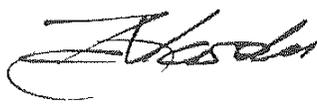
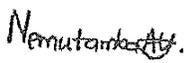
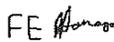


 Eskom		Works Information	Generation
Title.	Works Information: Matla Slurry Plant LV Switchgear Upgrade Technical Specification	Unique Identifier:	373-MAT--ADDB-D00180-16
		Area of Applicability:	Engineering
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PART 3: SCOPE OF WORK

Document reference	Title	No of pages
	This cover page	1
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C3 2	<i>Contractor's Works Information</i>	
	Total number of pages	55

C3.1: EMPLOYER'S WORKS INFORMATION

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1 DESCRIPTION OF THE WORKS

1.1 EXECUTIVE OVERVIEW

This document contains the works information for Matla Power Station safety upgrade of the Low Voltage switchgear in conjunction with the upgrade of the S5 PLC and SCADA to the latest technology on the market at the Slurry Plant. This project will also cover the interfacing of the PLC to the switchgear.

The primary concern is the risk to production and degradation of safety of the plant and personnel due to obsolescence. The risk exposure has been highlighted by the subsequent increasing failure rate of the control system and arc flash incidents on the switchgear. The objective of this project is to perform the necessary replacements to eradicate obsolescence and safety upgrades that will increase the plant safety, reliability and availability.

It is required that the upgrade project be done with minimal disruptions to current operations, and a thorough changeover strategy and procedures be put in place to facilitate the retrofitting of new switchgear components in the shortest possible time.

This technical specification report developed by the engineering team for the purpose of providing the technical information required for the works information.

1.2 EMPLOYER'S OBJECTIVES AND PURPOSE OF THE WORKS

The purpose of the works is to upgrade the LV Switchgear and controlgear Assemblies at Slurry Plant and interfacing to new PLC SCADA system. The modifications must retain the Operating and Control philosophy. At Matla Power Station the function of the Slurry Plant is to receive, mix and dispose of both Pulverised Fly Ash (PFA) and Bottom Boiler Ash (BBA) to a remote ash dam.

The PFA is conveyed pneumatically from the six (6) generating units to bulk storage silos at the Slurry Plant. Airlifts then convey the PFA to the PFA mixers where it is slurried. The BBA is slurry pumped from the generating units to Hydrobins where the water is decanted. Conveyors are utilised to transfer the BBA from the Hydrobins to mixers, which also introduces the BBA to the slurry pumps' suctions.

The ash slurry is then pumped to the ash dam with three (3) pump trains, each consisting of five (5) pumps in series (Running with only 4).

The LV switchgear and controlgear assemblies installed at Matla's Slurry plant are the Siemens 8PU 011 switchgear, the switchgear assemblies are form 3b subdivision by design. The switchgear is unsafe due to the fuse holder designs and previous incidents of arc flash injuries has occurred on the plant. Ageing has also resulted in numerous components no longer being available and non-standard equipment having to be used when failures are experienced.

Therefore the *Contractor* replaces/retrofits all switchgear functional units.

The basis for the supply of engineering deliverables is in form of documentation relevant to the different activities as stated in the Appendices below

#	APPENDIX	DESCRIPTION
1	Appendix A	Matla Power Station Ash Plant 400V Board A&B Switchgear Schedule
2	Appendix B	Matla Power Station Ash Plant 400V Board A&B Cable Block Diagram
3	Appendix C	Matla Power Station Ash Plant 400V Board A&B General Arrangement
4	Appendix D	Matla Power Station Slurry Plant Standard IO Block Diagrams

1.3 INTERPRETATION AND TERMINOLOGY

Available	It is the when a system, component or equipment is in the up state, i e in service, operational and able to perform as required
Balance of Plant (BOP)	It consists of a power plant's auxiliary plant systems that are required to support the power island(s), e.g fuel processing systems, cooling systems, water treatment, material handling, etc. The specific set of plant systems that form the balance of plant is dependent on the applicable power plant's configuration and design.
Control System	The control system consists of the Operating system, Engineering system, Process automation system, Protection Automation System, Operating & Engineering Network, network management system, User Management system and interfaces to 3rd Party systems that are specific to a particular plant
C&I Equipment Rooms	The room that are used to house the control systems
HMI	The Human-Machine interface used for operation and monitoring of the plant
HVAC	Heating, ventilation, and air conditioning are the technology of indoor and vehicular environmental comfort Its goal is to provide thermal comfort and acceptable indoor air quality
SCADA	SCADA is an acronym for supervisory control and data acquisition, a computer system for gathering and analysing real time data SCADA systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation.
Power Supply Cabling	All the cabling required to power the field equipment

Trunking	A rigid structure supporting a number of cables
Factory Acceptance Test (FAT)	It is an activity that demonstrates that the control system complies with its specification(s)
Functional Logic Diagrams	Logic diagrams are diagrams in the field of logic, used for representation and to carry out certain types of reasoning
Field Equipment	Instrumentation, cold junction boxes and junction boxes
OEM	The OEM refers to the original equipment manufacturer
OPC	Open Platform Communications is a series of standards and specifications for industrial telecommunication. The OPC server is a software program that converts the hardware communication protocol used by a PLC into the OPC protocol. The OPC client software is any program that needs to connect to the hardware, such as an HMI. The OPC client uses the OPC server to get data from or send commands to the hardware.
Operator Workstation	The primary interface of the operating plant via which the HMI is accessed with the number of operating display units
PLC	A programmable logic controller (PLC) or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process. It is a type of control system, one that is used in the automation industry for simple and/or sequential control applications. The main elements of a PLC are the microprocessor-based controllers and input/output (I/O) cards. It is a standalone automation system usually dedicated to the control and protection of small auxiliary plant systems. It does not contain an operator or communication network within itself and is usually interfaced to other systems (e.g. a SCADA system or DCS) when remote operating capability is required.
Supplier	It is the company, agent or entity that supplies the applicable technology or product

The following abbreviations are used in this Works Information

Abbreviation & Acronyms	Description
AC	Alternating Current
ATPV	Arc Thermal Performance Value
BBA	Boiler Bottom Ash
C&I	Control and Instrumentation
CM	Change Management
CoE	Centre of Excellence
CRA	Concept Release Approval
DCS	Digital Control System
DRA	Definition Release Approval
DRP	Design Review Procedure
ECM	Engineering Change Management
EDWL	Engineering Design Work Lead
ERA	Execution Release Approval
EMC	Electromagnetic Compatibility
FAT	Factory Acceptance Test
FRA	Finalisation Release Approval
HVAC	Heating, ventilation and air conditioning
JB	Junction Box
kPa	Kilo Pascals'
LPS	Low Pressure Services
MTTR	Mean-Time-To-Repair
OEM	Original Equipment Manufacturer
OPCR	Outside Plant Control Room
OPC	Open Platform Communications
PS	Power Station
PARICS	Participate, Accountable, Responsible, Inform, Consult, Sign-Off
PCM	Process Design Manual
PECM	Project Engineering Change Management
PFA	Pulverised Fly Ash
PLC	Programmable Logic Controller
PLCM	Project Life Cycle Model
PIS	Plant Information System

QCP	Quality Control Plan
RACI	Responsibility, Accountability, Consult and Inform
RAID	Redundant array of independent disks
ROC	Required Operating Capability
SANS	South African National Standards
SAT	Site Acceptance Test
SIT	Site Integration Test
SHE	Safety, Health & Environmental
SRD	Stakeholders Requirements Definition
AC	Alternating Current
DC	Direct Current
LV	Low Voltage
CT	Current transformer
VT	Voltage Transformer
SAS	Substation Automation System
IED	Intelligent Electronic Device
AFC	Approved for construction
OBL	Outside battery limits

2 MANAGEMENT AND START UP.

2.1 MANAGEMENT MEETINGS

- (1) Regular meetings of a general nature may be convened and chaired by the Project Manager as follows

Table 1: Project Meetings

Title and purpose	Approximate time & interval	Location	Attendance by:
Risk register and compensation events	Weekly on Tuesday's and Thursday's at 08 00	Employer's Project Manager Office	Employer, Contractor, Supervisor, and Quality inspectors
Overall contract progress and feedback	Bi-weekly via Ms Teams during the planning stage and daily when on site and work is being conducted Site meetings are held at 08 00	Employer's Project Manager Office	Employer, Contractor and Supervisor

- (2) Meetings of a specialist nature may be convened as specified elsewhere in this Works Information or if not so specified by persons and at times and locations to suit the Parties, the nature and the progress of the works Records of these meetings shall be submitted to the *Project Manager* by the person convening the meeting within five days of the meeting
- (3) All meetings shall be recorded using minutes or a register prepared and circulated by the person who convened the meeting Such minutes or register shall not be used for the purpose of confirming actions or instructions under the contract as these shall be done separately by the person identified in the conditions of contract to carry out such actions or instructions

2.2 DOCUMENTATION CONTROL

2.2.1 DOCUMENT VERIFICATION AND VALIDATION

The *Contractor* to verify the loop and wiring diagrams supplied by the *Employer* by doing proper plant walks and they will mark-up and produce the updated versions. The drawings will be supplied to the *Contractor* after contract award

2.2.2 DOCUMENT MANAGEMENT

- (1) All documents supplied by the *Contractor* shall be subject to Eskom's approval
- (2) The language of all documentation shall be in English

- (3) The *Contractor* shall include the Eskom's drawing numbers in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his Subcontractors.
- (4) Drawing numbers will be assigned by the *Employer* as drawings are developed.

2.2.3 DOCUMENT IDENTIFICATION

- (1) Eskom will submit the Vendor Document Submission Schedule (VDSS) as per Appendix A of the works info to the *Contractor*.
- (2) The VDSS is revisable and changes must be discussed and agreed upon by all parties.
- (3) Changes in the VDSS can be additional documentation to be submitted, changes in submission dates or corrections in documentation descriptions, document numbers, etc.

2.2.4 DOCUMENT SUBMISSION

- (1) All project documents must be submitted to the delegated Eskom Representative with transmittal note according to Project / Plant Specific Technical Documents and Records Management Work Instruction 240-76992014.
- (2) In order to portray a consistent image it is important that all documents used within the project follow the same standards of layout, style and formatting as described in the Work Info.
- (3) The *Contractor* is required to submit documents as electronic and hard copies and both copies must be delivered to the Eskom Representative with a transmittal note.
- (4) In addition, the *Contractor* shall be provided with the following standards which must be adhered to:
 - i. Project Handover Documentation Management Procedure (240-66920003).
 - ii. Project Documentation Deliverable Requirement Specification (240-65459834).
 - iii. Technical Documentation Classification and Designation Standard (240-54179170).

2.2.4.1 SHAREPOINT TRANSMITTAL

- (1) The *Contractor* shall submit all documentation to the Eskom Representative as well as the Project's Documentation Centre in the following media:
 - i. Electronic copies shall be submitted to Eskom Documentation Centre through SharePoint transmittal site that will be provided during contract award.
 - ii. Hard copies shall be submitted to the Eskom Representative accompanied by the Transmittal Note.

2.2.5 DRAWINGS FORMAT AND LAYOUT

- (1) The creation, issuing and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 Engineering drawing Standard.
- (2) Drawings issued to Eskom will be a minimum of four hardcopies and electronic copies. The *Contractor* is required to submit electronic drawings in Micro Station (DGN) format, and

scanned drawings in pdf format. No drawings in TIFF, AUTOCAD or any other electronic format will be accepted.

- (3) Drawings issued to Eskom may not be "Right Protected" or encrypted.

