Eskom	Scope of work	Gx Kriel Power Station

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PART 3: SCOPE OF WORK

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C3.1: *Employer's* WORKS INFORMATION

Contents

1. Description of the works

1.1 Executive overview

This *works* information describes the *works* for the replacement of the currently installed Dip Proofing Inverters (DPIs) 54L version 2, on the 380V unit boards A-D in each unit (total of six units) at Kriel Power station with control supply UPS. The replacement was prompted by the design deficiency of the DPI which is detailed in the 474-11302 – Investigation on Different Technologies for AC Control Supply for Gx Plant report.

The *work* outlined by this document is for the *Contractor* to perform engineering, design, manufacturing, factory acceptance test, transportation, off-loading, installation, site acceptance test and commissioning, and handover to site of the control supply UPS (with their associated power and control cabling) to be installed on the 380V unit boards A-D at Kriel Power Station. The scope extends to structural integrity and UPS space allocation and SCADA modification for alarming purposes. Furthermore, the scope shall extend to *Contractor* providing training to ESKOM engineering, Maintenance and Operating on control supply UPS and handing over the requires software and firmware.

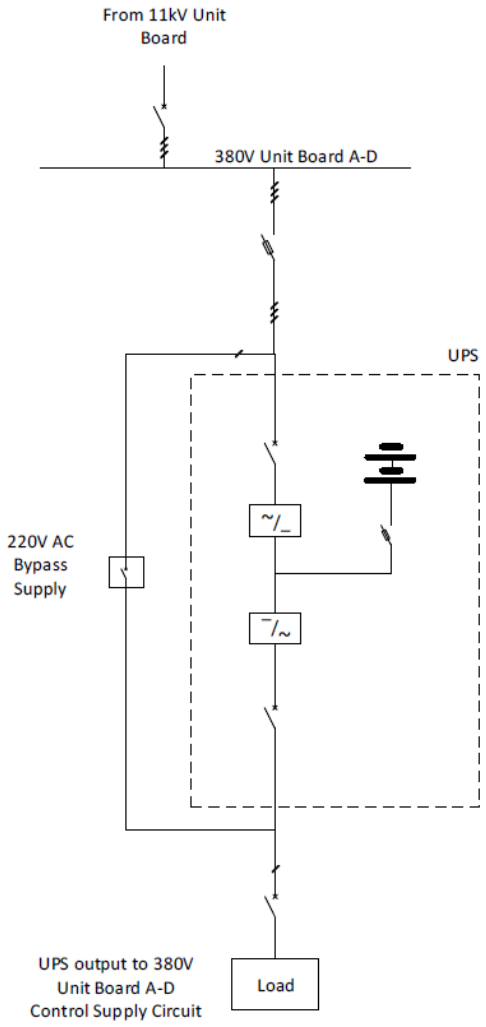

Figure 1: UPS configuration on the 380V unit board

1.1.1 Scope

Through this project, the *Employer* seeks the following from the *Contractor*:

1. The *Contractor* to decommission the currently installed DPIs with their associated feeder circuits and cabling; remove all the necessary components to a dedicated area, as per the site requirements.
2. The *Contractor* to design, manufacture, supply, assembly and integration, test, quality assurance, delivery to site, delivery to site, off-load, erect and commission the control supply UPSs, which shall be rated 5kVA (125% overload capacity for 10 minutes).
3. The design of the control supply UPS shall be in accordance with 240-53114248 Thyristor and switch mode chargers, AC/DC to DC/AC converter and inverter/ uninterruptible power supplies standard and PE Enquiry 2022 Schedules A B.
4. Manufacturing shall be the *Contractor's* premises, local or abroad, while the factory acceptance testing shall be carried out locally in South Africa at a properly equipped testing facility. Local engineering support shall be available should software configuration changes be required.
5. The *Contractor* size, design, manufacture, supply, assembly, test Nicad batteries for the control supply UPS
6. The *Contractor* shall size the battery with the UPS requirements of 5kW with standby time of 30 minutes.
7. The battery design shall be in accordance with 240-56360086 standard (Stationary Vented Nickel Cadmium Battery Standard) and Semi Sealed Nickel Cadmium Battery Spec Technical Schedules.
8. The *Contractor* shall provide Nicad batteries with hydrogen recombination technology to limit hydrogen emission.
9. The *Contractor* shall design, procure, install, test, commission, and handover the new earthing system in a form of bonding to the earth mat which shall include all necessary tests such as continuity tests for the new control supply UPS and Nicad batteries
10. The *Contractor* shall design bonding systems in accordance with 240-56356396 Earthing and Lighting protection standard.
11. The *Contractor* to adequately size 3-pole Short Circuit Protective Devices (SCPDs) as per the *Contractor's* design proposal, within the new feeder circuits for the control supply UPS. The "fault free zone" shall be maintained by ensuring that double insulated conductors are used.
12. The SCPDs to be used shall be a 3-phase fuse switch which shall be enclosed within the functional unit and/or panel such that it can only be operated when the functional unit panel door has been opened.
13. The circuits shall be wired such that the 3+N phase (from busbar side) of the boards are supplied to the control supply UPS via the SCPD.
14. The control supply UPS output shall interface to the existing DPI output terminals.
15. The *Contractor* shall design/size, source/manufacture, supply, quality control and assurance, install, test, commission, and handover of all power cables, inclusive of all necessary accessories and termination kits, related to the *Works.*
16. The *Contractor* shall further size the fuses to be used in the feeder circuits.
17. The cables to be provided include power cables from 380V unit boards to the UPSs, from the UPSs to the battery banks, and from the UPS to the 380V unit boards to interface with the auxiliary busbars.
18. The *Contractor* to provide new cable conduit/trunking where cables may be exposed to damage during normal plant operation.
19. The *Contractor* shall assess if the existing control cables from the DPI to the SCADA are fit for reuse. An Assessment report shall be submitted to the *Project Manager.*
20. If the existing control cables cannot be used, the *Contractor* shall design, manufacture, install, route, terminate new control cables between the control supply UPS and the SCADA RTU.
21. The *Contractor* shall decommission the old control cables

22. The cabling *Works* shall be in accordance with the Requirements for Control and Power Cables for Power Station Standard – 2405622744.
23. The *Contractor* may use the existing cable routing and racking where practically possible. The *Contractor* shall assess the support capability on the existing cable racks such that no safety hazards or racks damage exist.
24. The *Contractor* shall make a provision cable racking for areas where the existing cable racks cannot be used. This shall be done after approval has been granted by the *Employer.*
25. The *Contractor* shall update the necessary documentation i.e., cable block diagrams, cable rack design drawings, cable schedules, termination schedules to “as-built designs”.
26. The *Contractor* shall conduct tests on the installed cables and shall provide cable test certificates and safety clearance.
27. The *Contractor* shall submit the completed cable schedule in accordance with 240-56176097 Electrical cable schedule template.
28. The *Contractor* shall provide durable cable numbers in accordance with 240-56227443 Requirements for control and power station standard. In consultation with the *Employer,* The *Contractor* may use existing cable schedules such that no cable numbers are duplicated.
29. The *Contractor* shall submit cable connection and termination block diagrams for review and acceptance by the *Employer* showing items interconnected and cables provided. Each cable shall be numbered and coded, including the applicable general arrangement, wiring, circuit, and cable drawing number.
30. The cable numbering and coding shall be in accordance with the AKZ system of numbering. Cable schedules detailing each cable, its number, type (in code), length, origin, destination (each in AKZ code and clear text) shall be complied and used for the initial installation and thereafter, it shall be kept for maintenance purposes.
31. The *Contractor* shall submit cable design calculation to the *Employer* for review.
32. The *Contractor* shall assess the necessity to modify the existing SCADA and RTU to incorporate the new UPS signals, if there is sufficient spare capacity to add new signals. This shall include the modifying the RTU that interface to the EOD SCADA.
33. In the case of no spare capacity, the *Contractor* shall modify the SCADA EOD HMI to reflect the new UPS signals.
34. The *Contractor* shall ensure that the termination points of the UPS signals are captured, documented, and labelled correctly.
35. The *Contractor* shall obtain the necessary of approval from the SCAD OEM to modify the system, to prevent voiding the warranty on the SCADA/RTU.
36. The *Contractor* shall clarify and coordinate all the relevant interfaces that may exist.
37. The *Contractor* shall be responsible and shall be accountable and liable for all the structural analysis and designs by the *Contractor.*
38. The *Contractor* shall be responsible for the design of all temporary *works* required for the execution of the *works*
39. All the designs, design report, construction drawings prepared by the *Contractor* shall be signed off by the *Contractor’s* ECSA professionally registered Engineer.
40. The *Contractor* shall be mandated in terms of Construction Regulation 1024: Duties of Designer 6(1)g to fulfil the duties described therein. Any risk associated with the *Contractor*’s design shall be highlighted to the *Employer* together with the mitigation measures.
41. The *Contractor* shall carry out structural assessment in the LV switchgear room to evaluate the adequacy of the existing structures to support additional load that will be added onto the existing structures. The assessment shall include but not limited to the concrete floor slab that is supported by the universal beams which subsequently transfer loads to the foundation vial the columns.

42. The *Contractor* shall perform the structural design check and analysis using the governing standard and software, to determine if the structural elements would adequately support the new equipment, i.e., UPS and Nicad battery bank.
43. The *Contractor* shall perform strength capacity test, which include but not limited to slab core, drilling, reinforcement, scanning, and coupon tests for structural steel elements.
44. The *Contractor* shall provide mitigation or remedial measures of any deficiencies identifies during the assessment. The mitigation measures shall consider, optimisation. The design or design adequacy check shall be submitted to the *Employer* Civil Engineer for review and acceptance.
45. The *Contractor* shall provide the design report including all design calculations, drawings, and specifications to the *Employer* for review and acceptance.
46. The *Contractor* shall provide cost estimates for all approved mitigation or remedial work.
47. The *Contractor* shall produce “as-built” drawings of the affected structures. All calculations, construction drawings and reports shall be signed and approved the *Contractor’s* professionally registered Civil Engineer prior being submitted to the *Employer* for review and acceptance.
48. The *Contractor* shall provide all the documentation in the specific format as request ed by the *works.*
49. The *Contractor* shall compile and provide all drawings and equipment type tests reports and datasheets.
50. The *Contractor* shall provide the necessary spares as well as maintenance and operating manual.
51. The *Contractor* shall provide formal training to Engineering, Maintenance, and Operating personnel. All training material and presentation of training sessions shall be included in the works. The training material shall be supplied in English and training shall be supplied in South Africa, operating ang and maintenance training shall take place at Kriel Power Station.
52. Active interfacing with the *Employer’s* system engineer shall be required to complete a fully functioning unit.
53. The *Contractor* shall provide *Employer’s* Engineering and Maintenance tools for purpose of accessing and maintaining all electronic and mechanical components where recommended.
54. The *Contractor* shall furnish the *Employer* with applicable settings documents.

1.2 *Employer*’s objectives and purpose of the *works*

The purpose of this *works* is to replace the DPI with control supply UPS for all the units at Kriel Power station. The control supply UPS shall provide reliability by ensuring that the motor control supply voltage is always sustained under normal and abnormal conditions for predefined duration.

1.3 Interpretation and terminology

If required include here definitions additional to those used in the *conditions of contract* which are required only for the purpose of making the Works Information easier to draft and read. Also list abbreviations used and provide a full interpretation of each one, for example:

The following definitions apply:

Definition	**Meaning given to the definition**
Dip Proof Inverter	An inverter supplying the control supply of a large AC distribution board. The purpose is to keep the control supply stable during short power dips preventing contactors and relays de-energizing as a result of the dip.
Malfunction	The termination of the ability of an equipment to carry out the intended functions or the execution of the unintended function by the equipment.
System	An integrated set of constituent pieces that are combined in an operational or

	support environment to accomplish a defined objective. These pieces include people, hardware, software, firmware, information, procedures, facilities, services, and other support facets.
Voltage dip	A sudden reduction of the voltage at a particular point of an electricity supply system below a specified dip threshold followed by its recovery after a brief interval
Uninterruptible Power Supply	
Threshold	A defined magnitude that must be exceeded for a certain reaction, phenomenon, result or condition to occur

The following abbreviations are used in this Works Information:

Abbreviation	**Meaning given to the abbreviation**
AC	Alternative Current
Ah	Amp hour
AHU	Air Handling Unit
AKZ	Anlagenkennzeichnungssytem
C&I	Control and Instrumentation
CS	Control Supply
DC	Direct Current
DPI	Dip Proof Inverter
FAT	Factory Acceptance Test
FTA	Field Termination Assembly
HMI	Human Machine Interface
HVAC	Heating Ventilation Air Condition
I/O	Input/Output module
kW	Kilowatt
LOSS	Limit of Supply and Services
LP	Low pressure
LV	Low voltage
MV	Medium Voltage
NEC 3	New Engineering Contract
Nicad	Nickel Cadmium
OEM	Original Equipment Manufacturer
RTU	Ring Terminal Unit
SANS	South African National Standard
SAT	Site Acceptance Test

SCADA	Supervisory Control and
SCPDs	Short Circuit Protective Devices
UPS	Uninterruptible Power Supply
V	Voltage
VDSS	Vendor Document Submittal Schedule
Vn	Nominal Voltage

2. Management and start up.

2.1 Management meetings

The *conditions of contract* (e.g. Clause 16.2) require and other sections of the Works Information (e.g. safety risk management) may require (mandate) that a meeting shall be held. However the intention of all NEC contracts is that the Parties and their agents use the techniques of partnering to manage the contract by holding meetings designed to pro actively and jointly manage the administration of the contract with the objective of minimising the adverse effects of risks and surprises for both Parties.
Depending on the size and complexity of the *works*, it is probably beneficial for the *Project Manager* to hold a weekly risk register meeting (Clause 16.2). This could be used to discuss safety, compensation events, subcontracting, overall co-ordination and other matters of a general nature. Separate meetings for specialist activities such as programming, engineering and design management, may also be warranted.
Describe here the general meetings and their purpose. Provide particulars of approximate times, days, location, and attendance requirements, stipulating that attendees shall have the necessary delegated authority to make decisions in respect of matters raised at such meetings.
The right to hold specialist meetings should be stated generically and in such a way that ambiguity with other parts of the Works Information is avoided.
The following text could be used as a model for this section:

Regular meetings of a general nature may be convened and chaired by the *Project Manager* as follows:

Title and purpose	Approximate time & interval	Location	Attendance by:
Risk register and compensation events	As agreed between the Project manager and the *Contractor*	Kriel Power Station	*Employer, Contractor, Supervisor,*
Overall contract progress and feedback	As agreed between the Project manager and the *Contractor*	*Contractor*'s workshop/ Kriel Power Station	*Employer*, *Contractor*, *Supervisor*, and ___

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.

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 Management

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

Sub*Contractor*s. Drawing numbers will be assigned by the *Employer* as drawings are developed. All equipment to be coded, AKZ codes to be supplied by the *Employer*.

2.2.2 Document Identification

The *Contractor* is required to submit the Vendor Document Submission Schedule (VDSS) as per agreed dates to the delegated Eskom Representative. Eskom will pre-allocate document numbers on the VDSS and send back to the *Contractor* through the delegated Eskom Representative. The VDSS is revisable and changes must be discussed and agreed upon by all parties. Changes in the VDSS can be additional documentation to be submitted, changes in submission dates or corrections in documentation descriptions, document numbers, etc. The *Contractor*'s VDSS shall indicate the format of documents to be submitted. In Appendix A the *Employer*'s VDSS is attached to indicate minimum documentation required.

