes.

Table 2: List of applicable standards for drawings

Code	Description
SABS 048-1	Microfilming engineering drawings and producing prints from microfilm: Part 1 – Recommended procedure and aperture card
SANS 10111	Engineering drawing principles
SANS 10143	Building Drawing Practise - architectural drawings, buildings, drawings, graphic symbols, layout, letters (symbols), symbols, technical drawing
36-943	Engineering Drawing Office and Engineering Documentation Standard
240-86973501	Engineering Drawing standard - common requirements - Lists and standardises all requirements for Engineering drawings. Which includes: classification, format, changes, issuing, numbers, review, Title blocks and sizes
240-107305502	SmartPlant Data Take-On Strategy
240-53113685	Design Review Procedure
240-53665024	Engineering Quality Manual
240-53114186	Document and Records Management
240-107305436	SmartPlant Reference Data Catalogue Data Work Instruction (non-piping content)

6.2 STANDARD CLAUSES

All references to codes and standards as per the *Employer's* drawings apply. The publications associated to these references are to the latest issue of each, together with the latest additions and/or amendments thereto, as of the Contract Date, unless otherwise indicated. This list is not all-inclusive and does not relieve the *Contractor* from complying with all applicable codes.

The *Contractor* ensures that creation, issuing and control of drawings are in accordance with the *Employer's* Engineering Drawing Standard (240-86973501). The *Contractor's* structural steel and concrete drawings further complies with SANS 10143 Building Drawing Practice and the Southern African Structural Steelwork Detailing Manual by the Southern African Institute of Steel Construction.

The *Contractor* submits editable electronic drawings in MicroStation (DGN/DWG) format and in PDF format. Drawings issued to the *Employer* are not "Right Protected" or encrypted as the *Employer* is required to conduct the necessary configuration management on these documents upon receipt.

Drawings submitted by the *Contractor* to the *Project Manager* for acceptance includes signatures as required by Eskom Engineering Drawing Standard (240-86973501).

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Electronic drawings have a water mark indicating the approval phase of a drawing and hardcopies are to be stamped to indicate the approval phase.

The *Contractor's* drawings are complete in every respect (including welding details which are fully described) and are checked by the *Contractor* prior to submission to the *Project Manager* for acceptance. All drawings show full endorsement by a professionally register engineer with ECSA (including the ECSA registration number and signature on all drawings).

Any drawing prepared or made for the purpose of carrying out the *Works* is the property of the *Employer* and may be used by the *Employer* as the *Employer* deems fit.

6.3 DETAILED ENGINEERING DRAWINGS ISSUED BY *CONTRACTOR*

The *Contractor* prepares detailed engineering drawings for all the components of the *Works* which the *Contractor* designs. The *Contractor* submits these drawings to the *Project Manager* for his acceptance.

In addition to the prescribed codes and standards, drawings conform to the following minimum requirements:

- Each drawing set have an overview drawing which shows the overall layout of the system relevant to the drawing, with references to drawings where the details of the components depicted in the overview drawing can be found. The drawing referencing system incorporated in a set of drawings allow for drawings to be efficiently navigated, where details of components are easily found.
- The Contractor is to continually supply an up-to-date Master document list.
- A design drawing package is issued with one drawing number and multiple sheets, instead of multiple drawing numbers. The breakdown of the drawing packaging is sent to the *Project Manager* for acceptance.
- Drawings containing references to interfacing systems and to other applicable/relevant drawings includes the *Employer's* drawing number as well.
- The reference drawing list must include the *Employer's* (Eskom) drawing number. The *Employer's* drawing number is referenced in all communications and documentation.
- Drawings contain parts lists of all the components depicted in the drawing set. These parts lists include at minimum the following information:
 - Number label of the part in accordance to the numbering convention indicated on the drawing,
 - Description of the profile of the part (if it is not a standard profile, the dimensions are provided),
 - Length of the part,
 - Quantity of the part,
 - Description of the part,
 - Material specification and reference to the relevant material standard/code for the part.
- Welding details are in accordance with the Standard for Welding Requirements on Eskom Plant (240-106628253).

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- All connection details are indicated on drawings, including, but not limited to, weld sizes, weld lengths, weld types, weld material, bolt sizes, bolt material, bolt hole dimensions, spacing between bolts and stiffener plate dimensions.
- All dimensions of structural mechanical equipment and associated structures are provided. No dimensions are obtained from a drawing by scaling.
- Tolerances for the design are clearly indicated on the drawings.
- The final detailed engineering drawings that are issued for construction are on revision 0. Drawings submitted prior to that, have revisions of 0.1, 0.2 or a, b, c etc.
- All cells in the drawing title block needs to be populated and completed before the drawing is signed off.

6.4 DETAILED ENGINEERING DRAWINGS ISSUED BY *EMPLOYER*

Immediately upon receipt of the *Employer's* design drawings, the *Contractor* satisfies himself that the drawings contain all the information required for the preparation of his own shop drawings and supporting calculations, together with any other necessary details.

6.5 FABRICATION AND ERECTION DRAWINGS

The *Contractor* develops fabrication (shop drawings) and erection drawings for all civil and structural components of the *Works* to be issued for construction, together with mark-ups of the as-built condition of the Plant.

The *Contractor's* fabrication drawings and supporting calculations are submitted to the *Employer* for his acceptance prior to the start of fabrication. The acceptance given by the *Project Manager* does not absolve the *Contractor* from the liability and responsibility for the accuracy of the drawings.

6.6 DEMOLITION AND DISMANTLING DRAWINGS

The *Employer* provides drawings that indicate the components of the structure which is to be demolished at a high level. The *Contractor* uses the *Employer's* drawings to create demolition requirements which are presented on drawings by the *Contractor*. The *Contractor* ensures structural stability is maintained for all conditions of demolition/dismantling. The *Contractor* submits detailed demolition and dismantling method statements to the *Project Manager* for acceptance prior to any work being carried out. Included in this method statement are all drawings and design calculations required for the demolition/dismantling.

6.7 AS-BUILT DRAWINGS

The Contractor develops as-built drawings for all the components of the Works which he designed. The Contractor submits these drawings to the Project Manager for his acceptance 10 day after construction.

Any and all changes required for construction or manufacturing that impact or change the Employer's design is redlined on drawings by the Contractor. The redline drawings include notes for clarification purposes. The engineering change process will be used in the case of any design changes. The Contractor submits the redlined drawings to the Project Manager for his acceptance and includes the final redlined drawings in the data

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7 CONSTRUCTION

7.1 LIST OF APPLICABLE STANDARDS

All references to standard/codes/publications are to be the latest issue of each, together with the latest additions and/or amendments thereto, as of the date of contract, unless otherwise indicated. This list is not all-inclusive and does not relieve the *Contractor* from complying with all applicable codes.

Table 3: List of applicable standards for construction

Code	Description
SANS 14	Cast Iron Fittings
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 1056-2	Ball Valves Part 2: Heavy Duty Valves i (Not fire-safe)
SANS 1056-3	Ball Valves Part 3: Light Duty Valves (Not fire-safe)
SANS 1123	Steel Pipe Flanges
SANS 4427	High Density Polyethylene Piping
SANS 1200	Standardised specification for civil engineering construction
SANS 1393	Construction management systems - Requirements
SANS 1921	Construction and management requirements for works contracts
SANS 2001	Construction works
SANS 3001	Civil engineering test methods
SANS 10120	Code of practice for use with standardised specifications for civil engineering construction and contract documents
SANS 10145	Concrete masonry construction
SANS 10329	Design and construction of sectional steel tanks for storage of liquids at or above ground level
SANS 10400	The application of the National Building Regulations
SANS 10403	Formatting and compilation of construction procurement documents
SANS 10845	Construction procurement
SANS 18173	Non-destructive testing – general items and definitions
NSF61	Piping and materials used for potable water service
OHS Act 85 of 1993	Construction Regulations, 2014
NKP Act 102 of 1980	National Key Point Act, 102 of 1980
EPA	South African Environment Protection Act
Eskom Standard SSZ_45-17	Corrosion Protection of Medupi Power Station Corrosion Protection Specification
AWS D1.1	Structural welding code – steel
SANS 50025	Hot rolled products of structural steels
32-245	Eskom Waste Management Standard
32-727	Eskom Safety, Health, Environment and Quality (SHEQ) Policy