2.2.6 ENGINEERING CHANGE MANAGEMENT

- (1) All design changes shall be performed in accordance to the latest revision of the Eskom Project Engineering Change Management Procedure (240-53114026) and the *Employer* shall ensure that *Contractor* is provided with latest revisions of this procedure.
- (2) Any uncertainty regarding this procedure should be clarified with the *Employer*. All design reviews will be conducted according to the Design Review Procedure (240-53113685).

2.2.7 PLANT CODING

- 1) Eskom KKS Key Part Standard (240-109607736) shall be used to allocate codes to plant or system included in the *works*. Plant Coding shall be undertaken by the *Employer* and as such the *Contractor* shall make available the following documentation to code:
- i Electrical
 - a Single line diagrams
 - b General arrangements (GA) for the charger
 - c Cable schedules
 - d Room layout
 - e Schematic drawings
 - f Parts list
 - ii C&I
 - a C&I architecture drawings
 - b C&I cubicles
 - c Cable block diagrams
 - d Cable schedules
- 2) The *Employer* will assign a coding technician who will interact with the *Contractor* in coding the plant.
- 3) It is also the responsibility of the *Contractor* to consistently apply the KKS codes throughout the rest of the technical documentation which shall include, but not limited to:
- i Load schedules
 - ii Board parts lists
 - iii Cable block diagram
 - iv Termination diagram
 - v Alarm lists, loop diagrams
 - vi Signal lists

- vii Schematic diagrams
 - viii Termination diagrams
 - ix Logic diagrams, etc
- (4) The *Contractor* shall ensure that all documentation is coded (as per the codes assigned by the technician) prior submission to *Employer* for review
- (5) Coding and labelling of components inside electrical and C&I panels shall be done by the *Contractor*

2.2.8 PLANT LABELLING

- (1) It is the responsibility of the *Contractor* to manufacture and install coded equipment's labels.
- (2) Labels are manufactured and installed according to Eskom Plant Labelling Abbreviation Standard (240-109607332)
- (3) The *Contractor* will label all coded equipment and labelling
- (4) The Coding technician will do a quality check on the adherence to the Coding and labelling standards before installation on plant.

2.3 HEALTH AND SAFETY RISK MANAGEMENT

- (1) Health and safety file should be approved by Safety risk management department prior to any work commences on site
- (2) All work is to be done in accordance with OHS Act 85 of 1993, Matla plant procedures and Plant Safety Regulations (240-150642762).
- (3) Matla power station SHEQ induction must be done before access to site can be granted
- (4) The contractor should ensure that all employees have acquired the required competency for the task they are performing
- (5) The contractor to ensure compliance to updated legal requirements and other requirements
- (6) BUY QUIET All stakeholders are encouraged to purchase or rent quieter machinery, equipment, and tools to reduce worker noise exposure, contribute towards compliance to OHSA noise exposure limits and ultimately reduce the risk of noise induced hearing loss

2.4 ENVIRONMENTAL CONSTRAINTS AND MANAGEMENT

- (1) All activities listed in the National Environmental Act 107 of 1998, EIA Regulations as amended, must have environmental AUTHORISATION before commencement of work
- (2) The contractor shall comply with all applicable legal and other requirements
- (3) The polluter pays principle will be applied
- (4) The contractor manager shall ensure compliance with Eskom Matla Environmental procedures to ensure the prevention of pollution (refer OMOP 4090 and 4402)
- (5) The last payment will be processed based on the status of the last housekeeping check sheet (Annexure C. OMOP 4402) of designated area.
- (6) EMS file based on ISO14001 will be required

2.5 QUALITY ASSURANCE REQUIREMENTS

- (1) The contractor/executioner of work will be responsible for drawing up all QCP documentation and this must be approved by engineering and authorised by the Quality Department before commencing with the work
- (2) Contractors/executioner to adhere to QM 58 and OMOP4497 requirements
- (3) Number of NCR issued can affect your next tendering process
- (4) The QCP shall be signed progressively by the Engineer/Supervisor, Eskom QC Inspector, Contractor QC Inspector and/or AIA
- (5) No procuring of outage items without the approval of scopes by quality
- (6) All outage scopes creep and scopes addition should be approved by quality
- (7) No contractor should be in the possession of scopes for execution without the scopes approved by quality
- (8) The contractor is subjected to quality auditing at any point in time during execution of scope

2.6 PROGRAMMING CONSTRAINTS

- (1) The *Contractor* submits a programme within 1 week of the contract date
- (2) The program shall be in Microsoft Excel or Projects format (preferably 2010 version or lower)
- (3) The programme indicates
 - i. The hour duration of each activity
 - ii. The working calendar (number of hours per day, days per week)
 - iii. The exact quantity of people per day

2.7 INVOICING AND PAYMENT

- (1) Within one week of receiving a payment certificate from the *Project Manager* in terms of core clause 51 1, the *Contractor* provides the *Employer* with a tax invoice showing the amount due for payment equal to that stated in the *Project Manager's* payment certificate
- (2) The *Contractor* shall address the tax invoice to Eskom Holdings SOC Ltd and include on each invoice the following information:
 - i. Name and address of the *Contractor* and the Project Manager,
 - ii. The contract number and title,
 - iii. *Contractor's* VAT registration number,
 - iv. The Employer's VAT registration number 4740101508,
 - v. Description of service provided for each item invoiced based on the Price List,
 - vi. Total amount invoiced excluding VAT, the VAT and the invoiced amount including VAT,
 - vii. Add procedures for invoice submission and payment (e.g. electronic payment instructions)

2.8 INSURANCE PROVIDED BY THE *EMPLOYER*

Refer to the Contract Data Section 8 – Risks and Insurance

2.9 CONTRACT CHANGE MANAGEMENT

- (1) The *Contractor* or the *Project Manager* notifies each other of any event which may lead to a change in agreed terms as per NEC 3

2.10 PROVISION OF BONDS AND GUARANTEES

- (1) The form in which a bond or guarantee required by the conditions of contract (if any) is to be provided by the *Contractor* is given in Part 1 Agreements and Contract Data, document C1 3, Sureties
- (2) The *Employer* may withhold payment of amounts due to the *Contractor* until the bond or guarantee required in terms of this contract has been received and accepted by the person notified to the *Contractor* by the *Project Manager* to receive and accept such bond or guarantee
- (3) Such withholding of payment due to the *Contractor* does not affect the *Employer's* right to termination stated in this contract.

2.11 RECORDS OF DEFINED COST, PAYMENTS & ASSESSMENTS OF COMPENSATION EVENTS TO BE KEPT BY THE *CONTRACTOR*

- (1) The *Contractor* may keep records of payment and assessments of compensation events if he deems it necessary.

2.12 TRAINING WORKSHOPS AND TECHNOLOGY TRANSFER

2.12.1 GENERAL REQUIREMENTS

- (1) The *Contractor* provides training on the equipment and systems included as part of the *works* to the various categories of the *Employer's* technical staff for the duration of the *works*
- (2) All training provided by the *Contractor* is customised for Matla Power Station and is directly applicable to the actual equipment hardware and software supplied for the *works*
- (3) Training is focused on the specific Matla Power Station Slurry Plant Control Systems' architecture, configuration, layout, equipment, software, hardware, and design that the *Contractor* provides for the *works*
- (4) Generalised training based on the *Contractor's* generic control system architecture, HMI and design philosophies is not acceptable
- (5) Training material and tools are not shared by trainees during the training.
- (6) The training is provided as per the detailed training programme and prospectus accepted by the *Project Manager*

- (7) Maintenance staff are trained and authorised to perform certain maintenance activities such as replacement of defective components and general servicing during outages.

2.12.2 TRAINING CATEGORIES

- (1) Practical hands-on training for each individual trainee forms an integral part of each of the courses in these categories
- i. Training of Maintenance staff
 - ii Training of Operators
 - iii Training of engineering staff
- (2) The elements of the training are described in the subsections below

2.12.3 TRAINING OF ENGINEERING AND MAINTENANCE STAFF

- (1) Engineering and Maintenance training includes, as a minimum
- i Familiarisation with the documentation forming part of the *works*, including drawings
 - ii Design and configuration
 - iii Switchgear component familiarisation.
 - iv Switchgear installation
 - v

2.12.4 TRAINING OF OPERATORS

- (1) Operator training includes, as a minimum:
- i Familiarisation with the documentation provided as part of the *works*, including drawings with equipment lists
 - ii Design and configuration.
 - iii Operator instructions and operating philosophies

2.12.4.1 TRAINEE PARTICIPANTS

- (1) The total number of participants to be trained is as follows
- | | | |
|-----|-------------|--------------|
| i | Engineering | : 8 |
| ii | Operator | 8 |
| iii | Maintenance | 6 (or More) |
- (2) The *Employer* bears the cost of salaries, accommodation, travelling expenses and other allowances of his personnel during the training, but all other training costs are borne by the *Contractor*.
- (3) There shall be a minimum of two training sessions for each of the disciplines identified (e.g. engineering, operating and maintenance)

2.12.4.2 TRAINING DOCUMENTATION

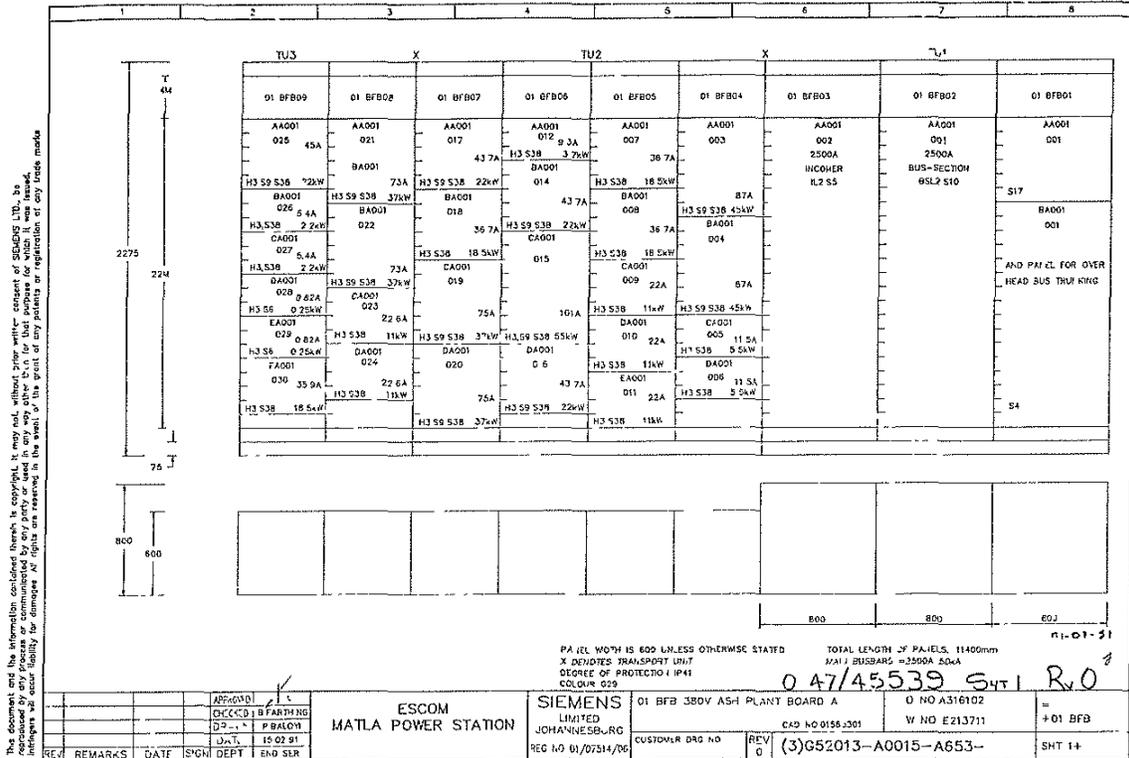
- (1) The *Contractor* provides all course material including manuals.
- (2) The course material is in English and includes all third party documentation
- (3) Printed and soft copies of the training documentation are supplied for each trainee plus an additional 1 hardcopy master set and 1 soft copy.
- (4) All training documentation provided by the *Contractor* is customised for Matla Power Station
- (5) The training documentation contains the specific Slurry Plant LV Switchgear specifications, operating and maintenance provided by the *Contractor* as part of the *works*
- (6) Training manuals are continuously updated by the *Contractor* up to the date of issue of the Defects Certificate for the whole of the *works*