2.2.3 Document Submission

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). In order to portray a consistent image, it is important that all documents used within the project follow the same standards of layout, style and formatting as described in the Work Instruction.

The *Contractor* is required to submit documents as electronic and hard copies and both copies must be delivered to the Eskom Representative with a transmittal note. The *Contractor* submits all documents according to the accepted VDSS. The process for submission of documents shall be agreed before the design work commences.

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

- Documentation Management Review and Handover Procedure for Gx Coal Projects (240-66920003).
- Project Documentation Deliverable Requirement Specification (240-65459834).
- Technical Documentation Classification and Designation Standard (240-54179170).
- Project Plant Specific Technical Documents - Handover Works Instruction 240-124341168.
- Project Documentation Deliverable Requirement Specification 240-65459834.
- Technical Documentation Classification and Designation Standard 240-54179170.
- Project/ Plant Specific Technical Documents and Records Management Work Instruction 240-76992014.

Email Subject
The *Contractor* shall submit all documentation to the Eskom Representative as well as the Project's Documentation Centre in the following media:

1. Electronic copies shall be submitted to Eskom Documentation Centre through generic email address (drmsharedservices@eskom.co.za). The email subject shall as a minimum have the following: (Project Name_Discipline_Subject). Electronic copies that are too large for email will be delivered on CD/DVD, large file transfer protocol and/or hard drives to the Project Documentation Centre. A notification email, with the transmittal note attached, shall be sent to the project generic email address. The Representative will be copied on the email as well.
2. Hard copies shall be submitted to the Eskom Representative accompanied by the Transmittal Note.

2.2.4 DRAWINGS FORMAT AND LAYOUT

The creation, issuing and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 Engineering drawing Standard. Drawings issued to Eskom will be a minimum of two hardcopies and one electronic copy. The General arrangement drawings shall be in accordance with 240-53114248 Standard. Reproducible drawings shall be provided in an English language. All drawings shall be in at least A3 size. All detail drawings shall be drawn and prepared on software. dgn format.

2.2.5 Operating

Procedures and manuals for the operation of all modified systems shall be provided/ updated by the *Contractor*.

2.2.6 Maintenance

1. Manuals for the maintenance of all modified systems shall be provided/ updated by the *Contractor*.
2. A list of recommended spares and their technical specifications are to be provided.
3. A list of special tools and drawings are to be provided. Drawings are to be provided as both hard and soft copies.

2.2.7 Engineering

1. A system operating description is to be provided.
2. Technical manuals detailing the implemented modifications are to be provided.
3. All OEM datasheets are to be provided.
4. All existing P&ID's, layout, general arrangement, line diagrams, logic diagrams and associated technical documentation affected by the modifications are to be updated to reflect the new/modified systems. Drawings are to be provided as both hard and soft copies (3 hard copies per drawing).
5. All new drawings and documentation to be uploaded and registered on the Kriel Power Station Documentation System by the *Employer*.
6. The *Contractor* provides all applicable documentation listed in the Vendor Documentation Submission Schedule in Appendix A for acceptance by the *Employer*.
7. All functional logic diagrams are submitted by the *Contractor* to the Project Manager for acceptance before activation of logic on the control.

2.2.8 As Built Drawings And Documents

It will be the responsibility of the *Contractor* to revise the drawings and to update all the existing documentation to reflect the "as build" status of the Kriel units and forwards these drawings to the Project Manager 15 working days prior the Completion Date.

2.3 Health and safety risk management

In addition to the requirements of the laws governing health and safety, Eskom may have some additional requirements particular to the *works* and the Working Areas for this contract. The text below provides for these being attached as an Annexure to this Works Information. PLEASE ALSO READ CORE CLAUSE 27.4 TOGETHER WITH Z7 IN THE ADDITIONAL CONDITIONS OF CONTRACT TO MAKE SURE THAT WHATHEVER IS INCLUDED IN THE ANNEXURE FOLLOWS ON FROM THOSE CLAUSES.

The Divisional/Regional Safety Risk Manager or his representative having jurisdiction over the *works* must provide the relevant safety, health and environmental (SHE) criteria for incorporation into this Works Information. The SHE specification / scope must be signed off by the Divisional/Regional Safety Risk Manager or his representative confirming that the applicable safety criteria have been taken into account.

The Commodity Manager / Buyer must refer the tender to the Divisional/Regional Safety Risk Manager or his representative in order to evaluate against enquiry-specific safety criteria.

The Divisional Safety Risk Managers who will be responsible for the allocation of resources to assist P&SCM with the above processes are as follows:

- Generation: Roley McIntyre
- Transmission: Tony Patterson
- Distribution: Alex Stramrood
- Enterprises: Jace Naidoo
- Corporate: Kerseri Pather

The *Contractor* undertakes to take all reasonable precautions to maintain the health and safety of persons in and about the execution of the service. Without limitation the *Contractor:*

- accepts that the *Employer* may appoint him as the "Principal Contractor" (as defined and provided for under the Construction Regulations 2003 (promulgated under the Occupational Health & Safety Act 85 of 1993) ("the Construction Regulations") for the Affected Property;
- warrants that the total of the Prices as at the Contract Date includes a sufficient amount for proper compliance with the Construction Regulations, all applicable health & safety laws and regulations and the health and safety rules, guidelines and procedures provided for in this contract and generally for the proper maintenance of health & safety in and about the execution of the service; and
- undertakes, in and about the execution of the service, to comply with the Construction Regulations and with all applicable health & safety laws and regulations and rules, guidelines and procedures otherwise provided for under this contract and ensures that his Subcontractors, employees and others under the Contractor's direction and control, likewise observe and comply with the foregoing.

The *Contracto*r, in and about the execution of the service, complies with all applicable environmental laws and regulations and rules, guidelines and procedures otherwise provided for under this contract and ensures that his Subcontractors, employees and others under the Contractor's direction and control, likewise observe and comply with the foregoing.

Radiographic Examinations
When radiographic tests are carried out in the plant the danger area is barricaded. Workers are made aware of this fact and the Radiographic technicians ensure that no person is within or enter the danger area prior to commencing of or during the tests by public announcement according to the procedure.

2.4 Environmental constraints and management

All spillages (whether oil, grease, diesel, chemical, etc.) are prevented at all times and where accidents occurred in line with any spillages, immediate remedial actions are taken to clean-up the affected area using the appropriate spill-cleaning chemicals/absorbents.

It is the responsibility of the *Contractor* to ensure that the *Contractor* obtains copies of the Environmental Policy of oil spillages,

The non-adherence to the rules will result in a non-conformance, hence immediate termination of the contract.

Rules are as follows:

1. Provide sufficient storage containers, labelled depicting general or hazardous waste and store in a designated storage area.
2. No hazardous waste may be stored for a period of more than 90 days at Kriel Power Station premises.
3. Ensure that all hazardous waste is disposed of at a licensed class H disposal site. A copy of the hazardous waste disposal certificate is submitted to the *Project Manager*.
4. Ensure that all other general waste is disposed of at the local municipal waste dump.
5. Ensure that your site complies with the general good housekeeping practices

2.5 Quality assurance requirements

1. The *Contractor* shall adhere to the Eskom Supplier Quality management Specification, 240-105658000.
2. QCP's shall be supplied by the *Contractor* for all work to be done.
3. No work shall commence before the QCP's have been approved by the *Employer*.
4. The QCP's shall make provision for Hold and Witness point to be included by the *Employer*'s representative.
5. There shall be signature pages in the QCP's that captures the detail of the people who is authorised to sign off activities on the QCP's.

2.5.1 Quality Plans

The Quality Plan manages the overall quality of the project's main activities/milestones. It lists detailed activities in order of execution where each activity is described and references the associated work packages or specifications with witness-, hold- and verification points. The QCPs make provision for signatures indicating completion by the *Contractor* and acceptance by the *Employer* at the end of each activity.

2.5.2 Work Packages

For all site related work the *Contractor* is required to submit a work package before any type of work can commence on Eskom plant. The required format of the work package is accordance with template 167A/158-A and a signed copy is provided by the *Contractor* after the *Employer* has reviewed and accepted the Work Package as final prior to any work.

2.6 Programming constraints

2.7 *Contractor*'s management, supervision and key people

State any additional constraining requirements on *Contractor*'s supervision and key people that are not already stated in other sections such as for Health and Safety. This section could be used to solicit an organogramme from the *Contractor* showing his people and their lines of authority / communication. This would be essential if the *Contractor* is a Joint Venture.

The *Contractor* makes arrangements for the use of the available workshop Equipment and Site specific tools.

The *Contractor* does not modify any plant or materials unless accepted by the *Employer* prior to implementation.
The *Contractor* notifies the *Employer* at least two days in advance of a Hold or Witness point on the *Works*.

The *Contractor* informs the *Employer* of any defect found and notify the *Employer* at least two days in advance of a Hold or Witness point on the Works.

The *Contractor* does not operate any Equipment on Site, unless specific authorisation is obtained from the *Employer*.

2.8 Invoicing and payment

The Z clauses make reference to invoicing procedures stated here in this Service Information. Also include a list of information which is to be shown on an invoice.

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.

The *Contractor* shall address the tax invoice to Eskom Holdings SOC Ltd and include on each invoice the following information:

- Name and address of the *Contractor* and the *Project Manager;*
- The contract number and title;
- *Contractor*'s VAT registration number;
- The *Employer*'s VAT registration number 4740101508;
- Description of service provided for each item invoiced based on the Price List;
- Total amount invoiced excluding VAT, the VAT and the invoiced amount including VAT;
- (add other as required)

Add procedures for invoice submission and payment (e. g. electronic payment instructions)

2.9 Insurance provided by the *Employer*

First read ECC3 Core Clause 87.1 and then add anything necessary for the management of insurance related issues such as a cross reference to where procedures for making claims can be found. Also provide contact details for persons capable of being able to answer any insurance related queries the *Contractor* may have, as well as to whom the information required by Marine Insurance may be addressed.

2.10 Contract change management

This section is intended to deal with any additional requirements to the compensation event clauses in section 6 of the core clauses; such as the use of standard forms. Not the same thing as documentation control.

Contract change management is managed in accordance with clause 6 of the core clauses in ECC3. In summary, in the event that the *Employer*/*Contractor* notices a change, an event register is issued. If the event/change has cost implications then a quotation is submitted with the event register. The *Project Manager* assesses the quotation and gives an instruction in writing to the *Contractor*.

2.11 Provision of bonds and guarantees

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.

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. Such withholding of payment due to the *Contractor* does not affect the *Employer*'s right to termination stated in this contract.

2.12 Records of Defined Cost, payments & assessments of compensation events to be kept by the *Contractor*

If Option C, D, E or F applies first read clause 52.2 and then state whether the *Contractor* is required to keep any other records. Include any other constraint which may be required in regard to format and filing of the records, and whether access for the *Project Manager* shall be provided in hard copy or electronically.

Could delete if Options A & B apply unless the *Employer* requires some form of control over the *Contractor*'s record keeping.

2.13 Training workshops and technology transfer

Describe type and frequency of on job training workshops, as well as any obligation for technology transfer being included as part of the contract on Completion of the *works*.

Formal training is conducted as part of this contract before completion of the works. The *Contractor* trains the *Employer*'s personnel as per details in section 5.2.9. The *Contractor* is responsible for providing a training register in order to keep as proof of training provided. The signed off training register by all participants is also to be supplied by the *Employer*.

3. Engineering and the *Contractor*'s design

3.1 *Employer*'s design

3.1.1 Operating philosophy

Kriel Power station is a base load coal fired power station located 15 km outside of Kriel town in Mpumalanga province, South Africa. Kriel reticulation comprises of Unit transformers that step down 18kV that is generated to 11kV that is used to supply the 11kV Unit boards A & B. Other unit transformers are then employed to step down 11kV to 380V to supply unit boards A-D. These 380V unit boards power motor circuits that are used for fans and pumps. DPIs are employed on these boards to provide supply to contactors during a voltage dip. This control supply powers the control for motor starter circuits, which in turn control and monitors motors which drive fans, pumps etc. These pumps and fans contribute to generation of power. DPI assists in external disturbance ride through capability of a generating unit. These compensate for momentary voltage dips that can cause the held-in coils of contactors to drop out, thereby causing a production loss. DPI can only compensate voltage dips that last for a second. There have been numerous incidents wherein DPI malfunction and result in production losses. The report (474-11302) was compiled to investigate different technologies for AC control supply as an alternative to the DPI.

The selected technology was UPS. Control supply UPSs shall be employed in the 380 V unit boards A-D. These UPSs will be fed from the 3-phase of each respective board's busbar and protection relay (vecto11™) shall monitor all three phases and maintain 2oo3 (2 out 3) or all phases for undervoltage. The bypass line be from the same board as seen in figure 1. The mains recorder monitors all three phases of the 380V unit board and maintain 2 out of 3 phases for under voltage to determine a real under-voltage and will interrupt in the event of 2 phases experiencing a voltage dip for more than 1 second. This is required as the aim is not to interrupt the supply in the event of a single-phase loss to the recorder. Resetting of the under-voltage conditions will also be a two versus three conditions, whereby two passes ought to be above the detection set value (i.e., 75% of Vn).

The single-phase output of the UPS shall feed the auxiliary busbar of each respective board which is used for motor control circuits. The UPS output shall interface with the existing DPI output terminals supplying the auxiliary busbar. The UPS modular (N+1) configuration on the rectifier and inverter presents a level of redundancy in the system. Furthermore, the system is also fitted with a bypass line and batteries to provide back-up, The batteries shall be sized for the UPS requirements pf 5kW with the standby time of 30 minutes

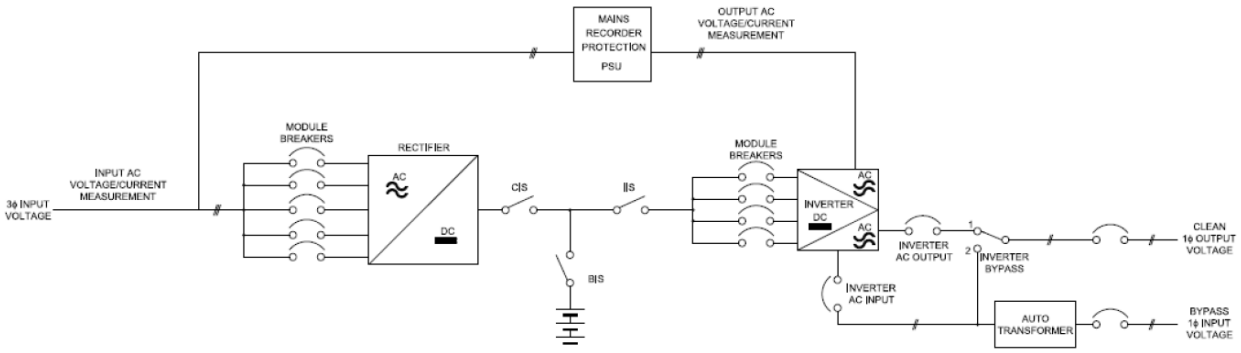

Figure 2: Single line diagram for control supply UPS

3.2 Parts of the *works* which the *Contractor* is to design

3.2.1 Functional requirements of the *Works*

1. The control supply UPS shall be of a modular type. with a rating of 5kVA (+125% overload capacity for 10 minutes). The UPS shall strictly be designed in accordance with 240-53114248 Thyristor and

switch mode chargers, AC/DC to DC/AC converter and inverter/ uninterruptible power supplies standard and PE Enquiry 2022 Schedules A B.