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Code	Description
SANS 14	Cast Iron Fittings
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SANS 191	Cast Steel Gate Valves
SANS 1056-2	Ball Valves Part 2: Heavy Duty Valves i (Not fire-safe)
SANS 1056-3	Ball Valves Part 3: Light Duty Valves (Not fire-safe)
SANS 1123	Steel Pipe Flanges
SANS 4427	High Density Polyethylene Piping
240-105020315	Standard for Low Pressure Valves
240-72273656	Power Generation Asset Critical Classification Standard
240-123801640	Standard for Low Pressure Pipelines
240-83539994	Standard fo on Eskom Plant
240-105658000	Supplier Quality Management Specification
240-106365693	Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings
240-106628253	Standard for Welding Requirements on Eskom Plant
240-107981296	Constructability Assessment Guideline
240-144332407	Guideline for Eskom Power Stations Concrete Remedial Work

7.2 STANDARD CLAUSES

The *Contractor* carries out the civil, structural and building portion of the *Works* in accordance with the Occupational Health and Safety Act (85/1993): Construction Regulations, 2014 and the National Building Regulations.

The *Contractor* provides all labour, installation tackle, gear and tools, vehicles, rigging tackle, temporary works/ scaffolding including any geotechnical works required, craneage and foundations for such, consumables, bulk mixing plant, site workshops, site offices, stores, facilities, Equipment and cleaning materials required to Provide the *Works*. The *Contractor* is responsible for the supply/ procurement of Plant and Material, fabrication/manufacturing, shop detailing, painting/ galvanising, handling, shipping, storage, testing, delivery, off-loading, erection/construction, disposal of debris, final painting and finishing complete in every detail of structural steelwork, concrete structures, miscellaneous support steel and concrete, access platforms, staircases, foundations, Equipment and spares required to supply the *Works*. The *Contractor* is responsible to construct any works that can reasonably be inferred from this Technical Specification

The *Contractor* provides all the test equipment for testing, the sub-assemblies and the functional groups for site testing, commissioning and performance testing.

The *Contractor* provides all necessary temporary works required to complete the *Works*. This includes scaffolding, suspended platforms, rope access work, material hoists, cranes, services etc.

The *Contractor* carries out manufacturing and proves standards of quality by means of inspections at every stage of the project.

During the erection period, the *Contractor* as a builder and/or user of machinery performs 'building work' in terms of OHS Act. The *Contractor*, before taking occupation on a Site, obtains a permit to work from the *Project Manager*. Before a part of the Site is released for access to others, the said

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part conforms to the safety requirements of OHS Act. The party taking access then becomes the 'User' in terms of the OHS Act. The releasing of a part of the Site in the above described manner does not relieve the 'Contractor Giving Access' of any of his obligations in terms of his contract with the *Employer*. No unauthorised person(s) enters into any prohibited/restricted area. Daily dairies/logs/data books are kept and signed by the *Contractor* and are also signed off daily by the *Supervisor*. The following is to be recorded (as a minimum) in the daily diaries:

- Manpower and Equipment used,
- Weather conditions,
- Description of any unique occurrences, incidents or accidents,
- Delays and reasons for the delays,
- Industrial relations abnormalities,
- Interface and access problems,
- Description of activities to be performed,
- Recording of on-site tests, for example a concrete slump test.

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

- The *Contractor* is restricted to the Site;
- The *Contractor* is not to enter any other areas and ensures that his employees abide by the regulations;
- The *Contractor* performs all hoisting and lifting by qualified riggers;
- The *Contractor's* Equipment does not impair the operation or access to the plant;
- The *Contractor* provides any temporary or expendable materials required for the storage of material;
- The *Contractor* safeguards and secures all items whilst in the *Contractor's* custody and control, until completion of the *Works*;
- The adjacent plant and equipment are not modified without written permission from the *Project Manager*. Modification in this sense includes, but is not limited to the following:
 - Welding onto existing plant,
 - Drilling into structural steel or concrete,
 - Cutting or removing
 - Loading adjacent structures.

The construction of the civil and structural portion of the *Works* is in accordance with the relevant sections of the Occupational Health and Safety Act (85/1993): Construction Regulations and standardised specifications listed in Table 3.

The *Contractor* ensures that a complete QCP, risk assessment, method statement, ITP and temporary works calculations accompanied by a rigging study, where applicable are submitted to the *Project Manager* for review and acceptance before the *Works* can commence. During reviews of the ITPs, the *Employer* provides the necessary intervention points.

All items that are assembled and constructed off site are listed and provided to the *Project Manager*. From this an ITP is developed between the *Project Manager* and the *Contractor* to determine the intervention points.

The *Contractor* has previous relevant experience with regard to the construction of the *Works*. The *Contractor* submits the previous work experience of his Construction Manager. The *Contractor* submits a company profile which includes:

- A list of traceable references that adequately proves that the *Contractor* (or their Sub-Contractor) has the relevant experience with regard to the civil/ structural/ structural mechanical aspects of the *Works*;
- Organogram; and
- The relevant qualifications and previous work experience of the key personnel. Key personnel have a minimum of five years of relevant civil and structural experience with regard to the *Works*.

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7.3 WORK METHOD STATEMENT

The *Contractor* provides a detailed work Method Statement for each activity of his work, together with activity durations. In addition to a description of the method of constructing the *Works*, the *Contractor*, in his work Method Statement, includes the following as a minimum:

- The scope of the particular Method Statement;
- A comprehensive description of the activity;
- Construction methodology and sequence of construction taking into consideration access restrictions and safety requirements;
- A clear description of the responsibilities of the *Contractor's* personnel involved in the activity, including (where applicable) his Project Manager, Site Quality Manager, Site Engineer, Health and Safety Manager, Technical Office Manager, Production Manager, Supervisor, Environmental Officer and other personnel required for the activity work;
- Reference to applicable statutory requirements and how the requirements have been taken into account;
- Health, safety and quality control for the activity;
- All plant, equipment and machinery required to complete activity;
- Quality control points as accepted by the *Project Manager*;
- Weld map. This to include (as a minimum) relevant material, dimensions, welding process, welding procedure specification number, welder qualification certificate number, NDT required, etc. for each weld number.
- Welding procedure specification for the activity including *Contractor's* Welding Procedure Specifications, Welder Qualification certificates, NDT testing procedure;
- Laydown areas requirements;
- Temporary works to be used including *Project Manager's* acceptance where such is supported off existing structures.
- Rigging studies and design calculations where applicable;
- Manufacturer's literature/ Technical Data Sheets for all materials used including product description, composition, material and performance properties, installation and application procedures, use limitations and recommendations;
- Plan for confining, collecting and disposing of broken concrete and other waste materials as a result of removal operations, where applicable;
- Works required to safeguard existing infrastructure and services; and
- Risk assessments associated with shutdown of plant/ equipment where deemed necessary, in order to execute the *Works*.

All work Method Statements include the name and qualification of the personnel working in the specified activity in conjunction with the requirements as set out in Supplier Quality Management Specification (240-105658000). All Method Statements are reviewed and accepted by *Project Manager* prior to starting any work.

7.4 GENERAL CONSTRUCTION WORK METHOD STATEMENT/CONSTRUCTION EXECUTION PLAN

As a tender returnable, the *Contractor* submits a general Construction Work Method Statement taking into consideration the various phases of the project. This Method Statement clearly illustrates how the *Contractor* accounts for the risks of this project. This Method Statement is tailored to address the specified project objectives and requirements. This Method Statement adequately deals with the critical characteristics of the project.