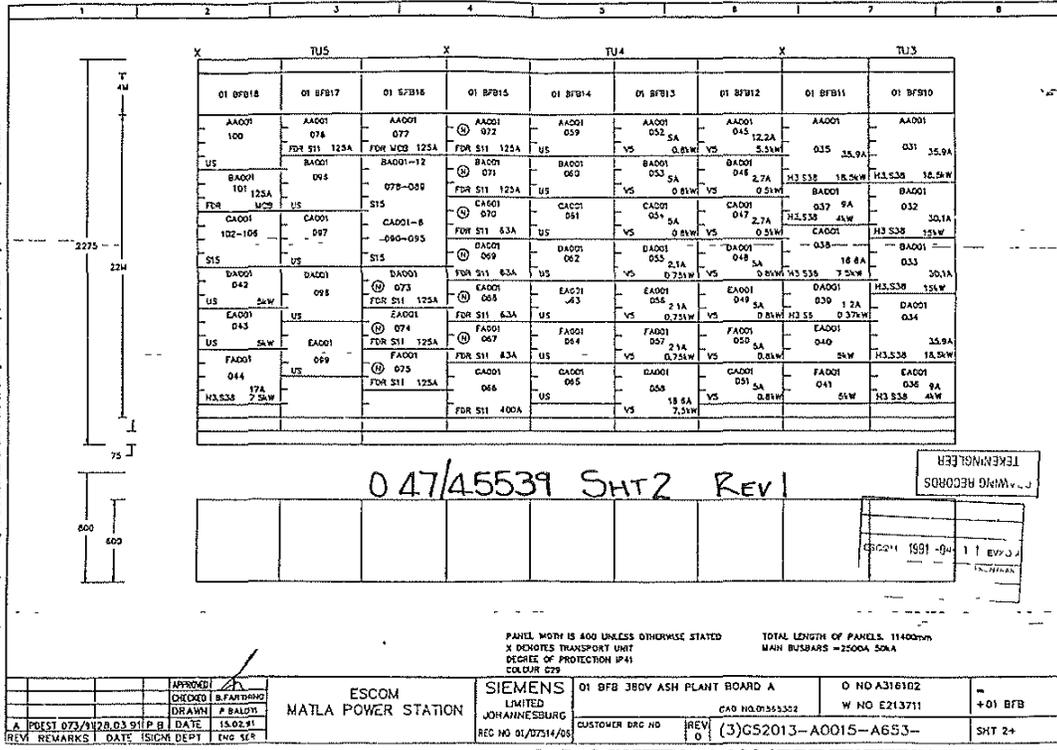
3 ENGINEERING AND THE CONTRACTOR'S DESIGN

3.1 EMPLOYER'S DESIGN

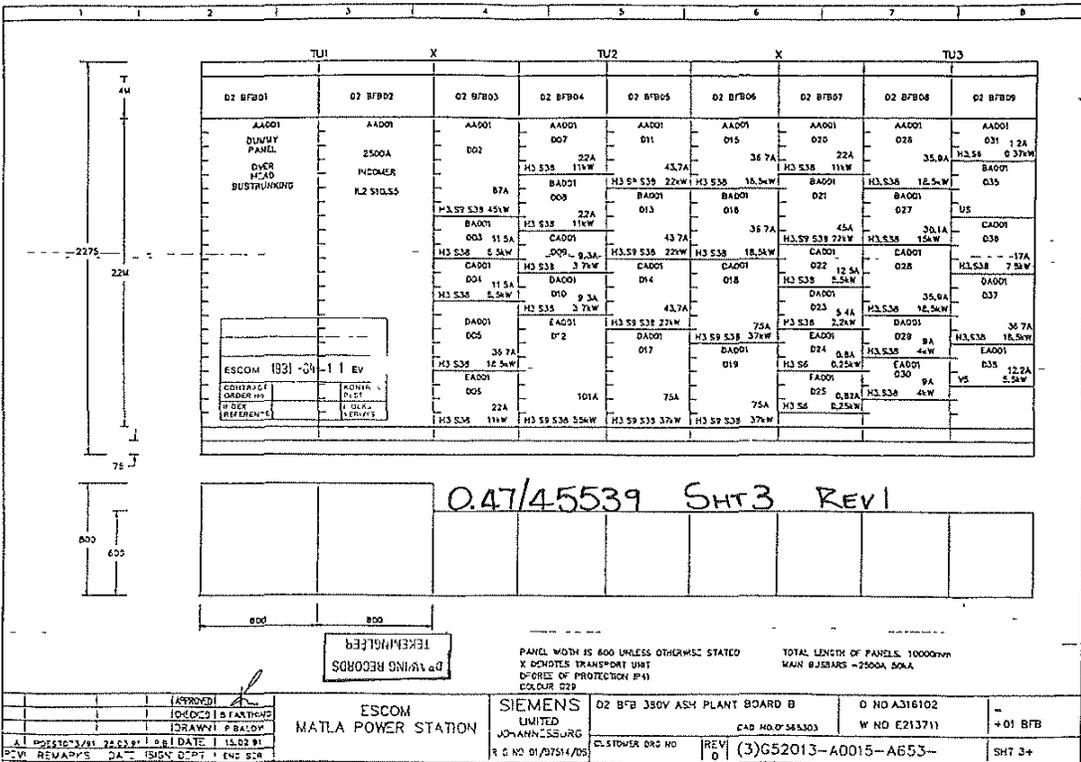
3.1.1 SYSTEM IDENTIFICATION (AS BUILT LAYOUT)

SWITCHGEAR GENERAL ARRANGEMENT





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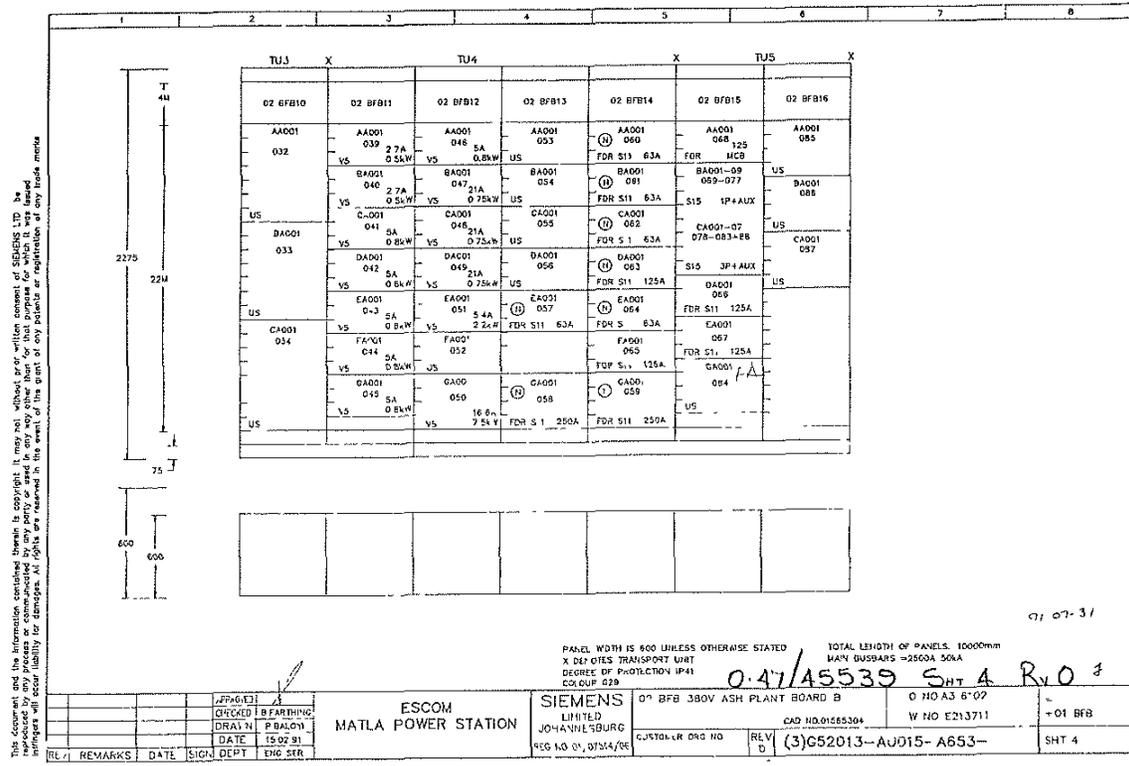


Figure 1: Existing Slurry Plant LV Switchgear Layout

3.1.2 SWITCHGEAR, PROTECTION AND RETICULATION

Figure 2 shows the slurry plant electrical reticulation layout, as may be seen the 400V Ash plant boards feed from the 11kV Ash plant boards via a 1.6MVA 11kV/400V transformer (Dyn11) and the 11kV boards fed from station boards 1 and 2. The plant reticulation is designed to allow for either of the boards to also run from the bus section breaker as shown in figure 2 below. The load transfer from A and B boards are performed via a dead bus transfer which is manually operated.

The auxiliary control voltage on the switchgear boards shall be maintained with a Dip Proof Inverter which shall be maintained by the Employer

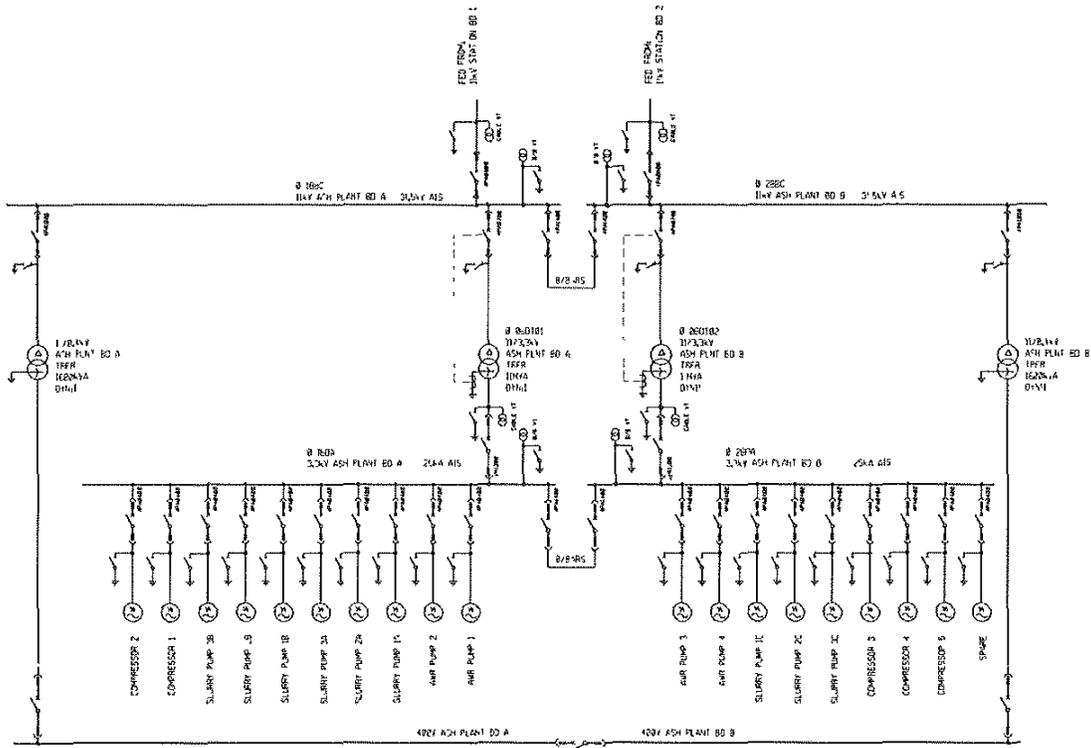


Figure 2: Slurry plant electrical reticulation layout.