2. The Control supply UPS shall sustain control supply voltage of control supply motor voltage under normal operating conditions and under voltage dip conditions for 1 second when the voltage drop to 0.75 Vn.
3. The UPS shall interface with the 380 V unit boards with regards to the rectifier power supply circuits and UPS output termination to the 380V unit boards.
4. The existing DPI circuit shall be modified- and re-used as far as possible for the control supply UPS.
5. The UPS shall as a minimum, voltage, and current recording capabilities.
6. A properly sized 3-pole SCPDs shall be provided as per design proposal, within the new feeder circuits allocated in table 1 for the control supply UPSs. The “fault-free zone” shall be maintained by ensuring that the double insulated conductors are used.
7. The SCPDs to be used shall be 3-phase fuse switch which shall be enclosed with the functionals unit and/or panel such that it can be only operated when the functional unit panel door has been opened.
8. The circuits shall be wired such that the 3+N phase (from the busbar side) of the boards are supplied to the control supply UPSs via the SCPD.
9. The control supply UPS shall be provided with Nicad batteries, which shall be properly sized to the UPS requirement of 5kVA, with the standby time of 10 minutes
10. The batteries and their cabinets shall be strictly designed in accordance with 240-56360086 Stationary Vented Nickel Cadmium Battery Standard and Semi Sealed Nickel Cadmium Battery Spec Technical Schedules.
11. The *Contractor* shall be responsible for also sizing the battery cubicle for batteries.
12. It shall be the responsibility of the *Contractor* to decommission the DPIs with their associated feeder circuits and cabling; remove all the necessary components to a dedicated area, as per the site requirements.
13. The *Contractor* shall be responsible for the provision of the power cables and control cables. These shall be in accordance with 240-5622744 Requirements for control and power cables standard. Furthermore, 240-56176097 Electrical cable schedule template shall be used for the cable schedules.
14. The cables required include power cables from the 380V unit board to the UPSs, from the UPSs to the battery ban, and from the UPSs the 380V unit boards to interface with the auxiliary busbars.

3.2.2 Interface requirements

3.2.2.1 General

1. The *Contractor* shall allow enough time to achieve interfacing between all the *Employer’s* Engineers and *Contractor.* The *Contractor* shall be involved in clarifications and technical queries regarding interfacing and be actively involved during interfacing sessions.
2. The following systems shall be affected:

1. LV switchgear protection
2. EOD SCADA
3. AKZ requirements
4. Station and Unit AC/DC supplies
5. Floor plans, cable entries and dimensions

3.2.2.2 Interface details

1. The existing DPIs have four alarms routed to the EOD via SCADA. The New UPSs shall have seven alarms to be monitored at the EOD. The list of the alarms shown in table 1 below.

Table 1: UPS alarms to be monitored remotely

Item	Description of new UPS remote alarm
1	Mains failure
2	Rectifier failure
3	Charger facility abnormal
4	Inverter Output failure
5	DC System failure
6	DC System Abnormal
7	System fault

2. The *Contractor* shall be responsible to assess the necessity to modify the existing SCADA and RTU to incorporate the new UPS signals. If there is sufficient spare capacity to add new signal. This shall include modifying the RTU that interface to the EOD SCADA.
3. In the case of no spare capacity, the *Contractor* shall modify the SCADA EOD MHI to reflect the new UPS signals.
4. The *Contractor* shall ensure that the termination points of the UPS signals are captured, documents and labelled correctly.
5. The *Contractor* shall obtain the necessary approval from the SCADA OEM to modify the system, to prevent voiding the warranty on the SCADA/RTU.
6. The *Contractor* shall clarify and coordinate all the relevant interfaces that may exist.

3.2.3 Control and Monitoring requirements

1. The control supply UPS monitoring requirements are detailed on sub-clause 3.2.16 of the PE Enquiry 2022 Schedules A B.
2. The control supply UPS monitoring requirements are detailed on sub-clause 3.3.10.6 of the PE Eqnquiry Schedules A B.
3. The indications are shown on sub-clause 3.3.10.8 of the PE Enquiry Schukdes A B

3.2.4 Output requirements

1. The control supply UPS output requirements are detailed on sub-clause 3.2.5 of PE Enquiry 2022 Schedules A B.

3.2.5 Cooling requirements

1. The cooling requirements are detailed on sub-clause 3.2.8 of the PE Enquiry 2022 Schedules A B.

3.2.6 Protection requirements

1. The protection requirements are detailed on sub-clause 3.2.9 – 3.2.17.1 of the PE Enquiry 2022 Schedules A B.
2. The battery protection requirements are shown on sub-clause 3.3.4 of the PE Enquiry Schdueles A B

3.2.7 Efficiency requirements

1. The efficiency requirements are detailed on sub-clause 3.2.19 of the PE Enquiry 2022 Schedules A B.

3.2.8 Electrical requirements

1. The type of fused switched, MCBS, transformers, contactors, transfer switches, static transfer switched, terminal blocks and control circuit devices and switching elements shall be in accordance with IEC 60947-(3,2,1,6,7 and 5), IEC 62310-1/2/3 and 240-7041329.

3.2.9 Earthing requirements

1. The earthing requirements are detailed on sub-clause 3.3.6 of the PE Enquiry Schedules A B

3.2.10 Engineering and special tools

1. The *Contractor* shall provide any special tools, test handles or keys that are required for maintenance or affecting adjustments.

3.2.11 Civil requirements

1. Structural assessment in the LV switchgear room to evaluate the adequacy of the existing structures to support additional load that will be added onto the existing structures shall be provided. The assessment shall include but not limited to the concrete floor slab that is supported by the universal beams which subsequently transfer loads to the foundation vial the column.
2. The structural design check and analysis using the governing standard and software, to determine if the structural elements would adequately support the new equipment shall be performed, i.e., UPS and Nicad battery bank.
3. Strength capacity test, which include but not limited to slab core, drilling, reinforcement, scanning, and coupon tests for structural steel elements shall be performed.
4. Mitigation or remedial measures of any deficiencies identifies during the assessment shall be provided. The mitigation measures shall consider, optimisation. The design or design adequacy check shall be submitted to the *Employer* Civil Engineer for review and acceptance.
5. Design report including all design calculations, drawings, and specifications to the *Employer* for review and acceptance shall be provided.
6. Cost estimates for all approved mitigation or remedial work shall be provided
7. “as-built” drawings of the affected structures shall be provided. All calculations, construction drawings and reports shall be signed and approved the *Contractor’s* professionally registered Civil Engineer prior being submitted to the *Employer* for review and acceptance.

3.2.11.1 Concrete

1. All concrete work is required to be in accordance with SANS 100100-1, SANS 2001-CC1 and SANS 10100-2 unless otherwise.
2. All concrete surfaces and cast-in items are required to be inspected and accepted by the Employer’s engineer prior to the commencement of any concrete casting.
3. Written acceptance from the *Employer* ‘s civil engineer for the use of any add-mixture or the use of ready mixed concrete, to pump concrete, or to use cement or cement blends other than ordinary Portland cement (OPC) must be obtained.
4. Compaction of concrete is required to be done by means of a poker vibrator only.
5. Submission of the concrete mix design to the Employer for acceptance is required.
6. It is required that a demonstration, 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.
7. It is required to perform a slump test on the same batch of concrete every time a sample is taken, and the result recorded.

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

Table 2: SANS specifications

Clause	Specification
3.5	**Concrete – Strength characteristics**
3.4.3	Concrete Grade is required to be: • Class 15 MPa/ 19 mm for Blinding Concrete (28 days), • Class 35 MPa/ 19 mm for Structural Concrete (28 days).
4.2	**Materials**
4.2.7	In general, one of the following types of non-shrink grout are required to be used: • • Cement-based non-shrink grout, not less than 50 MPa; • • Special proprietary non-shrink or expansive grout, not less than 50 MPa.
4.2.3.5	The following tests are required: • drying shrinkage on fine and coarse aggregates; • drying shrinkage of concrete;

	• flakiness index of the stone; • alkali-silica reaction.
4.4	**Reinforcement**
4.4	Add the following: All reinforcement is stamped with a SANS quality assurance mark
4.4.3.1	Cast in-situ concrete cover is required to be a minimum of: • 50 mm for exposed to earth or water; • 40 mm for above ground or not in contact with soil.
4.7	**Quality of Concrete**
4.7.1.1	• *Contractor* submits to the *Employer* full details of mix design and samples of all materials which he proposes to use for making concrete at least 28 days before work commences
4.7.10	Add the following: • A layer of blinding concrete of 50 mm minimum thickness is required to be placed under foundations. • A polyethylene sheet with a minimum thickness of 250 microns is required under ground slabs
4.7.12.3	• All angled corners are chamfered 20 mm x 20 mm, unless such other larger size is detailed on the Drawings.
4.7.19.3	• *Contractor* submits a detailed procedure for acceptance by the *Employer* on how he intends to carry out the repairs of structural concrete defects
4.7.22	• For concrete pour records, the *Contractor* submits a detailed Quality Control Plan to the *Supervisor* for acceptance. • In addition, the *Contractor* supplies the *Employer* with two copies of these records each day covering works carried out the preceding day.
5.1	**Testing**
5.1.1.4	• Six 150 mm cube samples taken from each batch or place of concrete deposition, three cubes are tested at 7 days and three at 28 days. • Strength at 7 days is required to be at least two thirds of 28-day strength.
5.1.2.1	• Any of the cube samples tested indicating a result more than 3 MPa below the specified strength is disregarded
5.1.3.3	Add the following: • …, unless no more than three batches of concrete is being mixed.
5.2	**Tolerances**
5.2.1	• Tolerances on all concrete work is required to be a level II degree of accuracy as specified in SANS 2001-CC1 with and is to be carefully maintained throughout the construction.
A	Add the following under “Location of holding-down bolts” • 3) The permissible deviation between any two bolts that share the same baseplate is limited to 2mm for bolt sizes up to and including M24, and 3mm for bolts larger than M24.

3.2.11.2 Civil infrastructure and building design

1. The *Contractor* shall be responsible for assessing the placement of the control supply UPS and its battery bank in each unit. Appendix 10.2-10.7 shows the proposed layout that the *Contractor* shall assess, if the cabinets cannot be fitted on the proposed areas, the *Contractor* shall propose an alternative layout for the cabinets.
2. A detailed assessment by the *Contractor* shall be carried out of the floor taking into consideration the QC decking and different arrangements of the battery bank and UPS units. This shall assist to validate the structural integrity of the slab and supporting structures.

3.3 Procedure for submission and acceptance of *Contractor*'s design

The Detail design is submitted in a hard copy and soft copy format. Drawings to be submitted in Bentley Microstation version 8 format and text documentation to be at least in PDF or Microsoft Word 365 is the preferred format for ease of review and commenting. The *Employer* reviews the submitted designs and provides comments back to the *Contractor* within 21 working days. After approval of the Detail design, the *Contractor* proceeds with manufacturing of the system based on the approved designs.

3.3.1 Design phases

The detail design evaluation of the control supply UPS shall commence when duly filled technical schedules of the control supply UPS and Nicad batteries are submitted, failure to submit and/or incomplete submission of the technical schedules will be deemed irresponsive. The technical evaluation criteria of the control supply UPS and Nicad batteries shall be in accordance with 240-95240645 Technical Evaluation Criteria for Standby Batteries, 240-90489609 Power Electronics tender technical evaluation criteria (UPS, phase controlled and switch mode chargers) and Nickel Cadmium A&B Schedules Technical Evaluation Spreadsheet. For the interfacing to the SCADA, the *Contractor* shall prove that they are trained or skilled on RTU560 and on the MicroSCADA, and thus the *Contractor* shall provide training certificate on ABB MicroSCADA RTU560 system. For the Civil assessment, the *Contractor* shall prove to be competent in carrying out the structural engineering assessment of then structures, and thus ECSA accreditation proof of registration shall be submitted.

3.3.1.1 Detail design

The detail design of the replacement of DPI with the UPS shall include the following:

1. Modification of the circuits and control busbar
2. Control supply UPS
3. Battery bank and battery cubicle sizing
4. Power and Control cable sizing
5. Design calculations of all power and control cable requirements.
6. List of all cables to be installed (Cabling Schedule)
7. Cable racking designs for any additional racking
8. SCADA interfacing
9. UPS alarm terminal strip
10. IP address configuration
11. Protection settings
12. CSP configuration
13. The final drawings (electrical and mechanical) of the complete control supply UPSs and its accessories system including plant interfaces updated on the drawings.
14. Panel internal wiring diagrams with numbers, AKZ, component descriptions, etc.
15. Termination schedules and cabling block diagrams
16. All calculations and specifications of the proposed equipment
17. Factory acceptance testing procedures
18. Filled technical schedules of the control supply UPS and batteries

3.3.2 Implementation Approval

1. Completed & signed off FAT defects lists
2. Two identical sets of marked up drawings to be used for site installation.
3. Completed & signed of FAT test reports
4. Long lead items delivered to site
5. Site establishment completed. (containers, tools, scaffolding, printers, etc on site)
6. A complete on-site inspection check list to be completed right after delivery (Panels & cabling checks)
7. Authorised site acceptance testing procedures
    a. Panel decommissioning work package
    b. Cabling decommissioning work package
    c. Panel installation work package
    d. Cabling installation & testing work package
    e. Cable racking work package
    f. Civils work package
8. A complete cold commissioning testing procedure (Live loop checks & function tests with machine at standstill)
9. A complete hot commissioning testing procedure (Function tests with machine running). The *Employer* will integrate the program to the overall commissioning program.
10. All relevant QCP steps signed off by the *Contractor* where applicable at the time.

3.4 Other requirements of the *Contractor*'s design

Use this by the Contractor in his design; for example codification section to describe any particulars which must be taken into account (configuration management) of Plant and Materials.

1. All plant and materials shall be new
2. All electrical installations shall be carried out by a qualified electrician.
3. The new electrical cabling is certified by the *Contractor*'s electrician issuing a certificate of compliance (COC) before it is allowed to be connected.
4. All components shall comply with the Eskom standard 240-53114248, as well as associated international standards, unless otherwise stated.

3.4.1 Configuration management

1. Kriel Power Station subscribes to the AKZ codification system
2. All AKZ numbers or codes shall be submitted to the Project Manager for approval.

3.4.2 Cable sizing consideration

For AC three-phase input cable sizing, the following should be considered:

1. Number of rectifier modules per phase
2. Maximum continuous current per rectifier module when recharging battery and supplying inverter modules
3. Derating for ambient temperature rating of cable environment at 40 °C
4. Derating to include bunched cables, if any
5. Voltage-drop at the required distance

For battery cables' size, the following should be considered:

6. Number of inverter modules
7. Maximum continuous current when the rectifier is off and the battery is supplying inverter load
8. Minimum voltage at inverter modules to operate at full power
9. Derating for ambient temperature rating of cable environment at 40 °C
10. Derating to include bunched cable if any
11. Voltage drop at the required distance

3.4.3 Battery cubicle requirements

1. The batteries shall be housed in a separate self-contained cubicle.
2. The cubicle shall be properly sized to allow natural air circulation.
3. The cubicles shall be designed to prevent the ingress of dust.
4. The cubicles shall be vermin-proofed.
5. Any additional safety measures to be provided by the Contractor.
6. All access doors and covers to live apparatus are adequately marked with warning signs to warn of live parts behind them.
7. All doors equipped with voltage and current carrying plant and materials are earthed to the main frame of the cubicles by means of a braided earth strap.
8. Internal panel lighting is provided with a door-mounted switch enabling the light to switch on automatically when opening the door.