The Construction Work Method Statement includes, at minimum, the following:

- Constraints identified and considered by the *Contractor*;

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- Interfacing with Others; the *Contractor* illustrates an understanding of the work that is to be completed by Others and accommodates for the completion of such work in his methodology;
- Description and illustrations of a construction traffic plan, use of laydown areas and plot plan.
- Shifts and hand overs for the various sections of the *Works*, this information is to enable the *Employer* to integrate the programmes of the various contractors;
- Detailed risk assessment which lists risks specific to the *Works* and is accompanied with associated proposed mitigations;
- List and description of plant and machinery required to carry out the civil and structural components of the *Works*;
- A clear description of the responsibilities of the *Contractor's* personnel involved with the *Works*, including (where applicable) his Project Manager, Site Engineer, Supervisor and other personnel required for the civil and structural *works*.
- Construction sequencing considerations, which take into account the constraints as indicated in this Works Information.
- A Concrete Works Method Statement (where applicable) which describes the following as a minimum:
 - Testing procedures;
 - Concrete placing and curing;
- A Steelworks Method Statement (where applicable) which describes the following as a minimum:
 - Erection procedures which includes considerations for modularisation and construction sequencing, including a lifting and rigging plan;
- An Earthworks Method Statement which describes the following as a minimum:
 - Excavation and earthworks construction.
 - The *Contractor* submits a new Construction Work Method Statement, a month prior to commencing with any construction activities and after Contract Award, which covers all the aspects listed in Section 8.3. and any additional requirements or changes arising from negotiations or clarifications, for acceptance by the *Project Manager*.

7.5 DEMOLITION AND DISMANTLING

The *Contractor* complies with the requirements of the Construction Regulations for demolition and dismantling of structures. All rubble is removed from Site by the *Contractor* and disposed of at the designated site immediately; the location of disposal is agreed upon with the *Project Manager*. This is in accordance with the Employer's standard: 32-245, Eskom Waste Management Standard.

Mechanical demolition is preferred. The *Contractor* develops a demolition and dismantling method statement complete with drawings that clearly indicates the various demolition phases. Full details of the demolition procedures and methods are provided to the *Project Manager* for review and acceptance.

7.6 CRITICAL INTERFACES

The *Contractor* interfaces with Others on Site and shares the Working Areas with them. The *Contractor* provides the *Project Manager* with requirements such as consumer power requirements, sewage and potable water requirements and termination interface requirements in order to complete the installation of the *Works*.

The *Contractor* is responsible for all system interfaces which forms part of the *Works*. The *Contractor* closely coordinates with Others to carry out the *Works*.

The *Contractor* interfaces with the *Employer* with regard to routine maintenance and other refurbishments carried out at the station, if applicable.

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7.7 CONSTRUCTION MONITORING

The *Contractor/Employer* provides the required level of construction monitoring, to ensure that the construction is completed in accordance with the approved design. The *Contractor* appoints a qualified Engineer to perform the following construction monitoring tasks as a minimum:

- Technical quality assurance during construction to ensure that the construction is executed as per the approved design, specifications and procedures;
- Witnessing and approval (by signature) of intervention points where applicable to Engineering;
- Raising Notice of Defects, where work performed by the *Contractor* is not in compliance with the approved design and specifications;
- Review and acceptance by signature of construction data books, as-built drawings and Operations and Maintenance manuals (where applicable) developed by the *Contractor*;
- Review and acceptance by signature of construction loading and temporary works calculations produced by the *Contractor* including the overall effect it has on existing structures, where so impacted;
- Review and acceptance by signature of the *Contractor's* quality control plan, method statements, rigging philosophies where supported of existing infrastructure, and fabrication drawings;
- Review and acceptance by signature of *Contractor's* Welding Procedure Specifications, Welder Qualification papers, NDT testing reports, Visual Inspection reports, Fall Protection Plans, Working at Heights Plans;
- Responding to technical queries and clarifications from the *Contractor* utilising documentation templates provided by the *Employer*;
- Documenting comments resulting from review of *Contractor* submissions through the *Employer's* SharePoint system;
- Certification following construction in accordance with SANS 10400-A, by a professional engineer who is registered with the Engineering Council of South Africa, declaring that the construction was executed in accordance with the approved design and the OHS Act. Refer.

7.8 TEMPORARY WORKS

The *Contractor* is responsible for all temporary works that is used by the *Contractor* to complete the *Works*. The *Contractor* submits all designs or proposals for temporary works to the *Project Manager*. The *Project Manager* reviews but does not accept the temporary works. The *Project Manager* comments on the effectiveness, necessity or risk of the temporary works or Equipment, to allow the *Contractor* to Provide the *Works* efficiently and without delay.

The *Contractor* designs, procures, manufactures and constructs all temporary works required for the execution of the *works*. The *Contractor* dismantles/demolishes temporary works when such works are no longer required.

The *Contractor* designs all temporary *works* necessary to execute the *works* in accordance with the applicable codes and standards stated in [Table 3].

The *Contractor's* appointed ECSA professionally registered structural engineer:

- Reviews and approves (by signature) the designs and drawings of all temporary works and additional supports and method statements produced by the *Contractor*; and
- Supervises, inspects and approves the *Works* as per such.

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All temporary works designs where supported from the existing structure are submitted to the *Project Manager* for review and acceptance, to prove that the members of the existing structure can withstand the induced load. The *Contractor* submits all design calculations, in a design report which includes, but is not limited to, all inspection reports, survey data, structural analysis models, assumptions, drawings/sketches, rigging studies etc.

The *Contractor* takes note that review and acceptance of any document/ drawing/ design calculations by the *Employer* in no way relieves the *Contractor* of his liability for the *Works*. The *Contractor* remains liable for all *works* conducted as per this Scope of *works*.

7.9 CORRECTION OF DEFECTS

The *Project Manager* cannot certify Completion until all the work is free of Defects which would have, in his opinion, prevented the *Employer* from using the *Works* and Others from doing their work.

7.10 EXCAVATIONS

No excavations are permitted without an excavation permit obtained from the Project Manager. The *Contractor* complies with the requirements of the Construction Regulations. Excavations are performed such that it imposes a minimum restriction on access to Site for Others. Excavation permits are only issued if the area has been scanned by the *Contractor*, to ensure that there are no underground services in the area to be excavated. Refer to 32-727, Eskom Safety, Health, Environment and Quality (SHEQ) Policy.

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:
 - a) The *Contractor* excavates the sides of excavations which are not positively supported to slopes which will remain stable;
 - b) 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;
 - c) 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.

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7.11 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	<p>This Sub-Clause is deleted and the following classifications of material applies:</p> <p><u>Hard Material</u></p> <p>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.</p> <p><u>Soft Material</u></p> <p>All material not classified as hard material is classified as soft material</p> <p>NOTE: Should the <i>Contractor</i> consider that any material to be excavated can only be removed by explosives, he is required to submit a written request to the <i>Project Manager</i> for his ruling. Failing such a request, the excavations are deemed to be in soft material.</p> <p>The decision of the <i>Project Manager</i> 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.</p>
4.1.5.1	Topsoil is conserved
4.2.2.1.3	Sides off excavations are not used as formwork

7.12 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.

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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: <ul style="list-style-type: none"> • drying shrinkage on fine and coarse aggregates; • drying shrinkage of concrete; • flakiness index of the stone; • 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: <ul style="list-style-type: none"> • The trade name of the admixture, its source and the manufacturers' recommended method of use. • Typical dosages and possible detrimental effects of under and over doses. • Whether compounds are likely to cause corrosion of the reinforcement or deterioration of the concrete. • 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. <ul style="list-style-type: none"> • Class 15 MPa/ 19 mm for Blinding/Mass Concrete (28 days), • Class 35 MPa/ 19 mm for Structural Concrete (28 days). • Class 35 MPa/ 13.2 mm for Screed/Topping

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Clause	Particular Specification
4.2.7	In general, one of the following types of non-shrink grout are required to be used: <ul style="list-style-type: none"> • Cement-based non-shrink grout, not less than 50 MPa; • Special proprietary non-shrink or expansive grout, not less than 50 MPa.
4.2.11.4	Galvanising of cover plates is required.
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: <ul style="list-style-type: none"> • Foundations (below 150 mm from finished floor level) – Rough finish is acceptable. • All concrete from 150 mm below finished floor level which receives an additional finish – Smooth finish is required • Off-shutter exposed concrete (not receiving any further finishes) – Smooth special finish is required.
4.4	Reinforcement
4.4	Add the following: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • <i>Contractor</i> submits to the <i>Employer</i> 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.