The circuit breakers currently installed are the Siemens 3WN (fixed mount) circuit breakers and these are compliant with IEC 60947; it is proposed that these circuit breakers be replaced with Siemens 3WA breakers Table 2 shows a high level comparison between the 3WN and 3WA circuit breakers proposed.

Table 2: LV ACB parameter comparison

Parameter	3WN1771-1WA88 circuit breaker	3WA circuit breaker
U _E	660V/ 690V	690/1000
I _{cn}	80kA	66kA
I _{cw} (1s)	80kA	55kA
I _N	3150A	3200
Size	III	Must match existing
Poles	3	3
Type	Withdrawable	Withdrawable
Breaking Medium	Air	Air

Since the panels were built to match the existing panels any new circuit-breaker installed will require the Contractor to perform pre-measurements in order to plan for all of the upfront modifications which may be required for fitting the circuit-breakers.

Figure 3 shows the electrical protection scheme employed on the A and B board incomers, an assessment of the protection scheme and assessment of the protection settings shows the scheme uses the following elements on a CAG 39 phase 1 relay

- 1 Phase over current,
- 2 Earth fault protection
- 3 DC fail protection alarm

It must be noted that this protection relay does trip the LV circuit breaker has a cross thrip to the 11kV feeder breaker this was implemented due to the high LV network fault levels and historically low tripping reliability of LV circuit breakers

Since the protection scheme is not compliant with with 240-56357424/240-143485806, the following modifications are proposed on the protection system

- 1 Replacement of the CAG 39 and MCCG over current and earth protection relays with a modern SIPROTEC protection relay (7SJ) which are currently used on the refurbished units, this will assist with standardization, all components and relays shall be approved for use on Eskom generation plant 240-56227589.
- 2 The protection scheme shall use IEC 61850 to allow for automated load transfer The load transfers shall be dead load transfer and this scheme shall be compliant with 240-56361454
3. The load transfer shall be implemented via the protection relays from Ash plant board A to B and vice-versa,

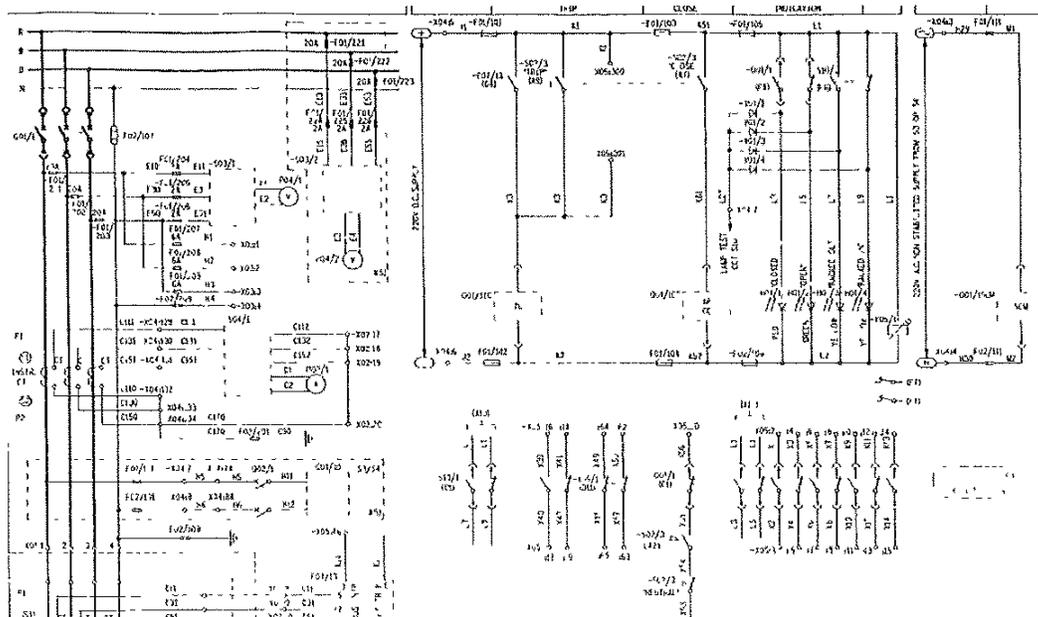


Figure 3: A and B board incomer electrical protection scheme.

The CT and VT will not be replaced as these are well suited to the existing switchgear based on the existing load flow and fault level studies

The 220VDC for the switchgear control and tripping circuits currently feeds from the existing charger panels where the 220VDC is generated and this is distributed to all of the switchgear boards. The 220VDC chargers will be installed by others and shall be utilised to feed the switchgear tripping and control circuits. With the removal of the charger panels each of the individual panels shall have a dedicated feeder from the new 220VDC chargers.

Matla power station electrical and C&I refurbishment project will not be performing any work on these LV boards, future Slurry plant projects (Slurry plant upgrade and Slurry plant refurbishment project) were assessed to determine future load growth requirements and no significant changes noted.

The *Employer* will provide the following documentation/drawings:

- i Existing and Proposed Substation Layouts (e.g. Charger placement within the substation)
- ii Updated Single Line Drawings
- iii Updated Switchgear Schedules
- iv Protection and Functional Block diagrams
- v Relevant Eskom Specifications and Drawings
- vi Existing and proposed I/O Functional Block Diagrams

All *Employer* information and property made available to the *Contractor*, including the works done by the *Contractor* for the *Employer*, is confidential and may not be disclosed to others.

3.2 PARTS OF THE WORKS WHICH THE CONTRACTOR IS TO DESIGN

- 1) Requirements for retrofitting of LV Switchgear and controlgear assemblies's outgoing functional units (feeders):
 - All circuits shall be made at the *Contractor's* factory to reduce execution time.
 - Expected execution time for the modification is 8 hours i.e. the board shall be down for a period of about 8 hours for all changes to occur.
 - Cables located in the fault free zone (unprotected live conductors) shall be brazed and phase segregated. Cables in the fault free zone (Unprotected live conductors) shall be replaced with double insulated cables.
 - Wiring terminals at the back of panel shall be IPXXB in accordance with SANS 60529.
 - Arc flash barrier to be installed for incomer circuits on the supply (line) side of the SCPD.
 - For feeder functional units, the arc flash barrier shall be on the supply (line) side of the SCPD.
 - All functional units with plastic door hinges must be replaced with metal hinges.
 - Panel door earth wire must be re-installed if not available.
 - *Contractor* to provide a component list per functional unit and type of all components used for retrofitting.
 - Standardisation must be accomplished by ensuring that circuits of the same power rating (for motor starters) have identical components up to breaker level.
 - Circuits shall be designed as per minimum requirements below.
 - All interlocks and interfaces on functional units must be reinstated.

- *The Employer shall provide standard schematic circuits as a guide for the Contractor*
- Feeder circuits,
 - i. All feeder circuit shall have MCCB as the SCPD (Short Circuit Current Protection Device) whose current rating shall be specified on the load schedule
 - ii The shaft of the SCPD shall protrude to the outside of the functional unit door to allow for closed door operation.
 - iii. Fixed functional unit doors with plastic hinges must be replaced with metal hinges
 - iv. Indicator lights and local control start and stop push buttons shall be located outside on the functional unit door
 - v Current and voltage indications if required shall also be located on the outside of the functional unit door
- Motor circuits,
 - i Motor starters shall incorporate isolation and switching facilities, overload and short-circuit protection, test and remote controls and indication as shown on the typical standard schematic diagrams to be provided by the Employer
 - ii Protection coordination shall be type 2 coordination and evidence shall be provided to the EMPLOYER
 - iii All held-in contactors' coils including interposing relay contactors (ITP) coils shall be rated for 230V AC
 - iv Each motor functional unit shall have a running and stop indication in front of the functional unit.
 - v A selector switch shall be provided to offer a selection between local and remote operation This selector switch shall be installed in the functional unit.
 - vi All functional units shall have X07 interface block for remote signal termination
 - vii The shaft of the SCPD shall protrude to the outside of the circuit door to allow for closed door operation
- Essential supply devices
 - i All boards with motor circuits shall have DPI (Dip Proof Inverters) for transient undervoltage withstand
 - ii. *The DPI shall be installed at the supply point of the control voltage*
 - iii. All switchgear with IEDs on the incomers shall have battery charger system rated for 220V to supply the IEDS, spring rewind, close and open coils of incomer or bus section circuit-breakers
- b. Replacement of the incomer and bus section circuit-breakers with none obsolete circuit-breakers Siemens 3WA circuit-breakers of the appropriate specifications,
 - The IEDs of the LV switchgear must be the same or have means to communicate (IEC 61850) with those IEDs used on the Station's MV switchgear to enable ease of integration to the existing network and facilitate standardisation
 - The IEDs for the incomer circuits shall also be able of controlling the bus section circuit-breaker

- c Protection and control schemes in accordance with the protection functional and interface block diagrams (Referenced Documents) and 240-56357424
 - d Interlocking system in accordance with 240-56357424, 240-56227516 and applicable
- 2) The *Contractor* is responsible for verifying and identifying all scope requirements for the plant systems, as part of the *Contractor's* engineering and design effort in order to meet the functional and performance requirements of the works
- 3) The *Contractor* is responsible for the design of the following as a minimum:
- e Switchgear functional units (feeders) in accordance with:
 - i 240-56227516 and SANS 61439
 - ii. Technical Schedule A and B
 - iii Switchgear Schedules
 - f Layout of the functional units and panel controls
 - g Replacement of the incomer and bus section breakers with none obsolete breakers Siemens 3WL breakers of the appropriate specifications
 - h Protection and control schemes in accordance with the protection functional and interface block diagrams (Referenced Documents) and 240-56357424
 - i Interlocking system in accordance with 240-56357424, 240-56227516 and applicable
- 4) Other requirements of the *Contractor's* design;
- i The Contractor shall use the information provided by the Employer in the form of load schedule and essential power supply size documents to specify the required Battery chargers for switchgear assembly. The Contractor must provide the specific battery charger ratings that will be suitable for the switchgear assembly circuits and IEDs
 - ii. Furthermore during the detail design phase the Contractor shall verify the load schedules with current plant, should there be no load schedule available or if the load schedules are missing some information, then the Contractor shall be responsible for compilation and/ or amendment of load schedules and then the Employer shall review.
 - iii The switchgear specific designs including all the protection requirements are to be incorporated into the final design of the schematic diagrams. All existing plant interfaces are to be considered and verified during the design
 - iv The Contractor provides the Engineering Design System (EDS) to illustrate the engineering methodology that will be used to ensure conformance with the Employer's design requirements.