3.4.4 Wiring and wiring identification requirements

1. The wiring requirements are indicated on sub-clause 3.4.5 of the PE Enquiry Schedules A B

3.4.5 Panel/cubicle labelling

1. Eskom standard 240-62629353 – Specification for panel labelling, applies to panel labels.
2. Conductive labels or backing plates are not allowed on the inside of any electrical cubicles unless attached to components such as auxiliary transformers with rivets.
3. All warning labels on panels, doors or other structures are pre-approved before printing and application by the *Contractor*.

3.4.6 HVAC evaluation

1. The *Contractor* shall evaluate the switchgear room HVAC system if the additional heat load added by the control supply UPS and batteries does not affect the HVAC system negatively.
2. Kriel power station has the following ambient conditions:

Table 3: Ambient Site Conditions

Ambient condition	Minimum	Average	Maximum
Pressure	80kPa	85kPa	90kPa
Temperature	-10 °C	35 °C	40 °C
Relative humidity	20%	60%	80%

3.4.7 Electrical bonding

1. Earthing system in a form of bonding to the earth mat which shall include all the necessary test such as continuity test for the new control supply UPSs and batteries shall be provided.
2. The bonding design shall be in accordance with 240-56356396 Earthing and Lightning protection standard.

3.4.8 Storage considerations

1. The UPS and battery installation shall adhere to the OEM storage and preservation requirements. Any deviations to the 240-137465740 Standby battery storage shall be indicated.
2. The manufacturing and delivery shall be aligned to avoid extended storage and preservations of the battery cells. Provision shall be made for storage and preservation of the equipment at local premises.
3. It must be advised when battery cells that require rejuvenation due to extended storage.
4. The cost of storage and applicable preservation requirements at the supplier local premises shall be indicated in applicable financial schedules.

3.4.9 Labelling

1. The package shall be in accordance with 0.54/3695 sheet 1&2 or 240-62629353.

3.4.10 Packaging

1. The packaging shall be of high specification impact resistant corrugated cardboard with waterproof outer plastic covering. Crating shall be an option.

3.5 As-built drawings, operating manuals and maintenance schedules

3.5.1 General

1. Three set of hard copies shall be provided.
2. The drawings format shall be .dgn
3. The drawings size shall be A3.

3.5.2 Drawings

The following drawings shall be provided:

1. General arrangement drawings
2. Single line drawings
3. Schematic drawings

3.5.3 Installation, operating and maintenance instruction manuals

1. All instruction manuals shall be comprehensively detailed
2. The manuals shall contain content list.
3. The manuals shall contain list of reference drawings
4. The manual shall detail all the component
5. The manuals shall be in loose leaf binders to IOS standards
6. The manuals shall be in A4 sizes
7. The manual content shall show general arrangement drawings, installation drawings and instructions, operating and maintenance instruction of all components, detailed parts list, spares ordering instruction etc.
8. Additional content of the manuals may include special instructions pertaining to spares storage, drawings for component location, dismantling and reassembly.

3.5.4 Settings and device configurations

1. The *Contractor* shall provide the settings data for each configurable device supplied.
2. All settings, configurations, alarm, are configured as per recommendation by the *Contractor* and are reviewed by the *Employer* for final acceptance.
3. The *Contractor* is responsible for the calculation of all settings and the calculations are provided to the *Employer* for acceptance. The applied settings within the UPS system are provided to the *Employer* by means of active Windows or configuration files containing the settings which can easily be copied to a work document.
4. The settings standard to be referenced is 240-56176168.
5. The settings document shall be compiled by OEM based on the application.
6. The SCPD shall be indicated on the settings document

4. Procurement

There is a cross reference from the definition of Disallowed Cost in Options C D and E to the Works Information regarding procurement procedures. This part of the Works Information MUST include any such procedures to be able to administer this procedure. Options A & B may also require constraints on procurement procedures.

4.1 People

4.1.1 Minimum requirements of people employed on the Site

Specify any constraints relating to people employed to Provide the Works; for example permits for foreigners, training (other than H & S), use of labour from designated areas and industrial relations.

4.1.2 BBBEE and preferencing scheme

Specify constraints which *Contractor* must comply with after contract award in regard to any Broad Based Black Economic Empowerment (B-BBEE) or preferencing scheme measures.

4.1.3 Accelerated Shared Growth Initiative – South Africa (ASGI-SA)

If the ASGI-SA requirements are to be included in this contract specify constraints which *Contractor* must comply with after contract award in regard to any ASGI-SA requirements. The ASGI-SA Compliance Schedule completed in the returnable tender schedules is reproduced here. If ASGI-SA does not apply, delete this paragraph.

The *Contractor* complies with and fulfils the *Contractor's* obligations in respect of the Accelerated and Shared Growth Initiative - South Africa in accordance with and as provided for in the *Contractor*'s ASGI-SA Compliance Schedule stated below

.

[Insert the agreed ASGI-SA Compliance Schedule here]

The *Contractor* shall keep accurate records and provide the *Project Manager* with reports on the *Contractor*'s actual delivery against the above stated ASGI-SA criteria. [Elaborate on access to and format of records and frequency of submission etc.]

The *Contractor*'s failure to comply with his ASGI-SA obligations constitutes substantial failure on the part of the *Contractor* to comply with his obligations under this contract.

4.2 Subcontracting

4.2.1 Preferred sub*Contractor*s

ECC does not make use of nominated subcontracting, but the *Employer* may list which sub*Contractor*s or suppliers the *Contractor* is required to enter into subcontracts with. This is usually only required where Plant and Materials need to be obtained from a particular supplier or group of suppliers in order to comply with operational standards.

4.2.2 Subcontract documentation, and assessment of subcontract tenders

Specify any constraints on how the *Contractor* is to prepare subcontract documentation, whether use of the NEC system is compulsory or not (compulsory is recommended) and how subcontract tenders are to be issued, received, assessed (using a joint report?) and awarded.

4.2.3 Limitations on subcontracting

The *Employer* may require that the *Contractor* must subcontract certain specialised work, or that the *Contractor* shall not subcontract more than a specified proportion of the whole of the contract.

4.2.4 Attendance on sub*Contractor*s

State requirements for attendance on Sub*Contractor*s, if any

4.3 Plant and Materials

4.3.1 Quality

Quality is usually designed in or specified in the technical specifications referred to in section 6 of this Works Information. However to cover circumstances where quality may not be prescribed, this sub-paragraph could be used as an overarching default requirement. It could also be used to deal with how repairs are carried out after a Defect has been notified; for example can the item be fixed up or must it be replaced by a new one. See also SANS 1200A, sub-paragraph 3.1

All inspections and testing to be performed in accordance with the Quality Control Procedure developed by the *Contractor*. The specified Materials and Equipment are to be new, unused, and free from defects and imperfections. Reconditioned Materials and/or Equipment are not regarded as new under any circumstances. The *Contractor* will not use Materials or Equipment which are generally recognised as being unsuitable or Otherwise to be avoided for the purpose for which they are intended.
Only components of high reliability will be utilised, with a proven operating history, to enable the Plant to achieve required reliability and availability. Equipment design, engineering and manufacture will be done in accordance with the best modern practice applicable to high-grade products of the type to be furnished, so as to ensure the efficiency and reliability of the Works and the strength and suitability of the various parts for the Works.
Materials and equipment withstands ambient conditions and the variations of temperature arising under working conditions without distortion, deterioration or undue strains in any part. All parts and components are made accurately, and where practicable, to acceptable standards so as to facilitate replacement and repairs. Repair of defective material and/or equipment will be done only with the *Employer*'s approval and any such repair, if approved, will be carried out to the satisfaction of the *Employer*.
The *Contractor* ensures that co-ordinated and formally documented management system is in place for the assurance of quality. The *Employer* is to specify intervention (hold and witness) points during the manufacturing, installation and on site testing stages of the project. The *Contractor* issues preliminary notification of such intervention points by ten working days in advance to the *Employer*, and confirms such hold and witness points at least five working days prior to the activity.

4.3.2 Plant & Materials provided "free issue" by the *Employer*

State arrangements for collection by *Contractor* or delivery by others on behalf of the *Employer*, offloading, inspection, storage, care custody and control, return of unused Plant and Materials, etc. State whether any samples are to be provided by the *Employer* and if so how, where and when. Always include a statement to the effect that 'all other Plant and Materials are to be provided by the *Contractor*'.

None

4.3.3 *Contractor*'s procurement of Plant and Materials

Specify any constraints on how the *Contractor* is to order, codify, expedite, freight, import, transport to Site and any other requirements for delivery and storage before installation. The *Employer* may require warranties from suppliers to be in favour of the *Employer* and not just to the *Contractor* during the life of the contract. Also include requirements for vendor data which the *Employer* may need after Completion of the whole of the *works*. THIS IS A VERY IMPORTANT SECTION IN PROCESS PLANT AND UTILITY PROCUREMENT CONTRACTS.

N/A

4.3.4 Spares and consumables

Some contracts may need to include provision for the supply of a minimum category of spares, fuel, oil or other feed stock and consumables which the *Employer* may need at or just after take over and that it is best the *Contractor* provide these initially as part of his Providing the Works.

The *Contractor* shall supply the *Employer* with a pricing of the spares required in order to maintain the new control supply UPS system. The recommended major and contingency spares are found on the "Spares Cost Modular UPS" on the PE Enquiry Schedules AB document. The list of spares shall be supplied three months before the delivery of the items for the installation. The *Contractor* shall keep all critical spares at hand, as needed during commissioning, to prevent extended delays caused by failure of any of the components; these spares will remain the property of the *Contractor*. Furthermore, the *Contractor* shall

provide a detailed spares management plan with projection on spares obsolescence and end of life management for electronic modules, power electronic devices and other assembly modules.

The following shall be provided in terms of spares:
1. Spares list
2. Maintenance spares list
3. Spares pricing
4. Spares life expectancy with packaging
5. Spares available for warranty period
6. Spares holding for 1 to 20 modular type/unit
7. Spares holding 21 to 40 modular types
8. Delivery
9. Spares availability

The complete recommended spares list includes the following details:
1. Description
2. Part number
3. Special storage requirements
4. Replacement part or routing maintenance part
5. Quantity
6. Cost
7. Lead time
8. Supplier full contact details and address.

4.4 Tests and inspections before delivery

Core Clauses 40 and 41 both make reference to the Works Information regarding tests and inspections. Specify any requirements here for any tests and inspections that are to be done by the *Supervisor* or Others before delivery to the Working Areas, particularly if such tests and inspections are to be carried out by agents of the *Employer* overseas.

4.4.1 Factory acceptance test (FAT)

1. The *Contractor* will perform pre-checks and tests before the *Employer* is notified to be involved with FAT.
2. Before FAT will commence, a complete Factory Acceptance Test Procedure will be submitted by the *Contractor* to the *Employer*. The *Employer* will review the procedure and make updates where necessary.
3. The *Contractor* supplies two copies of all test certificates and data sheets prior to the commencement of the factory testing.
4. The *Contractor* gives the *Employer* at least two months' notice of the date on which the UPS and the batteries are ready for inspection and testing when these tests are to be done in South Africa and four months' notice if it is to be done outside the border of South Africa.
5. The *Employer* is provided with access to the *Contractor*'s premises for the purpose of establishing compliance with the contractual requirements by means of inspections, surveillance's, audits and witnessing the performance of any tests.
6. Communications testing will be conducted during the basic design phase. This will also be regarded as a pre-FAT test.
7. This inspection entails a full system check (functional and wiring checks) to ensure compliance with this specification, contract drawings and other applicable standards.
8. Allowance is made in the delivery time to cater for this requirement.

9. The system functionality is to be demonstrated by the *Contractor* to the Project Manager/Supervisor during Factory Acceptance Tests at the *Contractor's* facility for one control supply UPS system. Only if non critical defects are picked-up that cannot be rectified before the first unit's commissioning, will additional FAT continue on subsequent units on the same basis.
10. A complete Factory Acceptance Testing procedure is included in the design package.
11. The following control supply UPS tests (checks) shall be conducted by the *Contractor* as a minimum requirement and witnessed by the Project Manager/Project Supervisor, lead Engineer and site representative:
    a. Converter tests
    b. Insulation tests
    c. Light load functional tests
    d. Functional tests
    e. Rated currents tests
    f. Power loss determination for assemblies and equipment
    g. Temperature rise tests
    h. Power factor measurements
    i. Checking on the auxiliaries
    j. Measurement of inherent voltage regulations
    k. Checking the properties of the control equipment
    l. Checking of protective devices
    m. Immunity tests
    n. Overcurrent capability tests
    o. Radio frequency generated interference and conducted noise
    p. Audible noise
    q. Measurement of ripple voltage and current
    r. Dielectric strength tests
    s. Insulation resistance tests
    t. DC output voltage adjustment range tests
    u. DC output voltage regulation tests
    v. Power efficiency tests
    w. Test for protection against lightning surges
    x. Short-circuit test on output terminals
    y. Ripple voltage limits and ripple current tests
    z. Salt fog tests
    aa. Glow-wire test on non-metallic enclosures
    bb. Lighting surge test
    cc. Cable and interconnection check
    dd. Control device(s)
    ee. Protective device(s)
    ff. Auxiliary device(s)
    gg. Supervisory, monitoring, signalling device(s)
    hh. Auto transfer to stored energy mode and back to normal
    ii. Auto transfer to bypass / isolation mode and back to normal
    jj. Manual transfer to bypass/isolation mode and back to normal
    kk. No load
    ll. Full load
    mm. Frequency slew-rate
    nn. AC input failure
    oo. AC input return
    pp. Parallel redundant UPS fault
    qq. Transfer test to bypass

12. The following battery tests (checks) shall be conducted by the *Contractor* as a minimum requirement and witnessed by the Project Manager/Project Supervisor, lead Engineer and site representative:
    a. Discharge performance
    b. Charge retention test
    c. Endurance in cycles
    d. Endurance in permanent charge

e. Charge acceptance at constant voltage
f. Vent operation
g. Gas recombination efficiency

13. The Factory Acceptance Testing of the control supply UPS and its batteries shall be completed at the manufacturer's works and accepted by the Project Manager, before dispatching the complete unit to site.
14. A defects list needs to be kept as a live working document to capture any deviation from the works information. These could be simple wiring errors or more serious functional requirements that are not met.
15. The *Contractor* is given a reasonable time to rectify wiring without delaying the completion of the FAT. When more serious defects are encountered, the *Contractor* needs to inform the Project Manager immediately about it, with an estimated time to resolution and testing of the function/requirement.

4.5 Marking Plant and Materials outside the Working Areas

Core clauses 70.1 and 71.1 require the Works Information to state how the *Contractor* is to "mark" Plant and Materials which is outside the Working Areas if they are to be paid for before delivery to the Working Areas. Specify here how the *Contractor* is to mark the Plant and Materials.

N/A.

4.6 *Contractor*'s Equipment (including temporary works).