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Clause	Particular Specification
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 <i>Contractor</i> 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 <i>Employer</i> for acceptance prior to the commencement of work on site.
4.7.10	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • <i>Contractor</i> submits a detailed procedure for acceptance by the <i>Employer</i> on how he intends to carry out the repairs of structural concrete defects
4.7.22	<ul style="list-style-type: none"> • For concrete pour records, the <i>Contractor</i> submits a detailed Quality Control Plan to the <i>Employer</i> for acceptance. • In addition the <i>Contractor</i> supplies the <i>Employer</i> with two copies of these records each day covering works carried out the preceding day.

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Clause	Particular Specification
5.1	Testing
5.1.1.4	<ul style="list-style-type: none"> • 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 <i>Employer</i>
<ul style="list-style-type: none"> • 5.1.3.3 	<ul style="list-style-type: none"> • Add the following: • ..., unless no more than three batches of concrete is being mixed.
5.2	Tolerances
5.2.1.1	<ul style="list-style-type: none"> • 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.
Variations	
CI 4.7.8.2	<ul style="list-style-type: none"> • Add the following: • Should “ready-mixed” concrete be used, the uninterrupted supply of the correct volume to Site should be guaranteed.
CI 4.7.8.2	<ul style="list-style-type: none"> • Add the following: • The <i>Employer</i> 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 <i>Contractor</i> is responsible for conducting all control testing.
4.7.10	<ul style="list-style-type: none"> • Add the following: • Concrete may not be placed before the <i>Employer's</i> 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.

7.12.1 Additional Requirements and Specifications

7. 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 *Employer* in writing before casting of concrete may commence.

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- The *Contractor* is required to obtain written acceptance from the *Employer* 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 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.
- 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.

7.13 STRUCTURAL STEEL WORKS

7.13.1 List of applicable standards

All references to standard/codes/publications are to be the latest issue of each, together with the latest additions and/or amendments thereto, as of the date of contract, unless otherwise indicated. Standards referenced within the following standards are also adhered to. This list is not all-inclusive and does not relieve the *Contractor* from complying with all applicable codes.

Table 4: List of applicable standards for structural steelwork

Code	Description
SANS 121	Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods
SANS 455	Covered electrodes for manual arc welding of carbon steels
SANS 517	Light Steel Frame Building
SANS 657	Steel tubes for non-pressure purposes
SANS 679	Zinc chromate primers for steel
SANS 681	Undercoats for paints
SANS 684	Structural steel paint
SANS 1273	Fasteners for roof and wall coverings in the form of sheeting
SANS 1465	Steel castings for general engineering applications
SANS 1700	Fasteners
SANS 1921-3	Construction and management requirements for works contracts, Part 3: Structural steelwork
SANS 2001-CS1	Construction works Part CS1 : Structural steelwork
SANS 3834	Quality requirements or fusion welding of metallic materials
SANS 4042	Fasteners – Electroplated coatings
SANS 10044	Welding
SANS 10064	The preparation of steel surfaces for coating

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Code	Description
SANS 10085	The design, erection, use and inspection of access scaffolding
SANS 10094	The use of high-strength friction grip bolts
SANS 10104	Hand railing and balustrading (safety aspects)
SANS 10120	Code of practice for use with standardised specifications for civil engineering construction and contract documents
SANS 10143	Building drawing practice
SANS 10155	Accuracy in buildings
SANS 10160	Basis of structural design and actions for buildings and industrial structures
SANS 10162	The structural use of steel
SANS 10177	Fire testing of materials, components and elements used in buildings
SANS 10237	Roof and side cladding
SANS 10400	The application of the National Building Regulations
SANS 10684	Fasteners – Hot dip galvanised coatings
SANS 14399	High strength structural bolting assemblies for preloading
SANS 14713	Protection against corrosion of iron and steel in structures – zinc and aluminium coatings – guidelines (ISO 14713)
SANS 15609	Specification and qualification of welding procedures for metallic materials – welding procedure specification
SANS 15614	Specification and qualification of welding procedures for metallic materials – welding procedure test
SANS 16961	Petroleum, petrochemical and natural gas industries – Internal coating and lining of steel storage tanks
SANS 23279	Non-destruction
SANS 50025	Hot rolled products of structural steels
SANS 50028	Flat products made of steels for pressure purposes
SANS 50219	Cold formed welded structural hollow sections of non-alloy and fine grain steels Part 1 – Technical delivery
EN 10210-1	Hot finished structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery requirements
EN 10210-2	Hot finished structural hollow sections of non-alloy and fine grain structural steels – Part 2: Tolerances, dimensions and sectional properties
ANSI/AWS A5.1/A5.1M	Specification for carbon steel electrodes for shielded metal arc welding
ANSI/AWS A5.17/A5.17M	Specification for carbon steel electrodes and fluxes for submerged arc welding
ANSI/AWS A5.18/A5.18M	Specification for carbon steel electrodes and rods for gas shielded arc welding

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Code	Description
ANSI/AWS A5.20	Specification for carbon steel electrodes for flux cored arc welding
ASTM A 6/A 6Mb	Standard specification for general requirements for rolled structural steel bars, plates, shapes and sheet piling
ANSI/AWS D1.1/D1.1M	Structural welding code – steel
BS 4-1	Structural steel sections – Part 1: Specification for hot-rolled sections
DIN 1026-1	Hot rolled steel channels – Part 1: Taper flange steel channels - dimensions, masses and sectional properties
EN 10024	Hot rolled taper flange I sections – Tolerances on shape and dimensions
EN 10025-2	Hot rolled products of structural steels – Part 2: Technical delivery conditions for non-alloy structural steels
EN 10034	Structural steel I and H sections – Tolerances on shape and dimensions
EN 10056-2	Structural steel equal and unequal leg angles – Part 2: Tolerances on shape and dimensions
ISO 8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and reparation grades of uncoated steel substrates and of steel substrates after overall removal of precious coatings

7.13.2 Specification data associated with SANS 2001 CS1 – Structural steelwork

All steel materials supplied and erection of the steelwork complies with the requirements of the latest issue of SANS 2001 – CS1.

All steel elements are marked to be traceable to a specific cast or trace of steel.

Table 5: Specification data associated with SANS 2001 CS1 – Structural steelwork

Clause/No	Specification Data
Essential data	
4.1	Materials
4.1.1	“All structural steelwork is manufactured using grade S355JR steel.”
4.1.5	Structural fasteners are of the following grades and types: “All structural bolts and holding down bolts are of class 8.8 and nuts are of class 8, unless otherwise specified on the <i>Employer’s</i> drawings.”
4.2	Drawings
4.2.1.3	The format of drawings are as follows: “All drawings prepared by the <i>Contractor</i> are issued to the <i>Project Manager</i> in the form of two paper prints that are signed off in ink, one electronic printable document in “PDF” format that contains a digital signature in accordance with