The Contractor shall provide an estimation of the amount of heat dissipated by the offered components

3.3 PROCEDURE FOR SUBMISSION AND ACCEPTANCE OF CONTRACTOR'S DESIGN

3.3.1 DESIGN REVIEW PROCEDURE

The *Contractor* is the Design Authority as defined in the Design Review Procedure 240-75005287. The *Contractor* is responsible for executing the design and all associated works in the design procedure and conduct all the design reviews as specified in this procedure. The *Contractor* and the *Employer* are both responsible for conducting the following design reviews:

- a Design Freeze Review
- b Integrated Design Review
- c Construction Completion Review
- d Acceptance Testing Review

3.3.2 ENGINEERING CHANGE PROCEDURE

The *Contractor* takes note of the *Employer's* Engineering Change Procedure 240-53114002. An engineering change includes any proposed change originating from engineering, *Contractors*, project management or construction management.

The Engineering Change Procedure applies to the *Employer's* personnel or *Contractor's* performing engineering or engineering related work where the quality of the engineering work performed is the direct responsibility of Eskom.

3.3.3 PROCESS FOR SUBMISSION OF DOCUMENTS

The *Contractor* submits all documents according to the accepted VDSS. The process for the submission of documents is described below.

- a The *Contractor* submits the documents/drawings to the Project Manager.
- b The *Employer's* Document Controller registers the documents.
- c The *Employer's* Document Controller will supply the documents/drawings to all relevant parties within the *Employer's* project team.
- d The *Employer's* project team reviews the documents/drawings and will submit all comments or inputs to the Project Manager and the Project Manager submits to the *Contractor* for consideration.
- e If the *Employer* finds major deficiencies in the submitted documents/drawings, the *Contractor* revises the documents/drawings and resubmits to the Project Manager.
- f The *Employer* reviews the documents/drawings and if no major deficiencies are found, the *Contractor* organises a Design Review session to which employer shall be invited for review.
- g The *Employer* and the *Contractor* conduct a Design Review.
- h If any fundamental errors were found in the designs or further actions are required, the *Contractor* record all concerns raised and revises the designs for resubmission to the *Employer* via the project manager.
- i The *Contractor* organises a Design Review session once all designs were revised according to the concerns raised by the *Employer*.

- j. If no fundamental errors were found in the designs during the Design Review session, the *Contractor* compiles the Design Review minutes or report and submits it to the Project Manager
- k. The *Employer's* Document Controller registers the report.
- l The *Employer's* project team reviews the *Contractor's* report/minutes. If the report/minutes are not acceptable, the *Contractor* revises the report/minutes and resubmits to the Project Manager
- m The Project Manager will accept the *Contractor's* design once the report/minutes are accepted by the *Employer's* project team

3.3.4 TIME REQUIRED FOR ACCEPTANCE OF DESIGNS

Not later than one month after receipt, the Project Manager will return one copy of the drawing marked "Accepted", "Accepted as Noted" or "Not Accepted", as may be appropriate. The notations "Accepted" and "Accepted as Noted" authorize the *Contractor* to proceed with the manufacture of the Plant covered by such drawings subject to the corrections, if any, indicated thereon. Where prints or drawings have been "Not Accepted" or "Accepted as Noted" the *Contractor* makes the necessary revisions on the drawings and submit further copies for acceptance in the same procedure as for the original submission of drawings. Every revision shows by number, date and subject in the revision block on the drawing.

3.4 OTHER REQUIREMENTS OF THE CONTRACTOR'S DESIGN

3.4.1 SYSTEM INTERFACE

The *Contractor* is responsible for all system interfaces which forms part of the Works. The *Employer* will provide the relevant information defining the system interfaces. The *Contractor* caters for all the identified interfaces and shall provide for any additional 15% capacity terminal interfaces.

3.4.2 EQUIPMENT LAYOUT

The *Employer* will provide the existing and proposed substation layouts. The substation layouts can be seen in Appendix H. The *Contractor* is responsible for the as built substation layouts after the Plant is installed.

The *Contractor* is responsible for the final positioning of the Plant. The *Contractor* assesses any possible clashes with the existing structures and equipment in the substations. The *Contractor* notifies the Project Manager of any possible clashes before the Plant is delivered to site after detailed plant assessments are completed and approved in consultation with the *Employer*.

3.4.3 CURRENT TRANSFORMERS AND PROTECTION RELAYS FOR MOTORS ABOVE 30KW AND CRITICAL MOTORS

The *Contractor* shall ensure that all motors which are above 30kW or larger and critical/ essential motors shall be fitted with approved current transformers which are compliant with 240-56357424. The protection circuits shall be in line with 240-56357424 and all protection relays used shall be 240-56227589 approved.

The *Contractor* specifies and supplies all the required neutral star side current transformers in accordance with 240-56357424.

3.5 DESIGN OF EQUIPMENT

3.5.1 GENERAL

The *Contractor* shall provide detailed schematic drawings including all of the component schedules for the proposed circuits along with relevant technical equipment type tests. The *Contractor* completes Technical Schedule A and B in Appendix 2 of Part 3A to provide guarantees on the offered Plant concerned.

The *Contractor* designs protection schemes that comply with 240-56357424 and 240-56227589 and Part 3B of this Works Information. The *Contractor* completes Technical Schedule A and B in Appendix J of Part 3B to provide guarantees on the offered Plant.

3.5.2 RATING AND OPERATING CONDITIONS

- a The *Contractor* shall estimate the functional unit heating performance based on feeder circuit wattage losses and provide these to the employer. Consideration and/or recommendations must be provided to ensure compliance with 240-56227516 as far as possible.
- b Ratings for switching devices are in accordance with 240-56227516.
- c Switchgear operating and service conditions are also stipulated in 240-56227516.

3.5.3 PANEL DESIGN AND CONSTRUCTION

The *Contractor* shall not be allowed to alter or modify the main switchgear busbar, new holes may be drilled for all new terminations as required, where possible reuse of existing terminals would be preferred in order to minimize conductor loss. All work shall be in line with the requirement of 240-56227516. It is required that all functional units with exposed copper busbars or access to

3.5.4 CIRCUIT BREAKERS

Circuit breakers are provided as per Switchgear Schedules in Appendix A and spec 240-56227516.

3.5.5 EARTHING DEVICES

The switchgear design includes busbar and cable earthing devices as an integral part of the associated functional unit as per Switchgear Schedules in Appendix A. The earthing devices are as per GGSS1201.

3.5.6 ACCESSORIES

Each functional unit is equipped with accessories to meet the design requirements and the accessories comply with 240-56227516.

3.5.7 DESIGN ACCEPTANCE AND TYPE TESTING

3.5.7.1 TYPE TESTING

The type tests and special tests are carried out on all types of functional units in accordance with 240-56227516, applicable sections of SANS 556-1 and

The *Contractor* provides the relevant certificates and test reports to prove the compliance with 240-56227516. The minimum requirements for applicable type tests applicable on LV Switchgear functional units shall be agreed upon between the employer and *Contractor* as per 240-56227516. The *Contractor* shall be required to complete all applicable sections of 240-56227516.

Applicable tests/verifications to be done according to sections 3.1.2.2 to 3.1.2.8. of 240-56227516 for when modifications are made to an ASSEMBLY.

3.5.7.2 ROUTINE TESTS

Routine tests are done by the accredited test authority in accordance to 240-56227516. The performance of the functional units as well as the associated protection schemes is proven to comply with the technical requirements stipulated in this Works Information.

Two soft and hard copies of the final routine test reports for each functional unit of the Plant are provided by the *Contractor* not later than the delivery date of the Plant.

3.5.8 COMPONENTS ACCEPTANCE

All active components of the Plant that do not form part of the OEM's original design are subject to approval by the Employer. The component complies with the relevant requirements of this Works Information as a minimum.

Where required, the *Contractor* provides calculations to prove the component application, design and compliance to the requirements. The relevant schematic drawings are used for the acceptance of component application. Should the requirements not meet the component application design requirement, the additional cost is borne by the *Contractor*.

The *Contractor* provides original copies of the technical documentation of each component in a file complete with contents list as well as all calculations or justification per component. The *Contractor* submits two copies of files labelled Components Acceptance Application in this regard.

3.5.9 DETAIL DESIGN FREEZE

After Contract Award, the *Contractor* performs Detail Design in accordance to Employer's requirements presented by Typical Schematic Diagrams. The designs are agreed with the Employer to achieve Design Freeze status.

The *Contractor* submits the following data in neat hardcopies and softcopy files for acceptance by the Project Manager before the Design Freeze status can be declared as a minimum:

- a Technical Schedules A and B
- b Compliance Schedules
- c Engineering Change Register

- d Single Line Diagrams for Switchboards
- e General Arrangement Drawings
- f. Substation Layouts
- g Switchgear Schedules
- h Protection Functional and Interface Block Diagrams
- i. Schematic Diagrams for Protection and Control Systems
- J Component Schedules
- k Technical Manuals
- l Accepted Prototype for the functional unit.

The Employer will accept the following set of drawings, per board, before any manufacturing can take place

- a General arrangement drawings for each switchboard,
- b Switchgear schedule for each board with reference to component schedule;
- c Schematic diagrams for each circuit (this must include all the wire numbers, termination numbers, termination strip numbers, fuse sizes and spare contacts),
- d Component schedule for each circuit on the ASSEMBLY,

3.5.10 DESIGN PROTOTYPE ACCEPTANCE

The *Contractor* designs, manufactures and tests one complete functional unit feeder as per Switchgear Schedule if the non OEM parts shall be used in order to demonstrate type 2 coordination and detailed test reports shall be provided after Contract Award. The prototype switchboard complies fully with this Works Information

The prototype functional Unit is designed and manufactured within six months of Contract Award

The following data must be submitted before any manufacturing on the prototype Functional Unit can start

- a. List of components used on the prototype functional units
- b. Technical Manuals
- c Type Test Certificate of all active components If evidence is available of type tests already made on similar component, this may, subject to the Project Manager's approval, be acceptable in lieu of the relevant tests
- d Type Test Certificates and Reports
- e General Arrangement of the prototype functional units
- f Schematic Diagrams of the prototype functional units
- g Buswiring Diagrams of the prototype functional units
- h Protection and Control Logic Diagrams of functional units if applicable
- i Component Schedule for each circuit used on prototype switchboard

After the completion of the manufacturing of the prototype Functional Unit, it is tested in accordance with the required routine tests specified in 240-56227516 The test requirements are agreed between the Employer

and the *Contractor*. All tests and results are documented and signed by the Project Manager and the *Contractor*.

A technical manual for each design prototype Functional Unit is required after the completion of the tests. The manual contains the information on the functional unit as listed above, the test reports as well as photos of the construction, layout and wiring of the functional Unit and fitment within the existing switchboard. This information is used as a reference for further manufacturing.

3.5.11 MANUFACTURING RELEASE

The prototype functional unit is tested or type-test certified, and accepted by the Project Manager before the manufacturing process of the functional unit retrofits can start.

The Employer accepts the set of drawings, per board for all functional units, as per all requirements of 240-56227516.

3.5.12 SWITCHGEAR ROOMS

The following general requirements apply with regards to switchgear rooms:

- a The design layout indicating the recommended height, position with respect to switchgear location and size of the venting ducts is provided to the Employer for review.
- b The IP rating of the vents is IP41 in accordance with IEC 60529.
- c The cable entry openings do not jeopardise the integrity of the substation floor. The *Contractor* provides the details of the weight and dimensions of the switchboards offered to the Employer for review (which includes the centre of gravity).
- d Cable entry and arc ducting requirements are checked against the structural design of the rooms to avoid clashes with other structures.
- e The repositioning of lights inside the substations is performed by others. The lights are repositioned to suit the switchgear internal arc venting on the top of the switchgear. No light fittings are allowed within the pressure relief zone of the switchgear.
- f The *Contractor* provides an estimation of the amount of heat dissipated by each switchboard with the tender as per Appendix J of Part 3A. The HVAC system is provided by others.
- g The room floor plan drawings are provided as part of the Works under Referenced Drawings. The *Contractor* provides the Plant layout designs for acceptance by the Project Manager.
- h The *Contractor* liaises with others to confirm the final position of power and control cable entries, subject to acceptance by the Employer.