In contracts which require the *Contractor* to procure sophisticated or highly specialised Equipment that could have a major influence on the progress of the works, the *Employer* may wish to exercise constraints or include witness and hold points during manufacture, assembly or delivery of such Equipment. Include these constraints here taking care not to imply that the *Employer* or the *Project Manager* take on any liability as a result. See also section 3.6 above relating to the design phase of the *Contractor*'s Equipment.

N/A.

5. Construction

This part of the Works Information addresses constraints, facilities, services and rules applicable to the *Contractor* whilst he is doing work on the Site during the construction and maintenance phase. It does not specify the work itself as that is included in Section 6 of the Works Information.

For contracts involving civil works the approach may be to incorporate SANS1200A or SANS 2000 into the contract. Whilst many of the headings below address the same issues, the list of headings below is more comprehensive. If the headings below are used, it may be prudent to delete paragraphs 3, 4 and 5 from 1200A after checking that their requirements have been included below as necessary. A similar approach can be used in contracts involving building works where the Model Trade Preambles are incorporated. Care should be taken to avoid inconsistency or ambiguity between this part of the Works Information and standard specifications incorporated by reference.

5.1 Temporary works, Site services & construction constraints

5.1.1 *Employer*'s Site entry and security control, permits, and Site regulations

Sites such as Sasol Secunda and Koeberg Nuclear Power Station have very strict entrance requirements which tenderers need to allow for in their prices, and the *Contractor* has to comply with. State these or similar requirements here.

5.1.2 Restrictions to access on Site, roads, walkways and barricades

In addition to the above there may be other restrictions once on the Site, plus rules relating to roads, walkways and the provision of barricades

5.1.3 People restrictions on Site; hours of work, conduct and records

Restrictions and hours of work may apply on some Sites. It is very important that the *Contractor* keeps records of his people on Site, including those of his Sub*Contractor*s which the *Project Manager* or *Supervisor* have access to at any time. These records may be needed when assessing compensation events.

5.1.4 Health and safety facilities on Site

Section 2.3 deals with contractual H & S requirements in addition to those of the OHSA Act. This section allows the *Employer* to state what measures are to be taken on Site against disease and epidemics and in emergencies. Also describe where First Aid facilities provided by the *Employer* are located and any other emergency arrangements. Do not use if already addressed in 2.3. The cross reference from Clause 27.4 applies.

5.1.5 Environmental controls, fauna & flora, dealing with objects of historical interest

This sub-paragraph may not be required if these matters are dealt with in the general environmental requirements referred to in paragraph 2.4 above.

5.1.6 Title to materials from demolition and excavation

Clause 73.2 states that the *Contractor* has title to materials from excavation and demolition (e. g. copper) only as stated in the Works Information. Hence state here any special arrangements regarding such title. If nothing is stated then the default position is the *Contractor* has no such title.

5.1.7 Cooperating with and obtaining acceptance of Others

This sub-paragraph could be used to deal with two issues.
1) The cross reference from core clause 25.1 about cooperation generally as well as details about Others with whom the *Contractor* may be required to share the working areas. See clause 11.2(10) for the definition of Others.
2) Requirements for liaison with and acceptance from statutory authorities or land owners.

5.1.8 Publicity and progress photographs

State requirements for notice boards, advertising rights, media relations, photography and progress photographs if required.

5.1.9 *Contractor*'s Equipment

This sub-paragraph is intended to address how records are to be kept of Equipment on Site including whether it is owned or hired. Include any constraints about scaffolding, rigs, heavy lifts and cranes, including removal from the Working Areas. Also silencing similar to Clause 4.1 in SANS 1200 A

5.1.10 Equipment provided by the *Employer*

Provide details of equipment made available for use by the *Employer* and set out conditions relating thereto.

5.1.11 Site services and facilities

This is a mandatory cross reference from clause 25.2 in ECC3. State what the *Employer* will provide in the way of power, water, waste disposal, telecoms, ablutions, fire protection, lighting etc. Give hook up locations

and any constraints on how the hook up is to be done. Always conclude by stating that the *Contractor* shall provide everything else necessary for Providing the Works.

5.1.12 Facilities provided by the *Contractor*

Describe what the *Contractor* is to provide in the way of Site accommodation, laboratories, storage, vehicles and office equipment etc for the *Project Manager* and the *Supervisor*, and any restrictions or minimum requirements concerning the *Contractor*'s own facilities. State requirements for facilities to be provided by the *Contractor* such as construction camps. Also state what happens to these facilities upon completion of the contract. Set out constraints, if any, as to the location by the *Contractor* of such facilities on the Site and requirements for drawings of Site facilities, as necessary.

5.1.13 Existing premises, inspection of adjoining properties and checking work of Others

Details under this sub-paragraph are very contract specific and may be quite extensive in some cases. State requirements for the inspection with the owners of adjacent buildings and properties and representatives of local authorities before commencing with the *works* that have the potential to damage surrounding buildings and property. State whether *Contractor* is required to inspect the work of Others to which he is required to connect and if so by when to avoid delays to his work.

5.1.14 Survey control and setting out of the *works*

Provide information on survey controls established by the *Employer*, if any, and state requirements for survey control and the setting out of the *works*.

5.1.15 Excavations and associated water control

State any particular requirements for handling deep foundations and controlling water from excavations.

5.1.16 Underground services, other existing services, cable and pipe trenches and covers

Describe known services making reference to drawings containing known services and state requirements for locating, marking and recording such services.
State requirements for the treatment of existing services i.e. their termination, diversion or continued use, either temporarily or permanently, and set out the procedures relating thereto.
State requirements, as necessary, for the use and availability of detection equipment for the location of underground services.
State responsibility for damage to services, known and unknown, and requirements for working in close proximity to services etc.
State requirements and reinstatement procedures for the notification and repair of damage to services and any penalties applicable to the damage of services.

5.1.17 Control of noise, dust, water and waste

State requirements, if any.

5.1.18 Sequences of construction or installation

Only prescribe sequences of work where absolutely necessary such as when *Contractor* has to give access to Others (without take over) and for technical reasons such as under tidal conditions and in rivers.

5.1.19 Giving notice of work to be covered up

State the procedure for notifying the *Supervisor*

5.1.20 Hook ups to existing works

State any constraints

5.2 Completion, testing, commissioning, and correction of Defects

5.2.1 Work to be done by the Completion Date

This is mandatory. Core clause 11.2(2) defines Completion as when the *Contractor* has done all the work which the Works Information states he is to do by the Completion Date. Rather than list all work to be done by the Completion Date, state that all work is to be done by the Completion Date except for [●]. For example:

On or before the Completion Date the *Contractor* shall have done everything required to Provide the Works except for the work listed below which may be done after the Completion Date but in any case before the dates stated. The *Project Manager* cannot certify Completion until all the work except that listed below has been done and is also free of Defects which would have, in his opinion, prevented the *Employer* from using the *works* and Others from doing their work.

	Item of work	**To be completed by**
	As built drawings of	Within days after Completion
	Performance testing of the *works* in use as specified in paragraph of this Works Information.	See performance testing requirements.

5.2.2 Use of the *works* before Completion has been certified

Clause 35.2 in ECC3 provides that the *Employer* may use any part of the *works* before Completion has been certified but if he does so he takes over the part of the *works* except if the use is for a reason stated in the Works Information. State the reason here if this applies.

N/A

5.2.3 Materials facilities and samples for tests and inspections

All components will be in line with approved list of components as supplied by the *Employer*. Samples of components may be requested by the *Employer* for pre-approval where deemed necessary.

5.2.4 Commissioning

Required mainly for contracts including mechanical and electrical work. Would typically refer to detailed commissioning procedure attached as an Annexure. Confirm whether commissioning is to be done before or after Completion. If after Completion, include this item of work in the list in sub-paragraph 5.2.1 above.

The activities forming part of live testing, live commissioning or power up of any component is not embarked on until the Project Manager's acceptance (safety clearance certificate) has been obtained for construction and erection work performed in this stage.

5.2.4.1 Commissioning documentation

Commissioning does not start until the following documents, which are required for the commissioning of the plant, is accepted by the Project Manager:

1. All relevant drawings as-built.
2. All relevant site acceptance test reports completed and signed.
3. All QCP's signed at the relevant steps.
4. Draft Technical Maintenance and Operating manuals supplied.
5. All installation related defects are cleared.

6. All safety clearance certificates signed.

5.2.4.2 Site acceptance tests

1. Site acceptance tests are carried out by the *Contractor* and witnessed by the Supervisor and/or *Employer*.
2. The test procedures are prepared by the *Contractor* and accepted by the Project Manager.
3. The purpose of the Site acceptance test is to ensure that all the Plant and Materials are correctly installed, checked and that no malfunction or damage occurred during the transportation and / or erection.
4. The *Contractor* provides all the test equipment for testing the individual functional units/components.
5. When the site acceptance tests are completed, the control supply UPS with its batteries has been safety cleared (safety clearance certificate) and the *Contractor* issues a COC for acceptance by the Project Manager.
6. The *Contractor* is the signatory to this certificate (240-124341168.)

5.2.4.3 Cold / pre commissioning tests

1. Site cold commissioning tests are carried out by the *Contractor* and witnessed by the *Employer*.
2. The test procedures are prepared by the *Contractor* and accepted by the Project Manager.
3. The purpose of the cold commissioning is to ensure that all the Plant and Materials are correctly installed, prove live loops and test basic functions with the machine at standstill.
4. The *Contractor* provides all the test equipment for testing the individual functional units.
5. The cold commissioning shall be performed in line with the Installation and Commissioning of power electronics equipment standard: 240-170000055.

5.2.4.4 Hot commissioning

Hot commissioning starts after cold commissioning is complete.

1. The plant is commissioned by running the system fully manual and testing each piece of Plant and Material for full functionality in each mode of operation.
2. The *Contractor* in conjunction with the *Employer* performs the commissioning of the control supply UPS and in accordance with Installation and Commissioning of power electronics equipment standard: 240-170000055.
3. The *Contractor* in conjunction with the *Employer* performs the commissioning of the UPS batteries in accordance with Standby battery storage and commissioning in Eskom standard: 240-137465740.
4. Due to possible constraints from the *Employer*, the *Contractor* allows for his commissioning engineer to be available continuously during each hot commissioning activity.
5. The commissioning engineer is officially certified by the *Contractor* as being qualified and experienced to commission the control supply UPS system and be able to make the necessary software and firmware updates as may be required onsite during hot commissioning.

5.2.5 Start-up procedures required to put the *works* into operation

In order to put the *works* into operation the *Employer* may require the *Contractor* to either do this for him or be in attendance whilst he does it, depending on who is the responsible person. State requirements of the *Contractor* here together with any special arrangements associated with operating plant and machinery.

The *Contractor* is on site when the first live operation of the plant commences. All switching to get the plant ready is done by the *Employer* to obtain the status for start-up as per agreed commissioning program.

5.2.6 Take over procedures

Take over is after or at the same time as Completion. The *Employer* may require the *Contractor* to provide assistance, security personnel on a temporary basis etc.

Take-over is when all testing, inspections and commissioning as specified in sections 5.2.1, 5.2.4, 5.2.5 are completed successfully.

5.2.7 Access given by the *Employer* for correction of Defects

Clause 43.4 requires that the *Project Manager* arranges for the *Employer* to allow the *Contractor* access to and use of a part of the *works* which has been taken over if needed to correct a Defect. After the *works* have been put into operation, the *Employer* may require the *Contractor* to undertake certain procedures before such access can be granted (for example barricading a motorway or in a nuclear power station). Include these here.

5.2.8 Performance tests after Completion

1. The performance tests are listed on sub-clause 6.4.2.11.1-5 of the PE Enquiry Schedules AB.

5.2.9 Training and technology transfer

5.2.9.1 General

1. The *Contractor* provides training on the Plant and Material 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. Training provided by the *Contractor* is directly applicable to the actual Plant and Material supplied for the works.
3. Generalised training based on similar Plant and Material is not acceptable.
4. Engineering training is provided prior to the Factory Acceptance Testing of the control supply UPSs.
5. All pre-FAT training is conducted at the *Contractor's* local test facility and all operating and maintenance training is conducted at Kriel Power Station.
6. The local facilities for training provided by the *Employer* are a suitably sized air-conditioned room, to accommodate 35 trainees as well as trainee and trainer desks, an overhead projector and flipchart or white board.
7. The *Contractor* submits to the *Project Manager* for acceptance a detailed training programme as well as a prospectus for each course one month before each training session.
8. The number of participants that are to be trained is as indicated by the Project Manager.
9. 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*.
10. The *Contractor* provides 3 additional (repeat) training courses as and when instructed by the *Project Manager*.
11. Practical hands-on training for each individual trainee forms an integral part of each of the following courses:
    a. Operating Training
    b. Maintenance Training
    c. Engineering / Commissioning Training
12. The Engineering / Commissioning training are of such a standard that experienced staff are able to commission and re-engineer some parts of the system after such training has been obtained.

5.2.9.2 Operating

The training includes the following aspects:

1. Familiarise with documentation including drawing configuration logic.
2. Operator interface familiarisation e.g. operational functions, alarms etc.

5.2.9.3 Maintenance

The training includes the following aspects:

1. Familiarisation with documentation (maintenance plan, procedures etc.)
2. Operator interface familiarisation e.g. operational functions, alarms etc.
3. Hardware familiarisation
4. Hardware maintenance
5. Maintenance of control and instrumentation

5.2.9.4 Engineering

The training includes the following aspects:

1. Familiarisation with documentation (maintenance plan, procedures etc.)

2. Operator interface familiarisation e.g., operational functions, alarms etc.
3. Hardware familiarisation
4. Hardware maintenance
5. Maintenance of control and instrumentation
6. Changes and addition of function blocks
7. Time stamping protocols
8. Interfacing to the future control system
9. Bus system fault finding and engineering
10. Full commissioning understanding

5.2.9.5 Training documentation

1. The *Contractor* incorporates all necessary technical data, design data literature and drawings into his training manuals.
2. The course material is in English and includes all third-party documentation.
3. A copy of the training documentation is supplied for each trainee.
4. The supply of drafts, pre-print proofs and printed copies of training documentation is planned by the *Contractor* in such a way that the required training is complete before FAT of the unit commences.
5. Training manuals are continuously updated by the *Contractor* up to the date of issue of the Defects Certificate for the whole of the *works*.

5.2.10 Operational maintenance after Completion

The *Employer* may require the *Contractor* before the *defects date* to perform certain duties after Completion and take over which relate to maintenance of the *works*. (Not to be confused with Defect correction) For example oil and filter changes

None

6. Plant and Materials standards and workmanship

This section of the Works Information contains all the specifications for the work which is left behind; the permanent works. It is likely to be the largest section by far and may even be compiled in volumes, e. g. Section 6 Volume 1: Civil Engineering Works. In design and construct contracts, it may be compiled in accordance with systems within the *works*; e. g. Section 6 Volume 4: Crushers.

Because practice varies widely between *Employer*s it is not practical in a general template such as this to deal with all arrangements. Only the discipline based section subheadings are provided below in the order the *works* are likely to be constructed together with some notes of a general nature.

6.1 Investigation, survey and Site clearance

Some contracts may require the *Contractor* to carry out further investigation of existing facilities or of the Site before commencing final design. There could be constraints on Site clearance especially in pipeline or transmission grid servitudes.