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Clause/No	Specification Data
	the <i>Employer's</i> Documents and Records Management Procedure (32-6) and one editable softcopy in Native Format (.dgn or .dwg)".
4.2.4.2	Attachments to facilitate erections do not remain as part of the permanent structure.
4.2.4.4	Hole sizes for holding-down bolts in excess of 36mm diameter are as per the <i>Employer's</i> drawings. The <i>Contractor</i> requests clarification in writing from the <i>Project Manager</i> if this information is not available on the <i>Employer's</i> drawings.
4.2.4.7	Connections to allow movement are as per the <i>Employer's</i> drawings.
4.2.4.8	The requirement for machining is as per the <i>Employer's</i> design.
4.3	Workmanship (General)
4.3.1.1	All steel elements are marked to be traceable to a specific cast or heat of steel.
4.4	Workmanship (Welding)
4.4.4.3	Tack welds are not to be incorporated into the final welds.
4.5	Workmanship (Bolting)
4.5.1.3	The maximum protrusion beyond the nut is not less than 3mm, but not greater than 5mm.
4.5.1.4	Washers under nuts and bolt heads on flat surfaces are required.
5.3	Non-Destructive testing of welds (Welding)
5.3.4	Ultrasonic or radiographic examination is required for all complete joint penetration welds.
5.3.5	The requirements for non-destructive tests are as follows: <ul style="list-style-type: none"> • "50% of all fillet welds are tested with either dye-penetration (DPI) or Magnetic Particle Inspection (MPI). The testing positions for DPI and MPI are indicated by the <i>Supervisor</i>. All welds that fail the test are repaired. The scope of the welds to be tested is increased to 100% of the welds for the case where any welds fail the test." • 100% of all complete joint penetration welds are tested both with DPI or MPI and by Ultrasonic examination."
Variations	
CS1.V.1	Clause 4.2.4.2 and 4.4.4.5: All attachments to facilitate erection are removed and holes are closed up after erection.
CS1.V.2	Clause 4.4.4.3: All tack welds are removed before welding, tack welds are not to be incorporated into the final welds.
Additional clauses	
CS1.A.1	Add the following to clause 4.1.1:

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Clause/No	Specification Data
	<p>“In the event of specified steel not being available, the <i>Contractor</i> notifies the <i>Project Manager</i> in writing. The use of an alternative steel grade is subject to the acceptance of the <i>Project Manager</i>.”</p>
CS1.A.2	<p>Add the following to clause 4.1.2:</p> <p>The chemical composition and mechanical properties of all steel incorporated into structures is stated in the mill test certificates and submitted to the <i>Project Manager</i> for acceptance.</p> <p>Where required and prior to fabrication, test certificates or cast analysis certificates, or both, pertaining to the steel to be used, are supplied to the <i>Supervisor</i> by the <i>Contractor</i>.</p>
CS1.A.3	<p>The following clause is added to 4.2.4:</p> <p>“Fabrication drawings are prepared by the <i>Contractor</i>. The drawings are issued to the <i>Project Manager</i> for acceptance in the form of two paper prints and in “PDF” electronic format and in Native Format (dgn or dwg). The <i>Contractor</i> does not commence with fabrication until written acceptance from the <i>Project Manager</i> is received.”</p>
CS1.A.4	<p>Add the following to clause 4.3:</p> <p>“The <i>Project Manager</i> is informed of the necessity for repair or rectification work before any attempt is made to carry out such repair. Approval is obtained from the <i>Project Manager</i> prior to commencement of the work.”</p>
CS1.A.5	<p>Add the following to clause 4.3:</p> <p>“All waterproofing is to be in accordance with SANS 10021.”</p>
CS1.A.6	<p>Add the following to clause 4.3:</p> <p>“All gutters and down pipes are provided to ensure free water flow away from the <i>works</i>.”</p>
CS1.A.7	<p>Add the following to clause 4.3:</p> <p>“Handling and lifting plant have sufficient capacity to ensure that steelwork is placed in its final position without distortion or undue stressing of members.”</p>
CS1.A.8	<p>Add the following to clause 4.3:</p> <p>“Except where otherwise authorised in writing by the <i>Supervisor</i>, the <i>Contractor</i> ensures that the work is carried out strictly in accordance with the relevant drawings supplied to the <i>Contractor</i> by the <i>Project manager</i> or supplied by the <i>Contractor</i> and accepted by the <i>Project Manager</i>.”</p>
CS1.A.9	<p>Add the following to clause 4.3:</p> <p>“Steel sections are provided as specified on the relevant drawings except that substitution by larger sections is permitted with the <i>Project Manager’s</i> prior acceptance. Where the <i>Contractor</i> wishes to make a substitution, he states his reasons and alternative proposals in writing.”</p>
CS1.A.10	<p>Add the following to clause 4.3:</p> <p>“Splices:</p> <ul style="list-style-type: none"> • All splices in platework are complete joint penetration welds as required to maintain the full strength of the plate.

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Clause/No	Specification Data
	<ul style="list-style-type: none"> • When a beam is required to be spliced, the <i>Contractor</i> obtains acceptance from the <i>Employer</i> with regard to the location of the splice and the welding procedure to be used. <p>Visual inspections of the root pass and final welds are required for splice welds.”</p>
CS1.A.11	<p>Add the following to clause 4.3:</p> <p>“Tolerances:</p> <ul style="list-style-type: none"> • Tolerances for overall dimensions (length, width, height, etc.) are 3mm unless otherwise specified by the drawing. • Tolerances for door locations are +/- 9mm. • Tolerances for stiffener, channels, angles and bars are +/- 3mm non-accumulative, unless noted of the drawing. • Tolerances for attachments such as supports, plates and pipes are located within 3mm of the required drawing location. • The centre line of a bolt hole is aligned within 1.5mm of the drawing dimension. • Bolt hole spacing is 3mm (non-accumulative) and 6mm (overall) of the drawing dimension. • Bolt hole diameter is within 2mm of the drawing dimension. • Special tolerances are shown on the <i>Employer’s</i> drawings and take precedence. <p>Unless otherwise specified by the drawing, tolerances for all overall dimensions (length, width, height, etc.) are within 3mm.”</p>
CS1.A.12	<p>Add the following to clause 4.3.6:</p> <p>“Flame cutting of holes is not permitted.”</p>
CS1.A.13	<p>Add the following to clause 4.3.7:</p> <p>“Structures, composite units and bolted assemblies that comprise component parts are not subjected to excessive stresses during the assembly, fabrication, or erection process.”</p>
CS1.A.14	<p>Add the following to clause 4.3.8:</p> <p>“Any necessary straightening or forming is carried out by methods that neither weaken nor deface the material.”</p>
CS1.A.15	<p>Add the following to clause 4.4:</p> <p>“Arc strikes outside the area of permanent welds are to be avoided on any base material. Cracks or other damage caused by arc strikes are ground to a smooth contour.”</p>
CS1.A.16	<p>Add the following to clause 4.4:</p> <ul style="list-style-type: none"> • “All weld joints in areas to be covered by stiffeners are to be ground flush after welding and prior to installation of stiffeners.”
CS1.A.17	<p>Add the following to clause 4.4.1:</p>

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Clause/No	Specification Data
	<p>“All complete joint penetration welds have complete penetration and wherever practicable are welded from both sides. The backs of the first run are suitably gouged out.”</p>
CS1.A.18	<p>Add the following to clause 4.4.1:</p> <p>“The <i>Project Manager</i> may instruct the <i>Contractor</i> to replace any welding equipment which is unsuitable or unsatisfactory for the service in which it is being used.”</p>
CS1.A.19	<p>Add the following to clause 4.4.3:</p> <ul style="list-style-type: none"> • “The <i>Contractor</i> submits for acceptance full details of his proposed welding procedures and the provisions of AWS apply to the acceptance thereof. Acceptance of the welding procedures does not relieve the <i>Contractor</i> of his responsibility for correct welding and for the minimising of distortion in the finished structure.”
CS1.A.20	<p>Add the following to clause 4.4.3:</p> <p>All welding procedures covering all forms of weld in the contract are in accordance with <i>Employer's</i> standard 240-106628253 and are submitted to the <i>Project Manager</i> and the Appointed Inspection Authority (AIA) for acceptance.</p> <p>Electrodes are selected, by the <i>Contractor</i>, to be suitable for the welding application to be used.</p> <p>The <i>Contractor</i> adheres to the following <i>Employer</i> standards where applicable;</p> <ul style="list-style-type: none"> • 240-106628253: Standard for Welding Requirements on Eskom Plant
CS1.A.21	<p>Add the following to clause 4.4.6:</p> <p>“Welds showing any planar defects such as cracks, lack of fusion or penetration and excessive slag inclusions or porosity are cut out and rewelded. Under-cutting is not permitted.”</p>
CS1.A.22	<p>Add the following to clause 4.4.6:</p> <ul style="list-style-type: none"> • “Weld repairs are made to the same procedure as for the original weld. All tests are repeated after the repair has been completed and reports on radiographic and ultrasonic tests are marked to indicate that the report refers to a repaired weld.”
CS1.A.23	<p>Add the following to clause 5.2:</p> <p>“The <i>Contractor</i> submits properly documented evidence of the qualification of the welders to the <i>Project Manager</i> and the AIA for acceptance. The <i>Project Manager</i> reserves the right of testing the welder according to the welder's qualification. Welder qualifications are in accordance with <i>Employer's</i> standard 240-56241933.”</p> <p>“The welders are qualified on Site under conditions simulating the conditions in the plant prior to any change in welding procedures, materials and prior to employment.”</p>
CS1.A.24	<p>Add the following to clause 5.2:</p> <ul style="list-style-type: none"> • “Welders hold the relevant current welders qualification certificates.”