3.5.13 SPECIAL DESIGN REQUIREMENTS INTERPOSING RELAYS

The *Contractor* is responsible for supplying interposing relays at the correct voltage levels for the PLC. The 24V DC interposing relay will be used to control the breaker from the PLC. The requirement of the interposing relays is indicated on the Switchgear 240-56227516 and 240-56227589.

3.5.14 PLANT INTERFACES

The *Contractor* is responsible for providing sufficient spare contacts as per the Technical Schedule A and B Appendix J in 240-56227516. These contacts would be used to trip the circuit breaker from pressure switches etc as per the existing designs at the Power Station

3.6 EQUIPMENT REQUIRED TO BE INCLUDED IN THE WORKS

3.6.1 OPERATING AND MAINTENANCE TOOLS

The *Contractor* provides any special maintenance tools and equipment for the switchgear as per 240-56227516, the *Contractor* also supplies the necessary toolbox for the storage of the tools. The numbers of operating and maintenance tool sets are specified in Schedule A of 240-56227516

Any special tools or keys that may be required for maintenance or for adjustments are provided. Handling equipment is provided to facilitate the removal from the housing of the withdrawable devices weighing more than 25 kg unless the device carriage itself is designed for the duty.

3.7 WORKS AND THINGS FOR THE WORKS SUPPLIED BY THE EMPLOYER/OTHERS

SUPERVISOR AND RESPONSIBLE PERSON COURSE

The *Contractor* appoints two people to attend necessary training intervention or course provided by the *Employer* for authorisation to take out a work permit. No work will commence without an authorised supervisor and responsible person on site. The authorisation process will take at least three to four weeks.

3.7.1 CABLING

The instrumentation and power cabling where deemed necessary is provided by the *Contractor* and shall be fully compliant with 240-56227443 Requirements for Control and Power Cables for Power Stations Standard. The core drilling for cables, sealing the cable slots, disconnecting the existing equipment and cables, reconnecting the cables and repositioning the lights is the responsibility of the *Contractor*.

- The *Contractor* provides the detailed technical specification for all power cable plugs, terminations and lugs, all crimps for conductors above 4mm² shall be hexagonal crimp and shall comply with 00 0/10341. The power cable plugs will be supplied by the contractor.
- The *Contractor* to re-use the existing instrument/trunk cabling that is currently installed on the existing PLC cubicles. A cable schedule is provided as per Appendix B and the *Contractor* is to investigate any other cabling that does not form part of the cable schedule and cater for it accordingly by tracing its whereabouts and allocating cabling numbering for it and if during implementation any cable is found to be causing shorts the *Contractor* will investigate and replace such a cable.
- The *Contractor* is responsible for Earthing connections.

3.7.2 VERMIN AND FIRE PROOFING

Where fire seals or vermin seals may be damaged by the *Contractor* these shall be replaced by the *Contractor* as part of the works completed.

3.7.3 REMOVAL OF EXISTING EQUIPMENT

The removal of existing electrical equipment to be replaced and cabling that is not required shall be the responsibility of the *Contractor* after the installation and commissioning of the plant

The *Employer* will determine the area and location where the removed equipment shall be stored. The *Contractor* to be advised by the *Project Manager* with regards to storage of all removed equipment.

3.7.4 PADLOCKS

The *Employer* will supply all padlocks. All pad lockable devices, doors etc., are capable of accepting the *Employer's* standard padlock as specified in 240-56227516. Sample of padlock used is provided by the Supervisor on request. Drawing 0 00/10344 shows the padlock in the closed position, adequate space is provided to insert the padlock into locking devices when in the open position.

3.7.5 CURRENT TRANSFORMERS

The *Contractor* is responsible for supplying all the required current transformers in the LV Switchgear.

3.7.6 LV SWITCHGEAR INTELLIGENT ELECTRONIC DEVICES

The *Contractor* supplies the IED's for the LV Switchgear as indicated as part of standard 240-56227516 including the protection scheme design for the LV Switchgear will be done by others.

3.8 AS-BUILT DRAWINGS, OPERATING MANUALS AND MAINTENANCE SCHEDULES

a Language

All documentation, including reports, manuals, etc. is in the English language.

b Type Test Reports

Type test documentation represents the design of the functional unit with respect to the configuration, type and rating. The information to be included in type test reports is in accordance with the applicable SANS standard. The report of the type tested functional unit and associated components reflects the equipment under consideration. The type test report is provided in full, containing all records of the tests conducted as well as the drawings.

c Manuals

The technical, training, maintenance and operating manuals are provided for each type (e.g. for different ratings, voltage levels etc.) of a functional unit. Technical manuals include all technical data, information on the switchgear construction as well as the technical data and leaflets of each individual component used in the switchgear provided. Where generic manuals are provided, an addendum is provided indicating the applicable project specific components.

Manuals are of a good quality and cover the following as a minimum:

- I Technical descriptions of the equipment and component parts
- II General arrangement drawings
- III Installation instructions with drawings or pictures

- IV. Operating and maintenance instructions for all components
- V. Detailed parts lists (accompanied by exploded view type drawings clearly detailing the part and uniquely identifying it)
- VI. Spare part ordering instructions

Any special instructions pertaining to storage of spare parts or their shelf life is included in the maintenance manual. All drawings requested for component location, dismantling and re-assembly for maintenance are included in the maintenance manual. All special tools required for operating and maintenance of the equipment are presented in a form of a schedule in the operating and maintenance manual, respectively. The content of the training manual is based on the content of the technical, operating and maintenance manuals.

3.8.1 DRAWING REQUIREMENTS

The *Contractor* provides drawings for the required equipment as per 240-86973501.

The *Contractor* supply reproducible drawings according to the Vendor Document Submittal Schedule (VDSS) that is supplied by the Employer. The *Contractor* develops the following minimum requirements for the drawings:

3.8.2 DRAWING NUMBERING SYSTEM

The following Eskom drawing numbering system is proposed and the *Contractor* shall update the existing drawings for the installed switchgear and reproduce new drawings where these may not be available. The *Contractor* may assign his own drawing number as required to meet his document control system requirements. However final handover shall require all drawings to have the relevant Eskom drawing numbers.

3.8.3 GENERAL ARRANGEMENT DRAWINGS

The *Contractor* provides general arrangement drawings completely dimensioned, showing:

- a. Arrangement of equipment offered
- b. Plant, front view, and other elevation views
- c. Required clearances for opening doors and for removing circuit breakers
- d. Conduit or cable entrance locations for bottom entrance.
- e. Instrument transformers (i.e. VT's and CT's) physical positions
- f. Position of control panels and associated relays and IED's.
- g. Position of earth switches
- h. Terminal blocks locations
- i. Earthing connections

3.8.4 SCHEMATIC DRAWINGS

The *Employer* provides typical functional protection and control block diagrams in the Referenced Documents of 240-56357424 and 19 EED/006, which will have to be used as guidelines for the development of schematic drawings for the protection, control and monitoring schemes. Schematic diagrams will show the following:

- a. All protection and control devices and their contacts, each of which are labelled with its correct ANSI device function number, or reference.
- b. Device terminal numbers, terminal block numbers and terminal numbers.
- c. All internal interconnections, bus wiring, inter-panel wiring and connections to external equipment such as Control and Instrumentation (C&I) panel
- d. All control and protection switches
- e. Power supply connections

3.8.5 WIRING DIAGRAMS

The *Contractor* provides detailed wiring diagrams to show the following:

- a. Approximate physical locations of all items in each control panel
- b. All interconnecting wiring between control panels.
- c. Identification of all terminals, terminal blocks, and wires by numbers
- d. Clear identification, by some distinguishing method, of all wiring which will be installed by the *Contractor*

This will include, but not be limited to, leads from external current transformers, trip circuits from remote devices, auxiliary contacts to remote devices, incoming DC control power, and separate incoming AC power. This also includes spare auxiliary contacts and relay contacts which are wired to terminal blocks for future use.

3.8.6 OPERATING AND MAINTENANCE MANUAL

The *Contractor* provides Operating and Maintenance manuals as per the requirements stipulated in Technical Schedule A and B in Appendix A and B of 240-56227516. The manuals comply with 240-56227516.

The procedures are provided by the original equipment manufacturer detailing descriptions of the maintenance work in accordance with BS 6626 and SANS 60947. The procedure covers the requirements for maintenance of the equipment over the design life.

3.8.7 MAINTENANCE SCHEDULE

The equipment offered must have a production lifetime for at least 10 years after Contract Award (this exclude production for spares only).

The *Contractor* provides a maintenance schedule as per 240-56227516. The maintenance schedule provided is for the switchgear life expectancy of 30 years. The *Contractor* also makes provision for maintenance spares during the life expectancy of the equipment.

The equipment of the same rating should be fully interchangeable to allow for low inventory and reduced down-times.

4 LIVE CHANGE OVER METHODOLOGY

The *Contractor* is responsible for the live changeover methodology

4.1 Pre-Changeover Work

- 1) Pre-changeover work relates to any work to be undertaken on a system before changeover can be undertaken (for which the system must then be placed on "outage"). No plant-wide outage is planned for the Common Plant
- 2) Prior to undertaking any pre-changeover work
 - I The *Contractor* provides an overall changeover strategy based on a phased replacement, such that the systems are changed-over, in such a manner that the electrical retrofitted equipment is available after each changeover
 - I The *Contractor* submits the strategy for approval by the *Project Manager*
 - II The *Contractor* provides a changeover plan and commissioning plan, which is informed by the approved strategy, for each system
 - III The *Contractor* develops a risk assessment, mitigation and options to recover the process plant are clearly identified

The following list below is the highlighted activities to be completed in pre-changeover.

- Cable tracing and marking must be completed
 - New electrical equipment installed
 - Power supplies must be installed and operational
 - Grounds installed in panels
- 3) It is the responsibility of the *Contractor* to engage with the Employer's operating (4) and maintenance team to ensure that
 - i. The strategy and plans are compiled to sufficient detail prior to commencing with any pre-changeover work
 - ii All relevant stakeholders have been consulted to inform the strategy and plans prior to commencing with any pre-changeover work
 - iii The plant system is available and mitigations are in place to initiate a changeover, once the pre-changeover work is completed.
 - iv The *Contractor* is responsible for arranging all required resources for the change over and the management thereof

5 PROCUREMENT

5.1 PEOPLE

5.1.1 MINIMUM REQUIREMENTS OF PEOPLE EMPLOYED ON THE SITE

- (1) Only qualified and experienced people to be employed
- (2) The *Contractor* shall comply with Basic Condition of Employment Act and Labour Relation Act for the use of labour in executing the *works* to give effect to the right to fair labour practices referred to in section 23 (1) of the Constitution by establishing and making provision for the regulation of basic conditions of employment, and thereby to comply with the obligations of the Republic as a member state of the International Labour Organisation, and to provide for matters connected therewith
- (3) The *Contractor* must have at least 2 of Supervisory and Artisan staff authorized in Plant Safety Regulations and/or High Voltage Regulations In order for any person to do work at the Power Station, this person should be authorized to take out a permit to work
- (4) The courses for the plant safety regulations will be presented free of charge to *Contractors* by the *Employer* and bookings must be done via the *Project Manager*.
- (5) N B Access to the switchgear/equipment rooms the *Contractor* to comply to the following prior to access being granted.
 - i The *Contractor's* Supervisor to attend the Arc Flash Course (PSR Module 5) and pass the required test. The course will be offered by the *Employer* at no cost and Course dates will be announced after Contract Award
 - ii. *Contractor* to ensure that all personnel working in the room wear special overalls due to the nature of equipment in the rooms

Overall specification – Arch Flash PPE overall rated ATPV 12cal/cm² and Blue in Colour..