N/A

6.2 Building works

Reference could be made to the latest Model Trade Preambles published by the Association of South African Quantity Surveyors. However these have been developed for use with the JBCC series of contracts and an approach where description of the work is made part of the bill of quantities, which is not the case in other forms of contract. Only parts of the Model Trade Preambles could be referenced by an ECC contract, with a covering note dealing with the changes in terminology. Further changes are required depending on which parts are to be selected.

This subsection would typically comprise

a) Particular specifications provided by the *Employer*
b) List of standardised specifications applicable to the *works* and
c) Variations to the standardised specifications

N/A

6.3 Civil engineering and structural works

Reference could be made to the SANS1200 series of specifications developed and published by South African National Standards. However these are now very out of date and originally developed for use with SAICE general conditions of contract for works of civil engineering which have themselves been superseded twice.
All SANS 1200 specifications are in the process of being updated to make them more compatible with a wider range of contracts, including NEC, and users should check availability of the new SANS 2000 series of specifications.

Sections 3, 4 and 5 of SANS1200A are probably already covered in section 5 of this Works Information.

This subsection would typically comprise
a) Particular specifications provided by the *Employer*
b) List of standardised specifications applicable to the *works* and
c) Variations to the standardised specifications

If use is made of the 1200 series, users should include a covering note dealing with the changes in terminology, such as the one provided below. Further changes are required depending on which specifications in the 1200 series are selected.

Doc Identifier	Description
240-56364545	Structural Design and Engineering Standard
240-71432150	Plant Labelling and Equipment Description Standard
240-56364535	Architectural Design and Green Building Compliance
SANS 10400	The Application of the National Building Regulations
SANS 2001-BS1	Construction works Part BS1: Site clearance
SANS 2001-CC1	Construction works Part CC1: Concrete works (structural)
SANS 2001-CM1	Construction works Part CM1: Masonry walling
SANS 2001-CM2	Construction works Part CM2: Strips footings, pad footings and slab-on-the ground foundations for masonry walling
SANS 2001-CS1	Construction works Part CS1: Structural steelwork
SANS 2001-EM1	Construction works Part EM1: Cement plaster
SANS1200 Series	Standardised specification for civil engineering construction
SANS 10120 Series	Code of practise for use with standardised specifications for civil engineering construction and contract documents
SANS 10108	The classification of hazardous locations and the selection of equipment for use in such locations

6.4 Electrical & mechanical engineering works

These specifications are usually project specific and developed by the *Employer* to suit his operations. Either include these specifications here, or refer to them in attached Annexure.

Check the specifications for inconsistencies in terminology and that they do not contain any provisions already dealt with in the chosen NEC *conditions of contract* or clash with them in any way.

Doc Identifier	Description
ISO 9001	Quality Management Systems

SANS 62259:2005	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Nickel-cadmium prismatic secondary single cells with partial gas recombination
32-727	Eskom Safety, Health, Environment and Quality (SHEQ) Policy
240-105658000	Supplier Quality Management: Specification
240-56227589	List of Approved Electronic Devices to be used on Eskom Power Stations
240-56227443	Requirements for Control and Power Cables for Power Stations Standard
240-53114026	Project Engineering Change Management
240-53114186	Document and Record Management Procedure
240-66920003	Project Handover Documentation Management Procedure
240-86973501	Engineering Drawing Standard
240-55714363	Coal Fired Power Stations Lighting and Small Power Installation Standard
240-56360086	Stationary Vented Nickel Cadmium Batteries Standard
240-53114248	Thyristor and Switch Mode Chargers, AC/DC to DC/AC Converters and Inverter/Uninterruptible Power Supplies Standard
240-56176852	Essential Power Supplies for Power Stations Standard
240-170000055	Installation and Commissioning of Power Electronics Equipment
240-137465740	Standby Battery Storage and Commissioning in ESKOM
240-170000292	DC and Power Electronics Systems settings Standard
240-87495495	Standby battery storage in ESKOM
240-56356396	Earthing and Lightning Protection Standard
240-124341168	Project Plant Specific Technical Documents
240-95240645	Technical Evaluation Criteria for Standby Batteries
240-90489606	Power Electronics Tender Technical Evaluation Criteria (UPS, phase controlled and switch mode chargers)
	Nickel Cadmium A&B Schedules Evaluation Spreadsheet
	PE Enquiry 2022 Schedules A B version 3 control supply ups specific
	Copy of Semi Sealed Nickel Cadmium Battery Spec Technical Schedules

6.5 Process control and IT works

These specifications are usually project specific and developed by the *Employer* to suit his operations. Either include these specifications here, or refer to them in attached Annexure.

Check the specifications for inconsistencies in terminology and that they do not contain any provisions already dealt with in the chosen NEC *conditions of contract* or clash with them in any way.

6.6 Other [as required]

N/A

7. List of drawings

7.1 Drawings issued by the *Employer*

This is the list of drawings issued by the *Employer* at or before the Contract Date and which apply to this contract.

Note: Some drawings may contain both Works Information and Site Information.

Drawing number	Revision	Title
0.45/8500	**1**	**Unit 1 MV & LV Switchgear room equipment layout**
0.45/30686	**1**	**Unit 2 MV & LV Switchgear room equipment layout**
0.45/30689	**1**	**Unit 3 MV & LV Switchgear room equipment layout**
0.45/54755	**1**	**Unit 4 MV & LV Switchgear room equipment layout**
0.45/30692	**1**	**Unit 5 MV & LV Switchgear room equipment layout**
0.45/30696	**1**	**Unit 6 MV & LV Switchgear room equipment layout**
28.45/54710	**1**	**Unit 1 380V Unit Board A Switchgear Schedule Sheet 42**
28.45/54711	**1**	**Unit 1 380V Unit Board B Switchgear Schedule Sheet 43**
28.45/54712	**1**	**Unit 1 380V Unit Board C Switchgear Schedule Sheet 44**
28.45/54713	**1**	**Unit 1 380V Unit Board D Switchgear Schedule Sheet 43**
28.45/54732	**1**	**Unit 2 380V Unit Board A Switchgear Schedule Sheet 42**
28.45/54733	**1**	**Unit 2 380V Unit Board B Switchgear Schedule Sheet 43**
28.45/54734	**1**	**Unit 2 380V Unit Board C Switchgear Schedule Sheet 44**
28.45/54735	**1**	**Unit 2 380V Unit Board D Switchgear Schedule Sheet 43**
28.45/54920	**1**	**Unit 3 380V Unit Board A Switchgear Schedule Sheet 42**
28.45/54921	**1**	**Unit 3 380V Unit Board B Switchgear Schedule Sheet 43**
28.45/54922	**1**	**Unit 3 380V Unit Board C Switchgear Schedule Sheet 44**
28.45/54923	**1**	**Unit 3 380V Unit Board D Switchgear Schedule Sheet 43**
28.45/54743	**1**	**Unit 4 380V Unit Board A Switchgear Schedule Sheet 42**
28.45/54744	**1**	**Unit 4 380V Unit Board B Switchgear Schedule Sheet 43**
28.45/54745	**1**	**Unit 4 380V Unit Board C Switchgear Schedule Sheet 44**
28.45/54746	**1**	**Unit 4 380V Unit Board D Switchgear Schedule Sheet 43**
28.45/54721	**1**	**Unit 5 380V Unit Board A Switchgear Schedule Sheet 42**
28.45/54722	**1**	**Unit 5 380V Unit Board B Switchgear Schedule Sheet 43**
28.45/54723	**1**	**Unit 5 380V Unit Board C Switchgear Schedule Sheet 44**
28.45/54724	**1**	**Unit 5 380V Unit Board D Switchgear Schedule Sheet 43**

28.45/53902	**1**	**Unit 6 380V Unit Board A Switchgear Schedule Sheet 42**
28.45/53903	**1**	**Unit 6 380V Unit Board B Switchgear Schedule Sheet 43**
28.45/53904	**1**	**Unit 6 380V Unit Board C Switchgear Schedule Sheet 44**
28.45/53905	**1**	**Unit 6 380V Unit Board D Switchgear Schedule Sheet 43**

8. Appendix A – Vendor Document Submittal Schedule

C = The *Main Contractor* submits the documents to the *Employer* as a deliverable for either, Completion or starting, of the applicable Activity

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= The document is maintained by the *Contractor* and available to the *Employer* on request

E =

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← (First Character of Revision

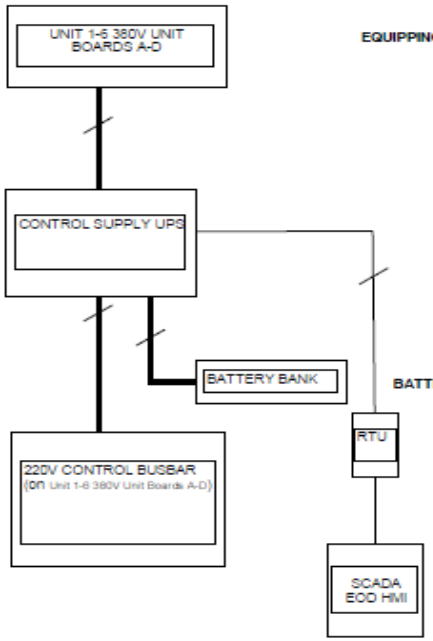
			PROJECT METHODOLOGY														TECHNICAL DOCUMENTATION REQUIREMENTS	
			ENQUIRY/TENDER	UP-FRONT TRAINING	BASIC ENGINEERING			DETAILED ENGINEERING		MANUFACTURING		PROCUREMENT AND INSTALLATION		COMMISSIONING		FINALISATION/ HANDOVER		
	FUNCTION GROUP	DOCUMENT DESCRIPTION		Up-Front Engineering Training Completion	High Level Eng Philosophies &	Technical Clarification Pre-requisite	Basic Eng Design Freeze Documents	Technical Clarification Pre-requisite	Detailed Eng Design Freeze Documents	FAT Pre-requisite Documents	FAT Completion Documents	Erection & Installation Pre-requisite	SIT Completion Documents	Cold Commissioning Output Documents	Hot Commissioning (OAT) Completion	"AS BUILT" Document Package	Generated by the Engineering Tools	Software Format
	CABLING, ROUTING AND RACKING	CABLE CONCEPTS (BETWEEN SWITCHGEAR, CONTROL SUPPLY UPS, BATTERIES AND			C		C		C					C	C	C	YES	PDF/WORD
		CABLE DESIGN AND SIZING CALCULATIONS			C		C		C					C	C	C	YES	EXCEL/PDF
		CABLE SCHEDULES						C	C					C	C	C	YES	CAD& EXCEL
		TERMINATION SCHEDULES						C	C					C	C	C	YES	CAD& EXCEL
		CABLE RACKING AND ROUTING DESIGNS						C	C					C	C	C	YES	CAD& EXCEL
		CABLE DETAIL DESIGN PACK												C	C	C	YES	CAD&PDF
		TERMINATING AND JOINTING KIT DATA										C	C	C	C	C	YES	CAD&PDF
		CABLE TESTS AND PROCEDURES							C			C	C	C	C	C	YES	PDF/WORD
		CABLE COMMISSIONING PROCEDURES							C			C	C	C	C	C	YES	PDF/WORD
		CABLE HANDOVER PACK (INCLUDING ALL TERMINATIONS, SCHEDULES, TEST REPORTS AND PROCEDURES - SIGNED)														C	YES	PDF/WORD &EXCEL/ CAD
		CABLE SERVITUDE DRAWINGS							C					C	C	C	YES	CAD& EXCEL
		CABLE RACK LOADING CALCULATIONS							C					C	C	C	YES	PDF
		CABLE RACK DESIGN DRAWINGS							C					C	C	C	YES	CAD& EXCEL
		CABLE BLOCK DIAGRAMS							C					C	C	C	YES	CAD& EXCEL
		CABLE TEST CERTIFICATES												C	C	C	YES	PDF
	ELECTRICAL BONDING	EARTHING DRAWINGS			C	C	C								C	C	YES	CAD&PDF
		EQUIPMENT GUARANTEE CERTIFICATE								C	C	C		C	C	C	YES	PDF
		CALIBRATION CERTIFICATES FOR ALL TEST EQUIPMENT USED IN THE PROJECT										C		C	C	C	YES	PDF
	BATTERY AND BATTERY CABINETS	BATTERY SIZING DOCUMENTATION			C	C	C		C	C	C	C		C	C	C	YES	PDF
		BATTERY TESTING			C	C	C		C	C	C	C		C	C	C	YES	PDF
		BATTERY CABINET DRAWINGS			C	C	C		C	C	C	C		C	C	C	YES	PDF
		EQUIPMENT GUARANTEE CERTIFICATE								C	C	C		C	C	C	YES	PDF

9. Limits of Supply and Services (LOSS)

KRIEL POWER STATION
DPI REPLACEMENT WITH UPS

INTERFACE:
UNIT 1-6 380V UNIT BOARDS A-D & 220V AC CONTROL/AUXILIARY BUSBAR

LIMITS OF SUPPLY AND SERVICES



	FUNCTIONAL SPECIFICATION	DETAILED DESIGN	DESIGN REVIEW	DETAILED ENGINEERING AND MANUFACTURING	DECOMMISSIONING	SUPPLY	INSTALATION	MODIFY	DOCUMENTATION	COMMISSIONING	HANDOVER	REMARKS:
EQUIPPING AND MODIFICATION OF CIRCUITS	E	C	E	C	C	C	C	C	C	C	C	CONTRACTOR PROVIDES AND INSTALLS THE REQUIRED SCPDs FOR CABLE PROTECTION
DPI					C							
POWER CABLING AND RACKING	E	C	E	C	C	C	C		C	C	C	CABLE TERMINATIONS ON THE SWITCHGEAR AND UPS SIDE SHALL BE DONE BY THE CONTRACTOR
CONTROL SUPPLY UPS	E	C	E	C		C	C		C	C	C	DESIGN, SUPPLY, INSTALLATION AND TESTING TO BE DONE USING ESKOM NATIONAL CONTRACT
UPS ALARM TERMINAL STRIP		C	E	C		C	C		C	C	C	
ALARM CABLE	E	C	E	C	C	C	C		C	C	C	
POWER CABLING AND RACKING	E	C	E	C		C	C		C	C	C	CABLE TERMINATIONS ON THE UPS SIDE SHALL BE DONE BY THE CONTRACTOR
POWER CABLING AND RACKING	E	C	E	C		C	C		C	C	C	CABLE TERMINATIONS SHALL BE DONE BY THE CONTRACTOR
BATTERY BANK AND BATTERY CABINET	E	C	E	C		C	C		C	C	C	DESIGN, SUPPLY, INSTALLATION AND TESTING
								C		C	C	MODIFICATION OF THE RTU TO INCLUDE THE NEW UPS SIGNALS TO BE DONE BY THE CONTRACTOR
CONTROL BUSBAR	E	C	E	C		C	C		C	C	C	TERMINATION OF UPS OUTPUT ONTO THE CONTROL BUSBAR TERMINALS SHALL BE DONE BY THE CONTRACTOR
								C		C	C	MODIFICATION OF THE EOD HMI TO INCLUDE THE NEW UPS SIGNALS TO BE DONE BY THE CONTRACTOR
												BONDING OF EQUIPMENT AND ANY STEEL WORK AND STRUCTURES SHALL BE DONE BY THE CONTRACTOR