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Clause/No	Specification Data
CS1.A.25	Add the following to clause 5.2: “All welders' tests are witnessed and/or accepted by the <i>Project Manager</i> before the welder or operator is permitted to work. The decision of the <i>Project Manager</i> regarding the acceptability of any test or existing qualification is final. Evidence of previous qualification tests are accepted solely at the discretion of the <i>Project Manager</i> .”
CS1.A.26	Add the following to clause 5.2: “Records showing the date and results of the qualification tests performed by each welder and weld operator together with the identification number assigned to him is at all times available for scrutiny by the <i>Project Manager</i> .”
CS1.A.27	Add the following to clause 5.2: “Each qualified welder and weld operator are assigned a unique identifying number. This number is marked on the work in indelible crayon to establish the extent of welds performed by the welder to whom it is assigned. Any welder or weld operator whose work is subject to multiple rejections will be required to undergo a re-qualification test on the appropriate weld procedure. At the discretion of the <i>Project Manager</i> any welder or weld operator failing a re-qualification test may be disqualified from any further welding on the <i>works</i> .”
CS1.A.28	Add the following to clause 5.3.2: “Visual examination of all welds check at minimum that: <ul style="list-style-type: none"> • there are no uneven leg lengths and there is no cracking or unacceptable undercutting or porosity, and • full fusion is being achieved while welding is in progress.”

7.14 UNDERGROUND SERVICES, OTHER EXISTING SERVICES, CABLE AND PIPE TRENCHES AND COVERS

In areas where excavation is required the *Contractor* uses applicable scanning methods to detect underground services to ensure no existing infrastructure is damaged.

7.15 EQUIPMENT PROVIDED BY THE *EMPLOYER*

No equipment is made available for the *Contractor's* use by the *Employer*.

7.16 DAMAGE TO COMPONENTS NOT FORMING PART OF THE *WORKS*

The *Contractor* takes the utmost care to prevent damage to existing infrastructure and equipment. The *Contractor* therefore plans the *Works* taking into account any existing infrastructure and equipment.

Any damages resulting from the *Works* is repaired/made good by the *Contractor* at his own expense, to the satisfaction of the *Employer*. The *Contractor* supplies a method statement for the repair works to the *Employer* for review and acceptance prior to conducting the repair works.

The *Contractor* may require removing some equipment and structural steel/ concrete structures to facilitate the *Works*. In such case, the *Contractor* submits a list of existing equipment/ structural steel/

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concrete structures that requires removal in a method statement for the *Project Manager's* review and acceptance. The cost of removal of undamaged components, preservation and replacement to its original working state is the responsibility of the *Contractor*. In the case where existing drawings are not available, the *Contractor* is responsible for compiling drawings signed by a Professional Engineer that are adequate for reassembling of equipment/ structural steel/ concrete structures that require to be reinstated. The *Contractor* is accountable for any modifications and impacts on the existing structures due to removal and reassembly.

7.17 SURVEYS

7.17.1 Site survey

The *Contractor* carries out a comprehensive site survey and verifies coordinates, elevations and dimensions with those shown on the *Employer's* drawings, prior to the commencement of any construction works where required. The *Contractor* submits this site survey in the form of a report for acceptance by the *Project Manager*. This report highlights any discrepancies, errors or omissions found in the survey.

7.17.2 Ground control survey

The *Contractor* conducts a ground control survey of underground utilities, services, trenches and tunnels that might affect the construction of structures. The *Contractor* submits the perimeters of the survey to the *Project Manager* for acceptance.

The position of underground services, underground utilities, trenches, vaults, exclusion zones and surface penetrations are physically identified by the *Contractor*. The outcome of this survey is submitted to the *Project Manager* in the form of a ground control survey report for acceptance.

The *Contractor* relocates underground services which interfere with the construction of the *Works* only with prior acceptance from the *Project Manager*.

7.18 DATA BOOKS

The *Contractor* submits a Data Books register indicating all Data Books planned to be prepared and submitted to the *Project Manager*. The register shall be kept up to date in line with any changes to the works.

The *Contractor* submits a copy of the updated Data Books register and a Data Books status report on a monthly basis to the *Project Manager*. The Data Books status report shall be in the following format:

DATA BOOKS REVIEW AND SUBMISSION STATUS REPORT									
Package: _____									
Contractor: _____									
Status Date: _____									
		PLANT AREA							
		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Common A	Common B
Fabrication	Total expected data books								
	Data books submitted to KET for final review (currently with KET)								
	Data books currently with the Contractor for correction of final review comments								
	Data books approved by KET (final approval)								
	Data books submitted to KET for archiving								
Construction	Total expected data books								
	Data books submitted to KET for final review (currently with KET)								
	Data books currently with the Contractor for correction of final review comments								
	Data books approved by KET (final approval)								
	Data books submitted to KET for archiving								
Commissioning	Total expected data books								
	Data books submitted to KET for final review (currently with KET)								
	Data books currently with the Contractor for correction of final review comments								
	Data books approved by KET (final approval)								
	Data books submitted to KET for archiving								

The *Contractor* progressively submits signed off Data Books to the *S Project Manager's Representatives* for Engineering, Quality and Commissioning as required. Each Data Book shall have an index of contents page approved by the *Project Manager's Representatives*. Data books include the following, as a minimum (where applicable):

- Document List;
- Instruction for Work/ Purchase Order;
- Approved ITP's, QCP's;
- Method statements and specifications adhered to;
- Rigging studies;
- Risk assessments;
- Approved Drawings;
- Fabrication Drawings;
- Material Certificates;
- Weld Map;
- Weld Matrix Sheet;
- Weld Sequence;
- Welding Consumables Certificates;
- Welding Procedure;
- Welders' Qualifications;

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- Contractor's ISO 3834 certificate;
- Eskom approved NDT *Contractor*;
- Approved NDT procedure;
- NDT Technician Qualifications;
- NDT Reports/ Results;
- Certificate of Manufacture;
- Inspection Reports;
- Corrosion Protection Consumables Certificates;
- Calibration Certificates;
- Notifications;
- Modifications;
- Concessions;
- Technical Queries, Engineering Responses and communications with *Project Manager/ Employer*;
- Non-conformance reports;
- Internal Release Notes;
- Transport notifications;
- Calculations for any temporary works that may be required for the safe execution of the *Works*;
- 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;
- Steel grade certificates; and
- Pre-concrete and post concrete surveys.

7.19 RISK ASSESSMENT

Risk assessments are to be done as and when required, considering the following types of risks:

- Active
- Emerging
- Retired

7.20 CONSTRAINTS

The *Contractor*, prior to tendering, becomes aware of all the possible constraints by inspecting drawings and attending the compulsory site clarification visit. Construction execution related constraints include, but are not limited to, the following:

- Unknown underground services,
- Work performed by Others,
- Access limitations,
- Operability of plant.