5.1.2 BBBEE AND PREFERENCING SCHEME

- (1) The *Employer* formal Black Economic Empowerment (BEE) programme was first initiated in 1995 with the publication of its policy regarding procurement from Black Suppliers (ESKADAAT6) ESKADAAT6 has set the standard for BEE programmes within Eskom and across South Africa as a whole
- (2) Eskom's policy is to maximise purchases from Black or Black Empowering Enterprises (BEE's) whether Black Woman-owned, small or Large Black or Black empowering suppliers. The purpose is to promote entrepreneurship in black communities and give black business access to the mainstream of business opportunity.
- (3) Eskom will concentrate its development efforts on black supplier's ninth manufacturing, construction and mining /extraction sector of the economy and provide support

5.1.3 SUPPLIER DEVELOPMENT AND LOCALISATION

- (1) Eskom Holdings SOC Limited ("Eskom"), as a State Owned Company, is required to drive and implement government's socio-economic initiatives

- (2) Eskom's Supplier Development and Localisation (SD&L) Programme, which is an essential component of its overall Transformation Programme, has as its primary objective the achievement of maximum and sustainable local development impact through leveraging Eskom's procurement spend in a manner that allows flexibility within the business in order to accommodate Government local development initiatives and policies
- (3) The SD&L programme seeks to maximise the following transformation objectives
- i B-BBEE The focal point of Eskom's B-BBEE Strategy is the sustainable development and empowerment of local black businesses, while continuing to uphold Eskom's core values. During the exemption phase, Eskom's stated policy was to give preference to level 1-4 B-BBEE contributors
 - ii Local Content Means the target committed by *Contractors* as a percentage of the contract value that will be spent in South Africa The total local content amount is calculated by adding rand value amounts as reported by suppliers in their quarterly report submissions
 - iii. Industrialisation Means any investment made by the supplier that results in building new and/or enhancing local capacity as well as increasing the export, thus enhancing industrialisation. The objective is to maximise Eskom and supplier spend to foster the establishment of new plants, expanding of existing plant and purchasing of machinery/equipment for local development
 - iv. Skills Development Eskom seeks to influence the development of skills through procurement spend, in order to contribute to the reduction of scarce skills and to build the country's capacity to compete globally
 - v Supplier Development Means providing a platform to develop emerging suppliers, through first-tier and second-tier contracting, and opportunities for national and international suppliers using the joint venture mechanisms
 - vi Job Creation Means the number of jobs created by suppliers as a result of Eskom's contract This contributes towards the achievement of localisation objectives of alleviating poverty through job creation
 - vii Corporate Social Investment In terms of the integrated Socio-Economic Development (SED) policy approved in 2014, Eskom together with its Subsidiaries, *Contractors*, Suppliers and Service Providers are required to participate in Corporate Social Investments (CSI) initiatives / programmes that are aimed at maximising the direct beneficiation of the Local communities around areas where Eskom operates its plant

5.2 SUBCONTRACTING

5.2.1 PREFERRED SUBCONTRACTORS

- (1) The *Contractor* shall make use of any supplier for sourcing of equipment, tools and material whatever that the *Contractor* will use to execute *works* shall comply with the SABS

5.2.2 SUBCONTRACT DOCUMENTATION, AND ASSESSMENT OF SUBCONTRACT TENDERS

- (1) The *Contractor* shall submit the proposed contract data for each subcontracting for acceptance to the *Project Manager*
- (2) The *Contractor* shall prepare subcontracting document as according to NEC contract.
- (3) The *Contractor* must inform the *Employer's* representative when intending to subcontract some of the *works* from the contract scope
- (4) The *Contractor* shall not subcontract a contractor that has lower or higher level accreditation than his/her according to CIDB

5.2.3 LIMITATIONS ON SUBCONTRACTING

- (1) The *Contractor* shall not subcontract more than 25% of the contract scope

5.2.4 ATTENDANCE ON SUBCONTRACTORS

- (1) The *Contractor* shall in writing inform the *Employer's* representative about the subcontractor intentions for site visit

5.3 PLANT AND MATERIALS

5.3.1 QUALITY

- (1) Refer to Matla quality manual in QM58 for compliance

5.3.2 PLANT & MATERIALS PROVIDED "FREE ISSUE" BY THE EMPLOYER

- (1) The *Employer* will provide power supply, water and land for the storage of equipment and material
- (2) The *Contractor* shall supply all the necessary equipment and material required to execute the *works*
- (3) Should the *Contractor* need to use any of the *Employer's* Equipment, including compressed air, electricity, water supply and crane, it must be specified by the *Contractor*. The *Employer* does not guarantee continuity of supply of any of these items

5.3.3 CONTRACTOR'S PROCUREMENT OF PLANT AND MATERIALS

- (1) The *Contractor* shall make use of SABS approved plant and material
- (2) Test certificates shall be given to the *Project Manager* of the project.
- (3) All warranties for the equipment, standard software and application software provided are included as part of the *works*.
- (4) All warranties are in the name of Matla Power Station.

5.3.4 SPARES AND CONSUMABLES

5.3.4.1 MAINTENANCE SPARES

- (1) The *Contractor* makes recommendations and supplies a spares list with a price per component at tender stage. The validity of this spares list is 12 months. The *Employer* reserves the right to purchase these spares within 12 months of the signing of the contract.
- (2) The *Contractor* supplies a complete listing of the components supplied and installed with technical description, model number and other technical detail as required by the SAP system and provided by the *Project Manager*. This will be used to update or create technical specifications for spares by the *Employer* (in the SAP system) and facilitate ease of ordering spares when required.

5.3.4.2 COMMISSIONING SPARES

- (1) The *Contractor* keeps sufficient spares to maintain the whole of the *works* up to the Defect date. If the *Contractor* is not planning to keep spares, a contingency plan should be put in place, and accepted by the *Project Manager*, to ensure that failures can be corrected with a minimal impact on the plant and process.

5.4 TESTS AND INSPECTIONS BEFORE DELIVERY

5.4.1 GENERAL

- (1) The *Contractor* does not bring to the working area those plant and material which the Works Information states are to be tested or inspected before delivery, until the supervisor/engineer has notified the *Contractor* that they have passed the test.
- (2) The Control System will undergo Factory Acceptance testing (FAT).
- (3) The *Employer* has the right to appoint a representative or representatives to inspect all parts during manufacture and to be present at any of the tests specified.
- (4) Arrangements for witnessing inspections are made through the *Project Manager*.
- (5) A minimum of ten working days' notice is given by the *Contractor* for inspections and is shown in the Accepted Programme.

5.4.2 FAT

- (1) During FAT, the *Contractor* demonstrates that the Control System meets the requirements of this Works Information and the detailed engineering design freeze documentation.
- (2) The FAT is done at a *Contractor's* assembly factory.
- (3) The *Contractor*, the *Project Manager* and the *Employer's* representative (s) witness the FAT.
- (4) All Control System hardware is included in the FAT, including HMI, network switches, and servers.
- (5) The *Contractor* provides all facilities and simulation systems at the FAT venue such that full testing of the control system logic can be done.

- (6) As a minimum, the following tests and inspection are performed during the FAT:
 - i System integrity and application tests
- (7) The *Project Manager* determines if any further testing is required in addition to that specified, such as that of any new technologies being used
- (8) The *Contractor* prepares a detailed FAT procedure which is approved by the *Project Manager*

5.4.3 FAT PROCEDURE

- (1) The *Contractor* prepares a detailed test procedure in preparation for FAT
- (2) As a minimum, the proposed FAT procedure identifies the following:
 - i Major test activities
 - ii Comprehensive list and description of the individual tests to be performed
 - iii. How the tests are to be prepared and conducted
 - iv. Test dates and durations.
 - v Checklists - how the test results will be documented
 - vi Acceptance Criteria
 - vii How the identified discrepancies will be processed
 - viii Retesting requirements

5.4.4 FAT REPORT & FAT COMPLETION

- (1) A Final FAT Report is prepared by the *Contractor* that includes the following as a minimum
 - i Test procedures used during FAT
 - ii. Detailed Test results
 - iii Discrepancies identified during the tests
 - iv Resolution of the discrepancies
 - v. Retests conducted and results thereof
 - vi. FAT certificate
- (2) The *Contractor* submits the Final FAT Report to the *Project Manager* for acceptance
- (3) FAT Completion is achieved upon acceptance of the Final FAT Report by the *Project Manager*

6 CONSTRUCTION

6.1 TEMPORARY WORKS, SITE SERVICES & CONSTRUCTION CONSTRAINTS EMPLOYER'S SITE ENTRY AND SECURITY CONTROL, PERMITS, AND SITE REGULATIONS

- (1) Refer to Access Control Procedure 4421

6.1.1 RESTRICTIONS TO ACCESS ON SITE, ROADS, WALKWAYS AND BARRICADES

- (1) Pedestrian crossings are made on the road they should be used when crossing the road.
- (2) Inside the plant walkways are clear, they should be used when walking inside the plant to keep safe on any object that might fall
- (3) Barricades are provided where there are open trenches and around the sumps and manholes

- (4) The *Contractor* shall occupy only such ground as is necessary to carry out the *works*
- (5) All fences and other structure that have been damaged or interfered with by the *Contractor* shall be restored to be a condition at least equivalent to their original condition.

6.1.2 PEOPLE RESTRICTIONS ON SITE; HOURS OF WORK, CONDUCT AND RECORDS

- (1) The LAR is for the person in charge of the plant to maintain control over activities taking place on his plant that are not covered by the Plant Safety Regulation and Operating Regulations for High Voltage Systems
- (2) Activities that are allowed to be carried out under the LAR must not require a permit and must satisfy the following criteria
 - i. They must not involve danger to the person carrying out the activity,
 - ii. No plant isolations must be required,
 - iii. The activity must be performed by a skilled person and there must be no risk of a production loss,
 - iv. The duration of the activity must be less than 24 hours
 - v. The Supervisor accompanies the *Contractor* during the first instances of working under a LAR on a specific plant area
- (3) It is very important that the person who plans to do an activity on a plant under the LAR informs the person in charge of the plant (ASS on the panel or Operating Supervisor) of what will be done
- (4) This means verbally telling the person in charge of the plant what will be done and not just signing the LAR book. The LAR book is also signed
- (5) It is also important that as soon as the activity is completed the person, who was doing the activity, notify (verbally) the person in charge of the plant that conditions are back to normal and that the LAR has been signed off. Just signing the LAR book is not sufficient
- (6) For more information please refer to Plant Safety Regulation.

6.1.3 HEALTH AND SAFETY FACILITIES ON SITE

Refer to Health and Safety Specification document 32-727 and 32-520

6.1.4 ENVIRONMENTAL CONTROLS, FAUNA & FLORA, DEALING WITH OBJECTS OF HISTORICAL INTEREST

- (1) Refer to Environmental Policy in 32-727 and 32-520

6.1.5 TITLE TO MATERIALS FROM DEMOLITION AND EXCAVATION

- (1) The *Contractor* has no title to an object of value or historical or other interest within the site
- (2) The *Contractor* shall notify the *Project Manager* when such an object is found and the *Project Manager* will instruct the *Contract* how to deal with it.
- (3) The *Contractor* does not move the object without instruction.

- (4) The *Contractor* has title to material from excavation and demolishing only as stated in the Works Information.