E = EMPLOYER

C = CONTRACTOR

REV 1

DATE 20-Jul-23

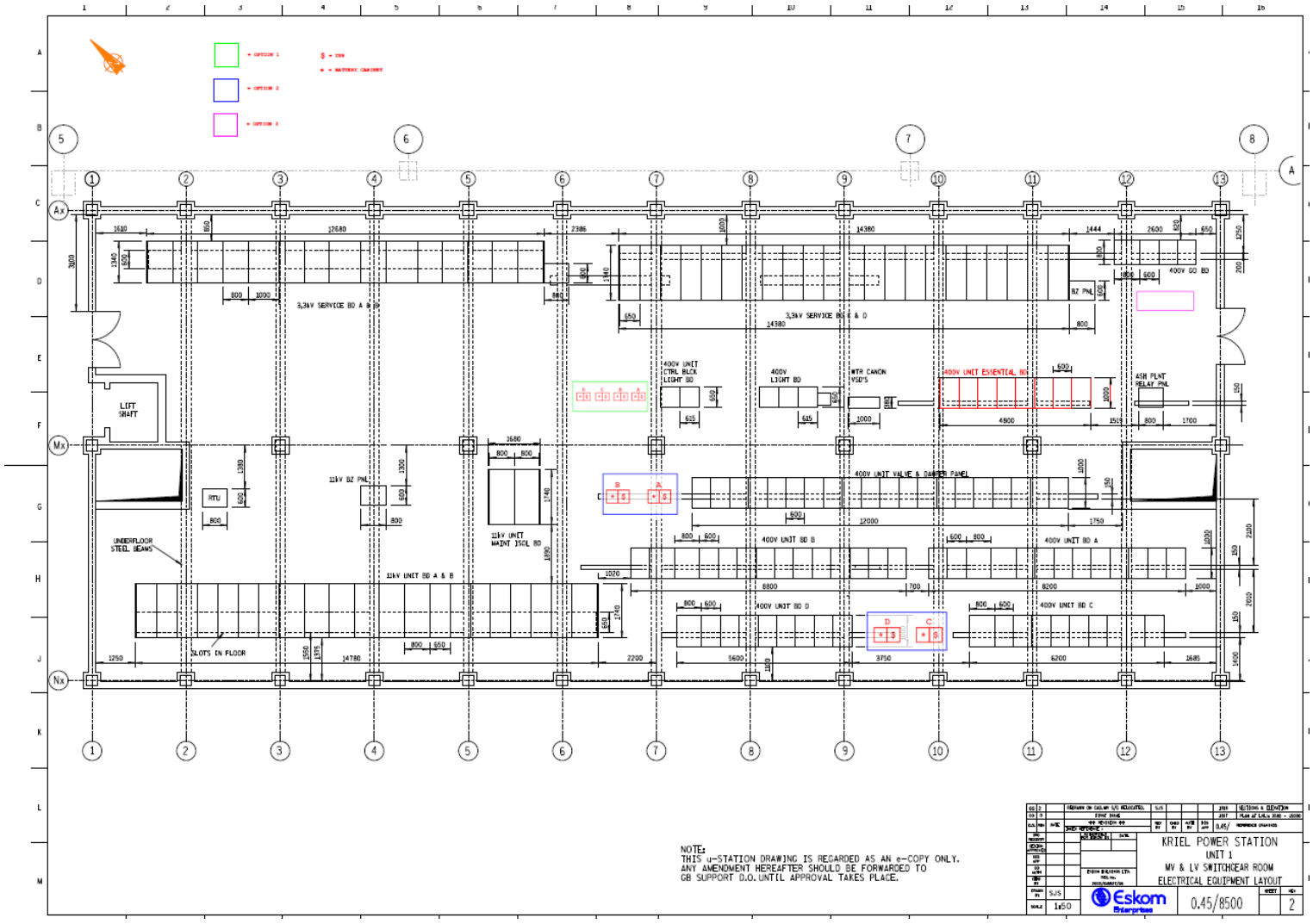
10. Appendix B: Power System and Interface Information

10.1 Equipment list

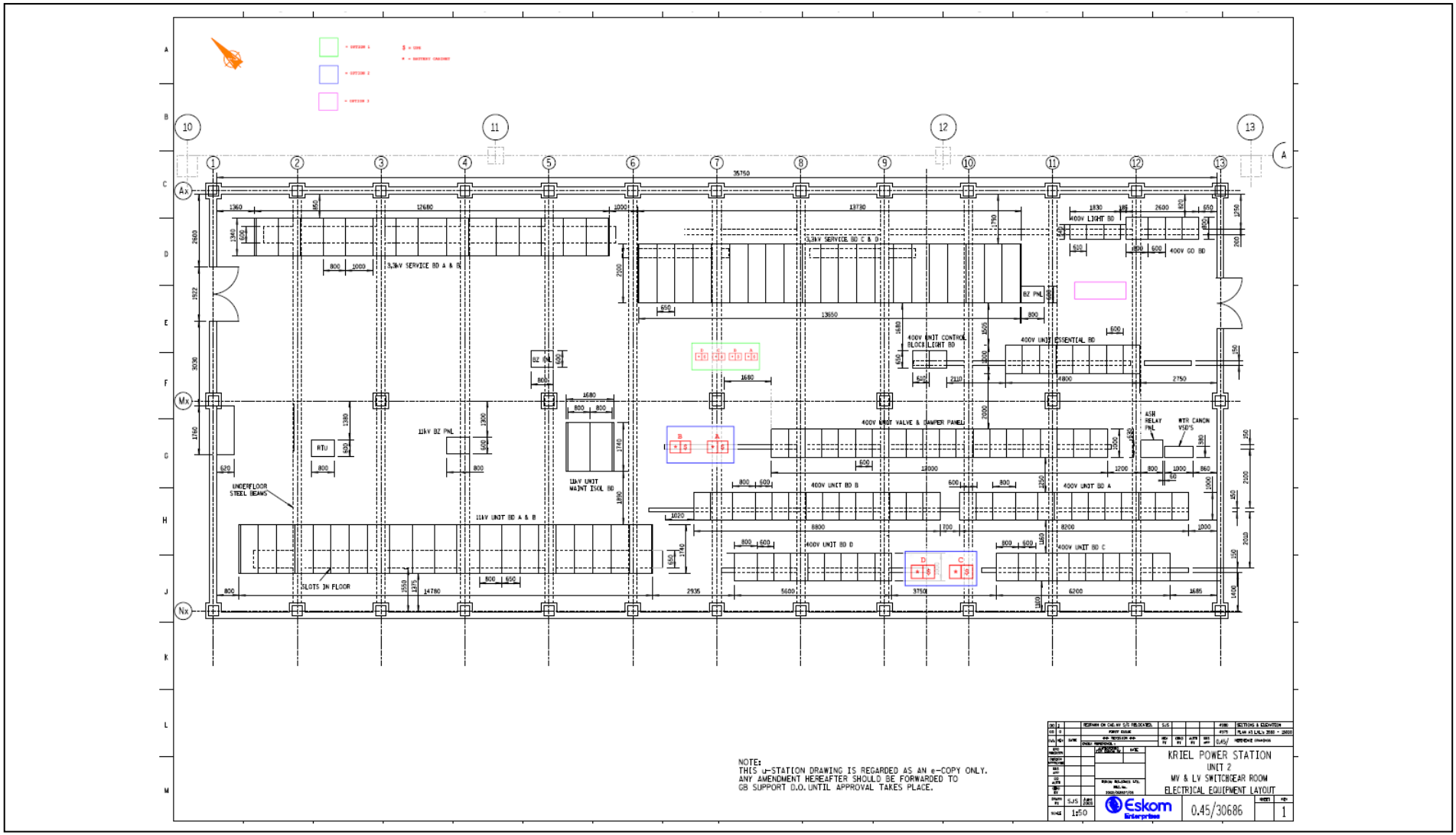
Item	LV Board	Currently installed DPI	Tier & Circuit	380V unit board AKZ	New control supply UPS rating	Drawing Number
1	Unit 1 380V unit board A	DPI 54L version 2	08 & B004	+05-01CA	5kVA (+125% overload capacity for 10 minutes)	0.45/8500
2	Unit 1 380V unit board B	DPI 54L version 2	10 & B004	+05-01CB	5kVA (+125% overload capacity for 10 minutes)	
3	Unit 1 380V unit board C	DPI 54L version 2	09 & B006	+05-01CC	5kVA (+125% overload capacity for 10 minutes)	
4	Unit 1 380V unit board D	DPI 54L version 2	08 & B006	+05-01CD	5kVA (+125% overload capacity for 10 minutes)	
5	Unit 2 380V unit board A	DPI 54L version 2	08 & B004	+05-02CA	5kVA (+125% overload capacity for 10 minutes)	0.45/30686
6	Unit 2 380V unit board B	DPI 54L version 2	10 & B004	+05-02CB	5kVA (+125% overload capacity for 10 minutes)	
7	Unit 2 380V unit board C	DPI 54L version 2	09 & B006	+05-02CC	5kVA (+125% overload capacity for 10 minutes)	
8	Unit 2 380V unit board D	DPI 54L version 2	08 & B006	+05-02CD	5kVA (+125% overload capacity for 10 minutes)	
9	Unit 3 380V unit board A	DPI 54L version 2	08 & B004	+05-03CA	5kVA (+125% overload capacity for 10 minutes)	0.45/30689
10	Unit 3 380V unit board B	DPI 54L version 2	10 & B004	+05-03CB	5kVA (+125% overload capacity for 10 minutes)	
11	Unit 3 380V unit board C	DPI 54L version 2	09 & B006	+05-03CC	5kVA (+125% overload capacity for 10 minutes)	
12	Unit 3 380V unit board D	DPI 54L version 2	08 & B006	+05-03CD	5kVA (+125% overload capacity for 10 minutes)	
13	Unit 4 380V unit board A	DPI 54L version 2	08 & B004	+05-04CA	5kVA (+125% overload capacity for 10 minutes)	0.45/54755
14	Unit 4 380V unit board B	DPI 54L version 2	10 & B004	+05-04CB	5kVA (+125% overload capacity for 10 minutes)	
15	Unit 4 380V unit board C	DPI 54L version 2	09 & B006	+05-04CC	5kVA (+125% overload capacity for 10 minutes)	
16	Unit 4 380V unit board D	DPI 54L version 2	08 & B006	+05-04CD	5kVA (+125% overload capacity for 10 minutes)	
21	Unit 5 380V unit board A	DPI 54L version 2	08 & B004	+05-05CA	5kVA (+125% overload capacity	

					for 10 minutes)	
22	Unit 5 380V unit board B	DPI 54L version 2	10 & B004	+05-05CB	5kVA (+125% overload capacity for 10 minutes)	
23	Unit 5 380V unit board C	DPI 54L version 2	09 & B006	+05-05CC	5kVA (+125% overload capacity for 10 minutes)	0.45/30692
24	Unit 5 380V unit board D	DPI 54L version 2	08 & B006	+05-05CD	5kVA (+125% overload capacity for 10 minutes)	
25	Unit 6 380V unit board A	DPI 54L version 2	08 & B004	+05-06CA	5kVA (+125% overload capacity for 10 minutes)	
26	Unit 6 380V unit board B	DPI 54L version 2	10 & B004	+05-06CB	5kVA (+125% overload capacity for 10 minutes)	
27	Unit 6 380V unit board C	DPI 54L version 2	09 & B006	+05-06CC	5kVA (+125% overload capacity for 10 minutes)	0.45/30696
28	Unit 6 380V unit board D	DPI 54L version 2	08 & B006	+05-06CD	5kVA (+125% overload capacity for 10 minutes)	

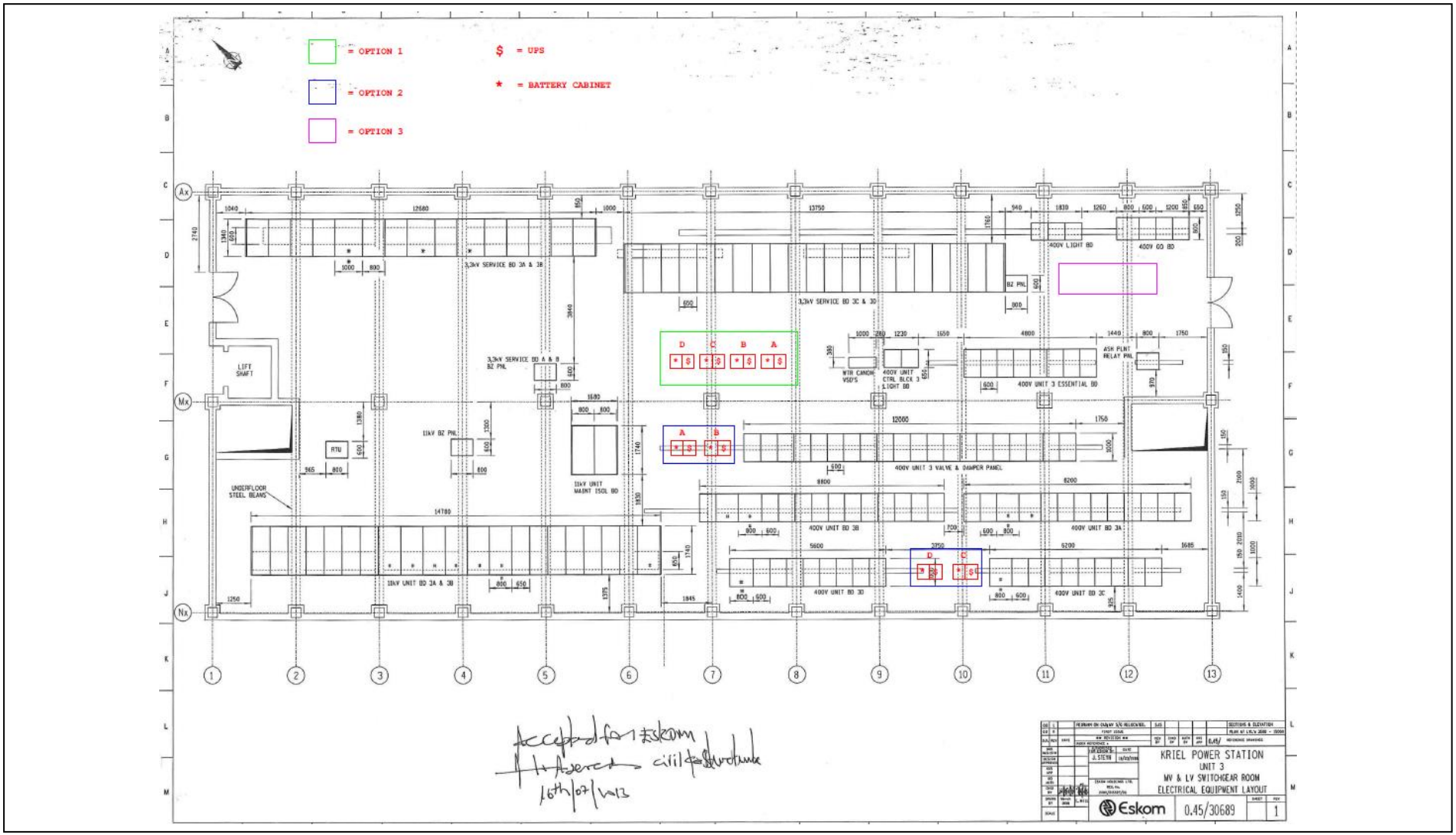
10.2 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 1