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8 COMISSIONING

Contractor is fully responsible for all commissioning and start-up activities for the reticulation systems installed by the Contractor, including, but not limited to, all craft labour, operators, and supervision. The Employer will provide assistance for coordination with other interfacing packages. Instrument calibration and checkout for instruments not furnished by the Contractor will be performed by others.

9 OTHER REQUIREMENTS

9.1 GENERAL

The following codes are required to be complied to:

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 <i>Contractor</i> is responsible for the complete surveying and setting out of the <i>Works</i> including the establishment of any beacons and benchmarks required to complete the <i>Works</i> . The <i>Contractor</i> 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 <i>Works</i> .
6.2	Degrees Of Accuracy
6.2 b)	Degree of accuracy II is applicable to the <i>Works</i> .

9.2 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.
4.4	Disposal of material
4.4.1	Materials from clearing and grubbing operations are to be disposed of at a disposal site accepted by the <i>Employer</i> .

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Clause	Particular Specification
	Disposal certificates are required to be kept on record by the <i>Contractor</i> .
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 <i>Contractor</i> .
4.4.4	The material which is to be reused is to be stacked at a site proposed by the <i>Contractor</i> which is accepted by the <i>Employer</i> .
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
Additional Clauses	
1	The size of areas subjected to land clearance are to be kept to a minimum
2	All vegetation not required to be removed are to be protected against damage

9.3 DOCUMENT MANAGEMENT

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) is 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 VDSS.

9.3.1 Document Identification

The *Contractor* ensures that a 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

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- 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

9.3.2 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.

9.3.3 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
- 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)

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9.3.4 Document Headers

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

9.3.5 Naming of files

The *Contractor* to 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 will be according to IEC 61355 – 1:2008 (Edition) Classification and designation of documents for plants, systems and equipment – Part 1: Rules and classification tables.

9.3.6 Document Submission

The *Contractor* 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 as per Appendix B. 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 B **Error! Reference source not found.** The VDSS to indicate 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 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 C. 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 will be clearly marked on the submittal by the *Contractor* and the submittal process will be 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 *Employer* for review. Any resubmittal of information to clearly identify the revisions by

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footnote or by a form of back-circle, with revision block update, as appropriate.

9.3.7 Transmittals

All document exchange to 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, External Drives, etc.)
- Sender signature
- Recipient signature, once submitted, to acknowledge receipt

If a transmittal is in response to an Eskom communication via transmittal, the Eskom Transmittal Number will be referenced in the transmittal response and will be provided in addition to the meta-data required in 1.4.

The *Contractor* to follow a structured and standard definition for Transmittal Descriptions, i.e. subject line convention of **YYYYMMDD – <Contract & Package Number> – <Vendor> – <Short Description> – <Sender Initials>**.

The *Contractor* to follow a structured method of communication as defined within Communication Interface Memorandum (CIM) for any correspondence

The *Contractor* to follow a structured and standard definition for email subjects i.e. a subject line convention of **YYYYMMDD – < Package File Number> – > – <Email Subject line>**.

The *Contractor* to 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

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- 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

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

Electronic technical data submittals is processed 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 20MB in size, then the document shall be uploaded on Zendto portal.

Notification to *Employer* that submittals have been posted to Zendto should 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 and notify the Employer of such submission.*

The hard copy prints is to be submitted to the address indicated for Technical Documents in the Supplementary Terms and Conditions of this Contract. The following number of prints is 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 *Employer* 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 external drives/USBs, 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 *Employer* will be copied on the email as well.
- Hard copies would be submitted to the *Employer* accompanied by the Transmittal Note.

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9.3.8 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 and PDF format as per 240-86973501 (Engineering Drawing Standards – Common Requirements).

Drawings shall be in sufficient detail to indicate the kind, size, arrangement, component weight, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the Schedule of Submittals.

Contractor to fully complete and certify drawings for compliance with the Contract requirements. Drawings to have title block entries that clearly indicate the drawing is certified.

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

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

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

The project name to be listed on all drawings, including manufacturers' drawings. Tag numbers and equipment names to 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 would be in the English language. The units of measure to 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 Process. Any uncertainty regarding this should be clarified with the *Employer*. The *Contractor* to comply with all minimum document metadata as specified in Technical Documentation Classification and Designation Standard (240-54179170).

The *Contractor* is to use Smartplant Owner Operator (SPO) for documents and records management. The *Contractor* is to 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

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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 would be provided with each document submittal. The transmittal letter to include the *Contractor* drawing number, revision number, and title for each drawing attached. Each drawing title is to be 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 to 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 to 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* to, during the progress of and upon completion of the *Works*, supply the Information required in terms of the Contract and all such Information as may usually be supplied in connection with similar *Works*, including, whether or not specified in the Contract, all Information necessary or useful for:

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

The scope of supply of Information from the *Contractor* to include drawings, documents, lists and data according to the types defined in Table 6 below:

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Table 6: Typical Document Requirement List	
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
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

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Table 6: Typical Document Requirement List	
Document Group	Description of document type (includes information data sets)
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
Commissioning	Commissioning schedule Test & Evaluation Master Plan (TEMP) Commissioning procedures Commissioning database Performance test procedure Performance test reports Field test reports and certificates
Operations	Operating procedures Plant operational documentation Plant tech specs Incident & upset mitigation procedures Operating scenarios (for C&I control purposes)
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
Training	Training plan Training manuals and instructions
Safety & Protection	Fire hazard analysis Waste management plan

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Table 6: Typical Document Requirement List	
Document Group	Description of document type (includes information data sets)
Design Analyses	<ul style="list-style-type: none"> 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
Electrical	<ul style="list-style-type: none"> 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

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When downloaded from the EDS database, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the Authorized Version on the database.

Table 6: Typical Document Requirement List	
Document Group	Description of document type (includes information data sets)
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
CBMS	Alarm and set-point schedule Instrument schedule Instrument data sheets Equipment layout drawings Routing layout drawings Cable schedules Termination schedules Junction Box GA and Internal Layout Instrument Stand GA Maintenance Manuals and procedures Operating and Control Philosophies Field device calibration certificates Network architecture Fire risk assessments

In addition to the official documentation submittals, the *Contractor* is to provide additional information for review and design coordination as requested by the *Employer* from time to time.

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The *Contractor* to 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 will 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*.

The *Employer* reviews the *Contractor's* submitted documents. The *Contractor* ensures adherence to the contract 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 as set-out in the VDSS, in Appendix B Each document submitted to the *Employer* 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 *Employer* in accordance with Project / Plant Specific Technical Documents and Records Management Work Instruction (240-76992014). The *Contractor* is required to submit documents in electronic and hard copies and both copies must be delivered to the *Employer* with a transmittal note.

9.3.9 Documentation Recording

The *Contractor* develops, 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 to 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
- 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* to 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)

9.3.10 Documentation Requirements

All documents supplied by the *Contractor* are subject to *Employer's* approval. For consistency, it is important that all documents used within the project follow the same layout, style and formatting as

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described in the Technical Documents and Records Management Work Instruction (240-76992014). Documents such as QCP's, Method Statements and other documents impacting the work are approved by the *Employer* 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 to 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.

9.4 CONFIGURATION MANAGEMENT

The *Contractor* supplies a comprehensive configuration management program according 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 shall be developed and 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

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of deliverables for hand-over to the *Employer* for use during the operation and maintenance phases of the plant.