6.1.6 COOPERATING WITH AND OBTAINING ACCEPTANCE OF OTHERS

- (1) The *Contractor* shall co-operate with others in obtaining and providing information which they need in connection with the *works*
- (2) The *Contractor* shall share the working area with others in executing the *works*

6.1.7 PUBLICITY AND PROGRESS PHOTOGRAPHS

- (1) Should publicity and/or progress photographs be required, an application shall be made via the *Project Manager*

6.1.8 CONTRACTOR'S EQUIPMENT

- (1) The *Contractor's* attention is drawn to the applicable regulation framed under the Machinery and Occupational Safety Act, 1983 (Act No 6 OF 1983)
- (2) When working in built-in areas, the *Contractor* shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85 Db(A) during excavation and other *works*
- (3) Alternatively the *Contractor* shall by means of barriers, effectively isolate the source of any such noise in order to comply with the said regulation

6.1.9 EQUIPMENT PROVIDED BY THE EMPLOYER

- (1) Should the *Contractor* require using any of the *Employer's* Equipment, including compressed air, electricity, water supply and crane, it must be specified by the *Contractor* during the kick off meeting. The *Employer* does not guarantee continuity of supply of any of these items.
- (2) The *Employer* shall be entitled to withdraw use of the said Equipment, should proper maintenance and cleanliness not be ensured. In that event, the *Contractor* shall be obliged to provide the necessary Equipment at his own cost
- (3) The *Contractor* is responsible for the repair, replacement or correction as necessary of all pieces of tools and equipment supplied by the *Employer* which are damaged and / or lost whilst in the *Contractor's* custody and control
- (4) The *Contractor* site manager must ensure that any one of his employees or Sub-Contractor, operating hoist equipment belonging to the *Employer*, is authorised by an Accredited Company and retraining is done annually. Arrangements for training courses can be made via Matla Power Station Maintenance Training but the *Contractor* will absorb costs
- (5) A copy of this accredited and valid training certificate must be given to the *Employer's* Supervisor, who will then arrange access for usage

6.1.10 SITE SERVICES AND FACILITIES

- (1) Potable Water Supply is available at the existing points

- (2) Electrical Power Supply requirements are as follows
 - i Power is available at the existing points.
 - ii The *Contractor* provides his own portable 380V electrical distribution boards, and supply cables to and from the boards, for all his power supply requirements to execute the *works*
 - iii *Contractors'* Electrical Distribution Boards complies with OHSAs as referred to in the Electrical Installation Regulations and the Electrical Machinery Regulations
 - iv Each board brought onto site must have a Certificate of Compliance issued by an accredited person
 - v The *Contractors'* Electrical Distribution Boards are installed at the *works* on a time negotiated with the *Project Manager*, prior to the possession date.
 - vi The *Employer* connects distribution boards to a 380V three-phase AC power supply, only after the *Contractor* has submitted the valid Certificate of Compliance.
 - vii All *Contractors'* Electrical Distribution Boards are earthed to the steel structure of the plant
- (3) The *Employer* provides the *Contractor* access to existing toilet facilities. The *Contractor* is to provide this facility should the existing facilities not be within reasonable distance from the working area
- (4) The *Contractor* are not allowed to use the *Employer's* dining facilities, unless a specific agreement has been made between the *Contractor* and Eskom Catering and Accommodation Services (ECAS)
- (5) The *Contractor* may buy take away meals from the fast foods outlet on Site.
- (6) The *Contractor* provides a First Aid service to his employees and subcontractors. In the case where these prove to be inadequate, like in the event of a serious injury, the *Employer's* Medical Centre and facilities will be available
- (7) Outside the *Employer's* office hours, the *Employer's* First Aid Services are only available for serious injuries and life threatening situations
- (8) The *Employer* recovers the costs incurred, in the use of the above *Employer's* facilities, from the *Contractor*.

6.1.11 RESTRICTIONS TO ACCESS ON SITE, ROADS, WALKWAYS AND BARRICADES

- (1) The *Contractor* should provide facilities they deem necessary in executing the work. This must be discussed with the *Project Manager* prior to commencement of work.

6.1.12 PEOPLE RESTRICTIONS ON SITE; HOURS OF WORK, CONDUCT AND RECORDS

- (1) The *Contractor* shall properly deal with and disposal of water to ensure that the *works* are kept sufficiently dry for their proper execution.
- (2) The *Contractor* shall provide, operate and maintain in sufficient quantity such pumping equipment, well points, pipes and other equipment as may be necessary

- (3) The *Contractor* shall also provide temporary works as may be necessary to minimise damage, inconvenience or interference.

6.1.13 HEALTH AND SAFETY FACILITIES ON SITE

- (1) The *Contractor* will be held responsible for any damage to known services (services that are within the site of the *works* and are known/shown on drawings or highlighted by *Employer*) and he shall take all the necessary measure to protect them.
- (2) All *works* or protective measure shall be subjected to approval
- (3) In the event of service being damaged the *Contractor* shall immediately notify the authority concerned as well the *Project Manager* and the engineer.
- (4) The *Contractor* shall not repair any such service unless instructed to do so by the *Project Manager*.
- (5) The *Contractor* shall complete such an investigation well in advance, prior to the start of construction work in the said section and shall submit a report in good time to enable the engineer to make whatever arrangements that are necessary for the protection, removal or diversion of the service before any construction *works* commences
- (6) As soon as any underground service not shown in the in the drawing is discovered, it shall be deemed to be known service and the *Contractor* will be held responsible that the *Contractor* for any subsequent damage to it
- (7) If such service is damaged during the course of its discovery, the cost of rectifying the damage will be met by the *Employer* unless it is established that the *Contractor* did not exercise reasonable diligence and that the damage was avoidable
- (8) Where the authority concerned elects to carry out on site own account any alteration or protective measure, the *Contractor* shall co-operate with and allow such authority reasonable access and sufficient space and time to carry out the required work.
- (9) Permanent alteration or permanent diversion of service necessitated by the execution of the *works* and authorized will be paid for in terms of the conditions of contract, but no such work will be paid for if it has not been previously inspected and if no proper written instruction was given

6.1.14 ENVIRONMENTAL CONTROLS, FAUNA & FLORA, DEALING WITH OBJECTS OF HISTORICAL INTEREST

- (1) Where underground cables and pipes are present in the area, care must be exercised to ensure that they are not damaged In the case of damage to existing components, the *Contractor* will be held liable for replacement/repair thereof

6.1.15 TITLE TO MATERIALS FROM DEMOLITION AND EXCAVATION

- (1) The *Contractor* shall take all responsible measure to minimise any dust nuisance, pollution of stream and inconvenience to or interference with public as a result of the execution of the *works*

7 PLANT AND MATERIALS STANDARDS AND WORKMANSHIP

7.1 INVESTIGATION, SURVEY AND SITE CLEARANCE

- 1) This activity is a pre-cursor to the Detailed Engineering, during which the *Contractor* conducts the necessary plant investigation work. The *Contractor* is to investigate all the existing loop drawings, and do plant walks to familiarise themselves with the plant.
- 2) The *Contractor's* plant investigation work is conducted on a Functional Group basis and then on a KKS basis, where applicable.
- 3) The scope of the plant investigation work includes, but is not limited to
 - v Verification of the location and suitability of all process control and network equipment
 - vi. Verification of control system loops and terminations
 - vii. Verification of power requirements and terminations
 - viii Verification of the scope of work as defined by the *Works Information*
 - ix. Verification and amending of all philosophies relevant to the scope of work
 - x Cable tracing, verification and cable schedule updating

The *Contractor* is responsible for

- i Clarifying the input documentation and scope of work to be performed
 - ii Identifying any discrepancies in the input documentation and making the *Employer* aware of such discrepancies. The *Contractor* provides recommendations, where applicable, and takes action to resolve such discrepancies
 - iii Collecting any process/plant data and information required for the *Contractor's* design to be completed.
- 4) The *Contractor* provides a pre-cursor method statement as part of the tender returnable for the live change over (live change over refers to switching from the existing PLC to the supplied installed new PLC). The method statement must consider that the maximum time to do the changeover is three (3) days per-cubicle. The final live change over method statement which will be utilised for the actual live changeover is provided and submitted to the project manager after the *Contractor* has investigated the plant for review and acceptance by the *Employer*.
- 5) The *Employer* provides drive schedules and instrument schedules once the contract is awarded.

7.2 STANDARDS

The *Employer* Standard Specification applicable to the *Works* are provided by the *Employer*. The *Employer* will submit revised/updated standards. The *Contractor* is to obtain his own copies of International and National Standard Specification documents.

It is the responsibility of the *Contractor* to report any conflict within this *Works Information* with any referenced standard, specification or technical guideline.

7.3 LIST OF REFERENCE PROCEDURES, STANDARDS AND SPECIFICATIONS

The *Contractor* complies with all standards, specifications and regulations as listed within this works Information, on the table below

Table 3: Eskom Governance and Project Controls Specifications

No.	Document No.	Description / Title
1	36-681	Generation Plant Safety Regulations
2	32-520	Occupational Health and Safety Risk Assessment Procedure
3.	32-727	SHEQ Policy/Procedure
4	ISO 9001	Quality Management Systems
5	240-53113685	Design Review Procedure (DRP)
6	240-52844017	System Reliability, Availability and Maintainability Analysis Guideline
7	240-56355728	Human Machine Interface Design Requirements Standard
8	240-56355815	Control & Instrumentation Field Enclosures and Cable Termination Standard
9	240-109607736	Eskom KKS Key Part Standard
10	240-109607332	Eskom Plant Labelling Abbreviation Standard
11.	240-55410927	Cyber Security Standard
12	40-72926760	Operational Technology (OT) Operating Model
13	240-56355731	Environmental Conditions for Process Control Equipment Used at Power Station
14.	EED Matla FS rev 1	Matla Power Station Refurbishment Project MV Switchgear Replacement Project Load Flow And Fault Study Report
15	240-56357424	MV and LV Switchgear Protection Standard
16.	240-143485806	Generation auxiliary plant medium voltage protection standard.
17	Type testing report 4419/38e, LD 3231	Standard low voltage switchgear 8PU with high level busbars and 3WN1 circuit breaker
18	240-56227516	LV Switchgear and Control Gear Assemblies and Associated Equipment for Voltage up to and including 1000V AC and 1500V DC Standard CONTROLLED
19.	SANS/IEC 61439-1	Low voltage switchgear and controlgear ASSEMBLIES. Part 1 Type-tested and partially type-tested ASSEMBLIES
20	SANS/IEC 61641	Enclosed low-voltage switchgear and controlgear assemblies — Guide for testing under conditions of arcing due to internal fault
21	240-56227589	List of Approved Electronic Devices to be Used on Eskom Power Stations Standard
22	240-56361454	Undervoltage Protection Standard
23	240-56176852	Essential Power Supplies for Power Stations Standard
24.	32-245	Eskom Waste Management Standard
25	4444	Matla Power Station Risk Management Procedure
26.	474-305	Plant Equipment Risk Management Procedure
27	13340-04	Matla Power Station Environmental Policy

APPENDIX A

SWITCHGEAR SCHEDULE



Switchgear
schedules.docx



SWITCHGEAR
SCHEDULE ASH PLAI

APPENDIX B

CABLE BLOCK DIAGRAM



45144D03 (2).pdf



45144E02 (2).pdf

APPENDIX C

GENERAL ARRANGEMENT



General
Arrangement (GA).docx

APPENDIX D

LV IO STANDARD INTERFACES



Proposed LV IO
Standard Interfaces.xlsx

C3.2 CONTRACTOR'S WORKS INFORMATION