9.4.1 PLANT IDENTIFICATION

9.4.1.1 Plant Coding

Plant Coding is undertaken by the *Employer*, and as such the *Contractor* makes available of the following documentation to code:

I. Mechanical

- general arrangements (GA)
- Piping and Instrumentation Diagrams (P&IDs)
- interface list
- process flow diagrams (PFDs)

II. Electrical

- single line diagrams
- electrical board general arrangements (GA)
- cable schedule

III. C&I

- C&I architecture drawings
- C&I Cubicle GA
- cable block diagrams
- remote control station lists
- cable schedules

The *Employer* only code the KSS code defining Documentation listed above. The *Employer* assign a coding practitioner who shall interact with the *Contractor* in coding the plant as listed above. It may be required that the person be based at the *Contractor's* offices full time. The *Contractor* is then 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 includes, but not limited to:

- load schedules
- board parts lists
- cable block diagram
- termination diagram
- drive & actuator schedules
- instrument schedules
- alarm lists, loop diagrams

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- signal lists
- schematic diagrams
- termination diagrams
- Logic diagrams, etc.

The *Contractor* ensures that all documentation is coded (as per the codes assigned by the Practitioner) prior submission to *Employer* for review.

9.4.1.2 Plant Codification

The KKS system is 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, CBMS, and Civil) are 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 are used but all rules specified in the *Employer’s* documents would 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 *Employer* 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 Contract 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* codes 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* is 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* submits these for the *Employer’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 *Employer*.

As soon as the contract is place, the *Contractor* provides the *Employer* with the following: -

- Outline drawings or diagrams showing the *Contractor* reference
- Coding for systems and equipment.
- In respect of items procured by the *Contractor* from another

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- 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.

9.4.1.3 Plant Labelling

1. New labels are provided for all plant, material and equipment provided as part of the *Works*. It is the responsibility of the *Contractor* to manufacture and install labels according to station based labelling standard. The *Employer* provides the labelling standard.
2. All labels are made from anodised aluminium and are pop riveted in place.
3. Coding and labelling of components inside electrical and C&I panels shall be done by the *Contractor*.
4. The Coding practitioner facilitate the base-lining of all equipment lists from the *Contractor*, and only baseline equipment lists shall be used as a basis for the production of labels.
5. The abbreviations are in accordance with the Kusile's abbreviation standard, Alpha KKS 02 – Kusile Power Station Project – Standard Abbreviations provided

9.5 DESIGN REVIEWS AND CHANGE MANAGEMENT

9.5.1 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, Appendix B.

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 NEC contract requirements and is finalised during contract negotiations with the *Contractor*.

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 *Employer's* 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.

9.5.2 Change Management

All Design change management are performed in accordance to the latest revision of the Eskom Project Change Management Procedure (240-53114026) and the Kusile Engineering Change Management Work Instruction (240-132735850). The *Employer* ensures 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.

9.6 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* 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 14 days after construction is completed.
- Structural Certificate signed by the *Contractor's* Professionally Registered Engineer confirming that structure has been constructed in accordance with the design

Detailed handover requirements are as per the requirements defined in the Kusile Project “240-128515850 - Documentation Handover Specification”. As a minimum the *Contractor* provides 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*.

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

9.7 SYSTEM INTERFACE

The *Contractor* is responsible for all system interfaces which forms part of the *Works*. The *Employer* shall provide the relevant information defining the system interfaces. The *Contractor* caters for all the identified interfaces, taking into consideration all Packages required.

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10 AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Thabani Mdlalose	Kusile Power Station Lead Discipline Engineer
Shamita Jagjiwan	Kusile Power Station Lead Integration Engineer
Yuvir Gokul	Kusile Power Station Engineering EDWL

11 REVISIONS

Date	Rev.	Compiler	Remarks
	0	C Radford	Draft document for review
15/06/2021	01	Calvin Langley	Addressed comments
15/11/2021	02	Calvin Langley	Included Electrical Helistop Scope
13/07/2022	03	Ayo Jimoh	Aux bay unit 6 fire wall added
31 May 2023	04	Thabani Mdlalose	Removed sub-surface, surface and roadworks finishes in the perimeter of the Admin Island. Document title also changed.
12 October 2023	05	Thabani Mdlalose	Removed the Unit 1 to 3 Aux Bay Stiffener installation, Unit 2 to 6 Boiler Liftshaft fire doors installation and the construction of the HeliStop scope of works. Added the scope of sealing all external pipe and cable entries openings at Boiler Fuel Oil Pump House Building.

12 DEVELOPMENT TEAM

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

- Charmaine Radford
- Wikus van Rensburg
- Ruan Beneke
- Dirk Kotze
- Calvin Langley
- Thabani Mdlalose

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APPENDIX A– SYSTEM INTEGRATION STANDARDS

Note: The Contractor is to request for clarification should there be any conflicting requirements within the standards and guidelines.

240-53114186	Technical Documents and Records Management Work Instruction
240-132735850	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
240-58552870	SmartPlant for Owner Operators (SPO) Documentation Metadata Standard
240-107305502	SmartPlant Data Take-On Standard
240-109607332	Abbreviation Standard for Labelling of Plant at Power Stations
240-93576498	Eskom KKS Standard
SANS 10143	
IEC 61355– 1:2008	Classification and designation of documents for plants, systems and equipment – Part 1
	KKS Power Plant Classification (B105e) 5th Edition 2003 Published by Verlag VGB PowerTech Service GmbH (Essen)
ISO 10007(2nd Edition)	

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**Kusile Power Station – Miscellaneous Building
Structures and Modification Works**

Unique Identifier: **366-423660**

Revision: **05**

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APPENDIX C – MASTER DOCUMENT LIST TEMPLATE

Kusile Power Station									
DRAWINGS AND SPECIFICATION SCHEDULE									
Doc Code	Rev.	Cust. Doc No.	Title	Action	Actual date	Client receipt date	Client Document status	Client ref letter for doc status	Document status

APPENDIX D– DOCUMENT REQUIREMENTS AFTER FINAL HANDOVER

Dossier Chapter	Dossier Sub-Chapter	Dossier 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 2C	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

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Chapter	Documents for Final Handover
	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	<i>Contractor</i> 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	<i>Contractor</i> 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

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Chapter	Documents for Final Handover
			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	<i>Contractor</i> Application for Eskom's Inspection of the <i>Works /Part of the Works</i>
		5.3.2	Data Pack (e.g. Material Certificates, Qualifications, NDE and Welding Documentation, Isometric Drawings, Cutting Instructions, Factory Design Review Reports, C&I Loop checks, etc.)
		5.3.3	Partial/final Inspection certificate
		5.3.4	Defects Notification Certificate/Clearance
		5.3.5	Safety and Housekeeping Certificate
		5.3.6	Safety Clearance Certificate
		5.3.7	Completion Certificate
		5.3.8	Defects Certificate
		5.3.9	Take over Certificate
		5.3.10	Specific Requirements
		5.3.11	KKS and Labelling Certificate

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

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Chapter	Documents Handover	for	Final Test
			Certificate, Type Test Certificates)		
	6.12	6.12	Synchronisation Tests		
	6.13	6.13	Grid Code Compliance Certificate		
	6.14	6.14	Defect List		
	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		
	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)		
	11.1	11.1	Approved Out of Normal Status		
	11.2	11.2	Out of Normal Status (Pending Approval)		
	12.1	12.1	Training Manual		
	12.2	12.2	Proof of Training		
	12.3.1	12.3.1	Plant Safety Regulations		
	12.3.2	12.3.2	High Voltage (HV) Regulations		
	12.3.3	12.3.3	PFFR		

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Dossier Chapter	Dossier Sub-Chapter	Dossier Sub-Chapter	Documents for Final Handover
		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 listing • 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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APPENDIX E - AUXILIARY BAY SAFETY BARRIER DRAWINGS

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APPENDIX F- AUXILIARY BAY LIFT BAY SEAL DRAWINGS

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APPENDIX G – DIESEL GENERATOR BUILDING DRAWINGS

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APPENDIX H – TUNNEL FIRE BARRIERS DRAWINGS

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APPENDIX I - WWTP FILTER PRESS WALL COATING DRAWINGS

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APPENDIX J – LIME AND SODA ASH OFFLOADING FACILITY DRAWINGS

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APPENDIX K - AUX BAY UNIT 6 FIRE WALL DRAWINGS

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APPENDIX L – BOILER FUEL OIL PLANT PUMP HOUSE BUILDING DRAWING

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