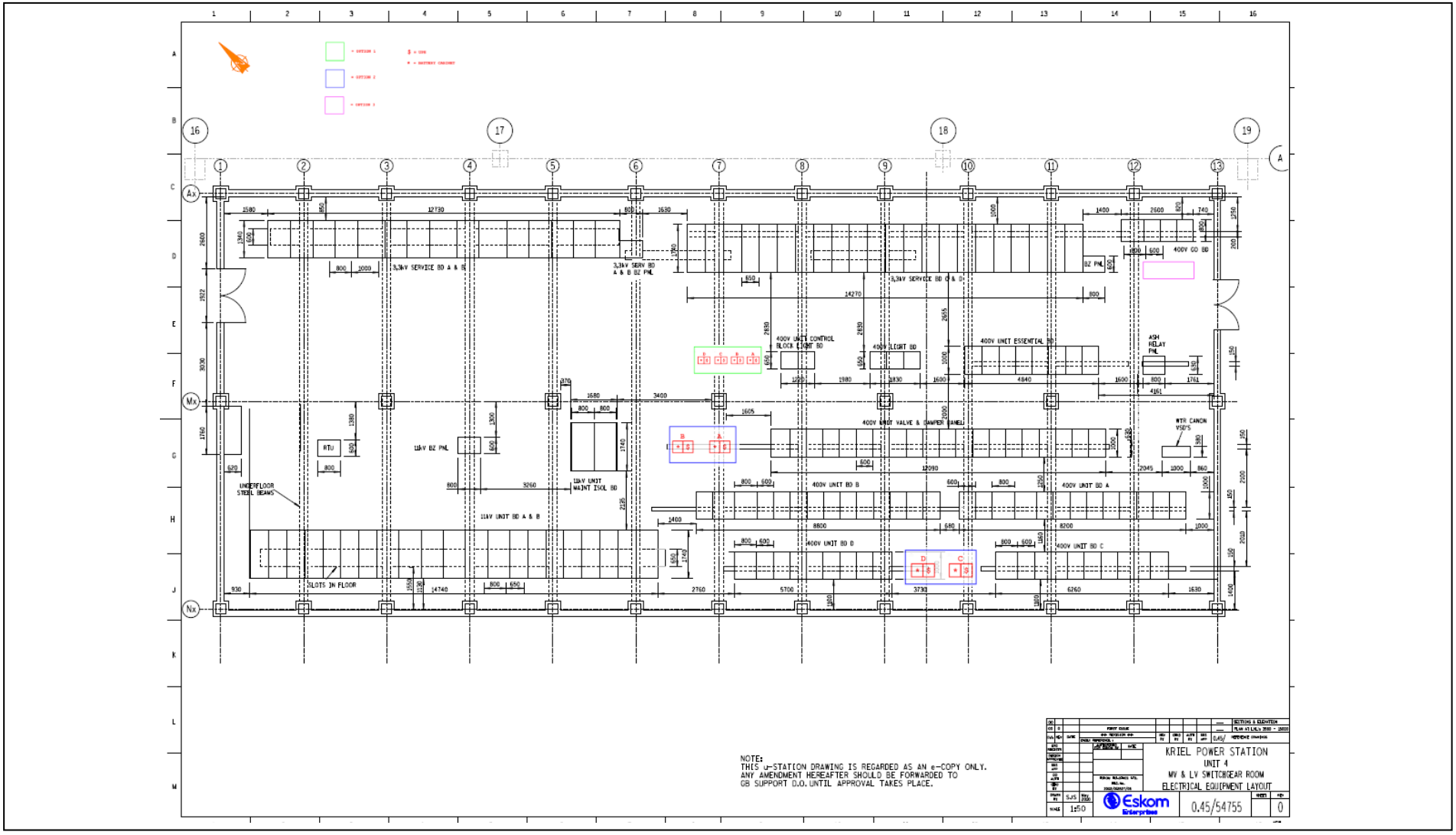
10.3 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 2



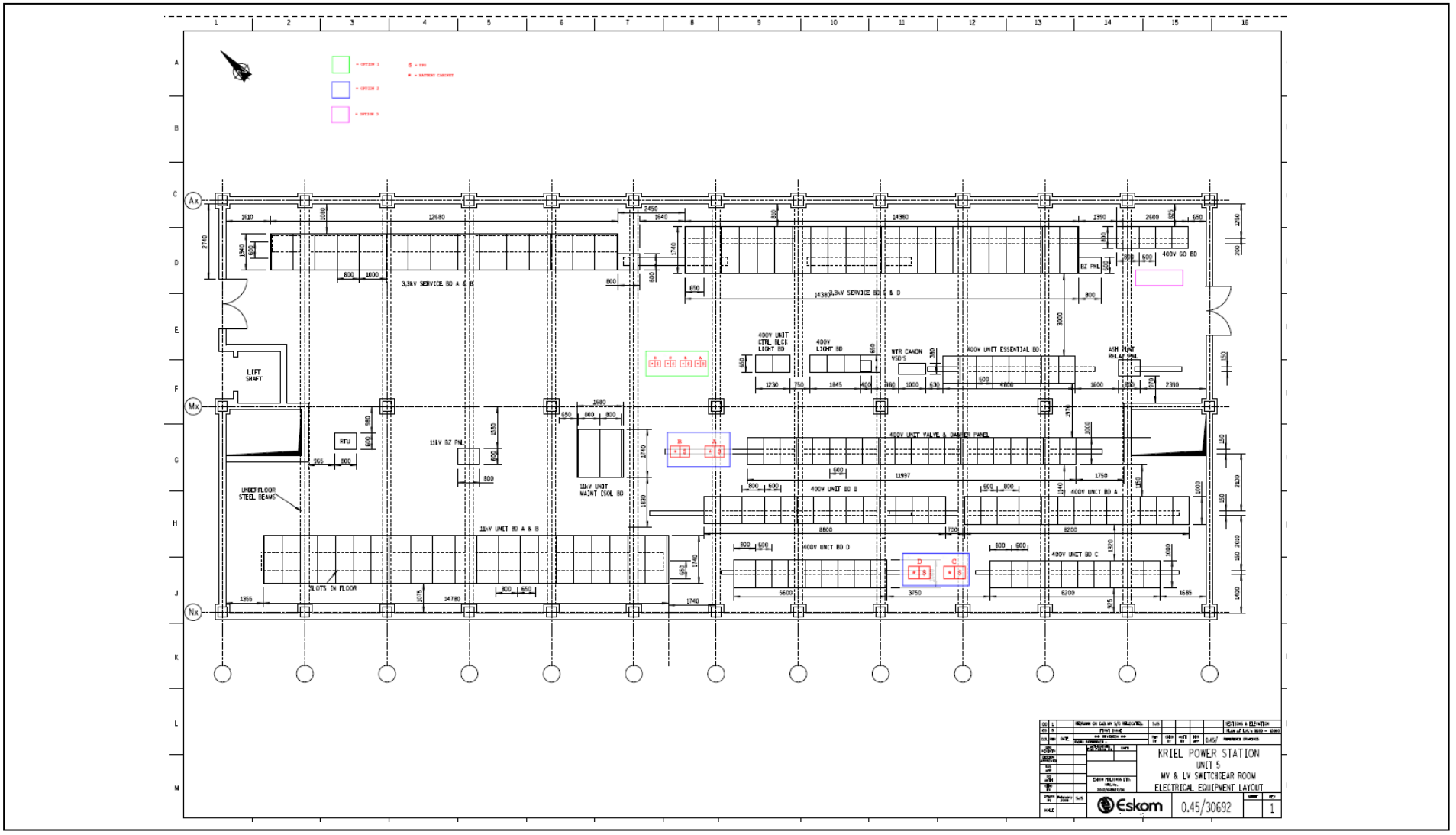
10.4 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 3



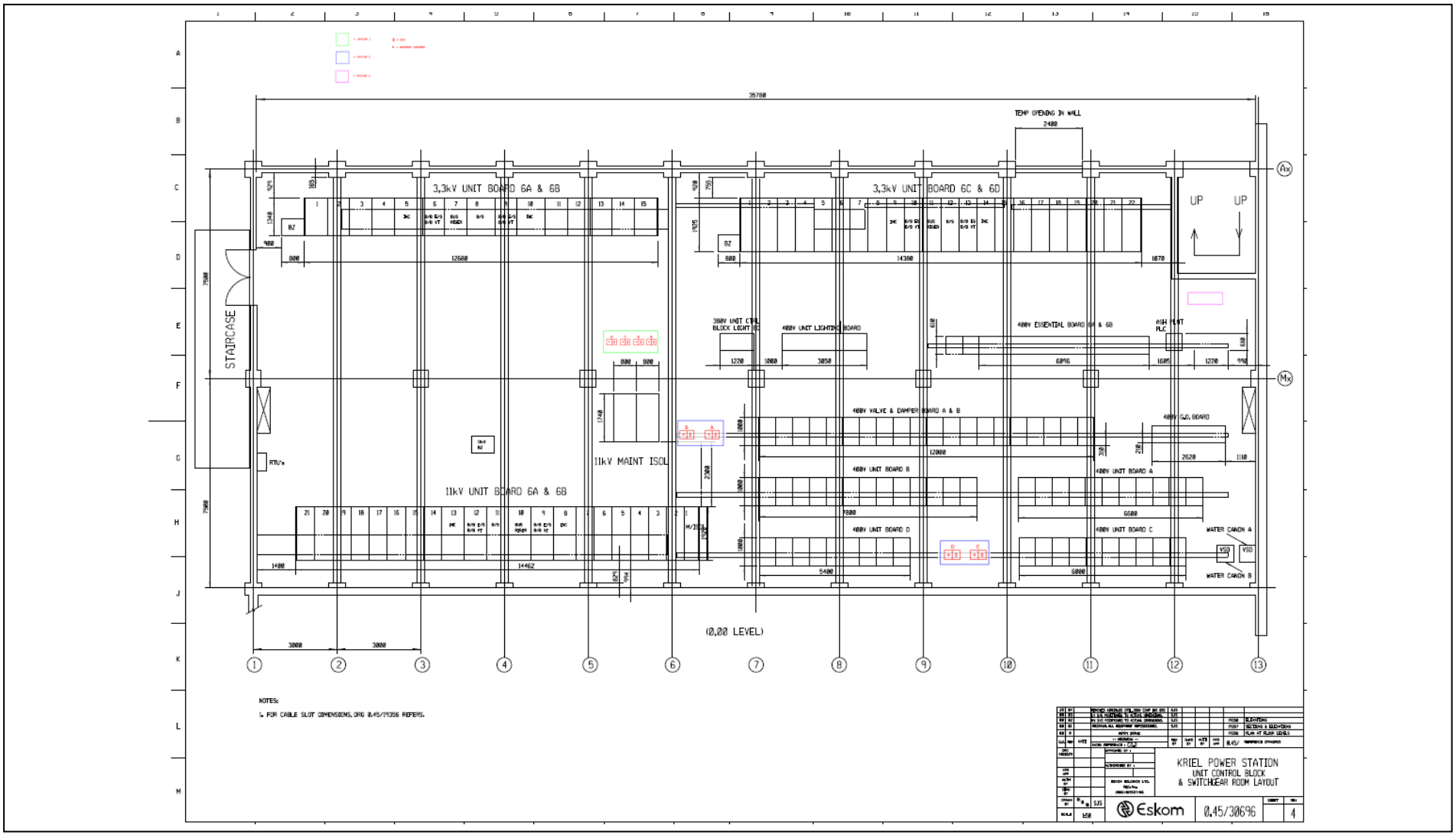
10.5 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 4



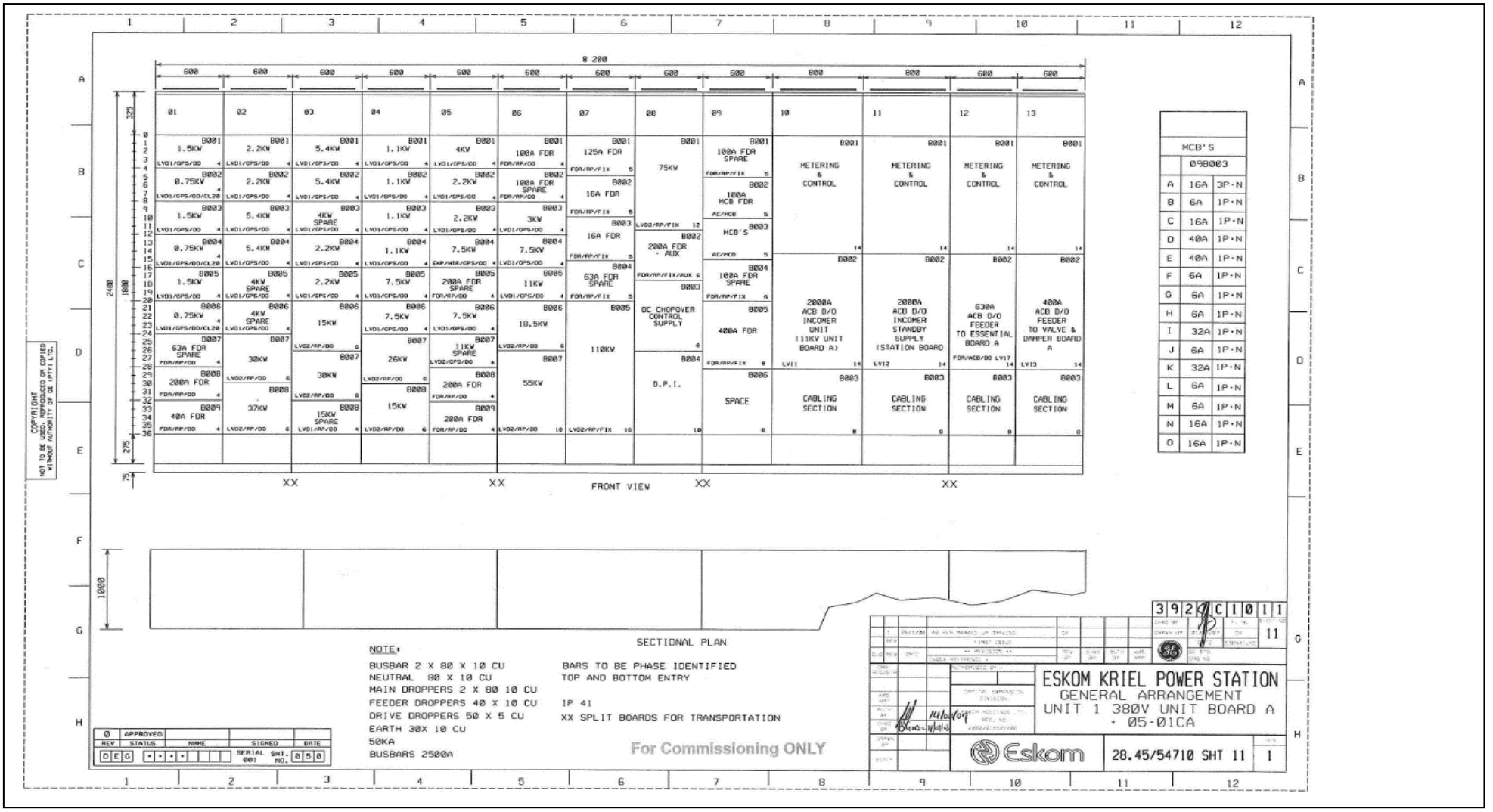
10.6 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 5



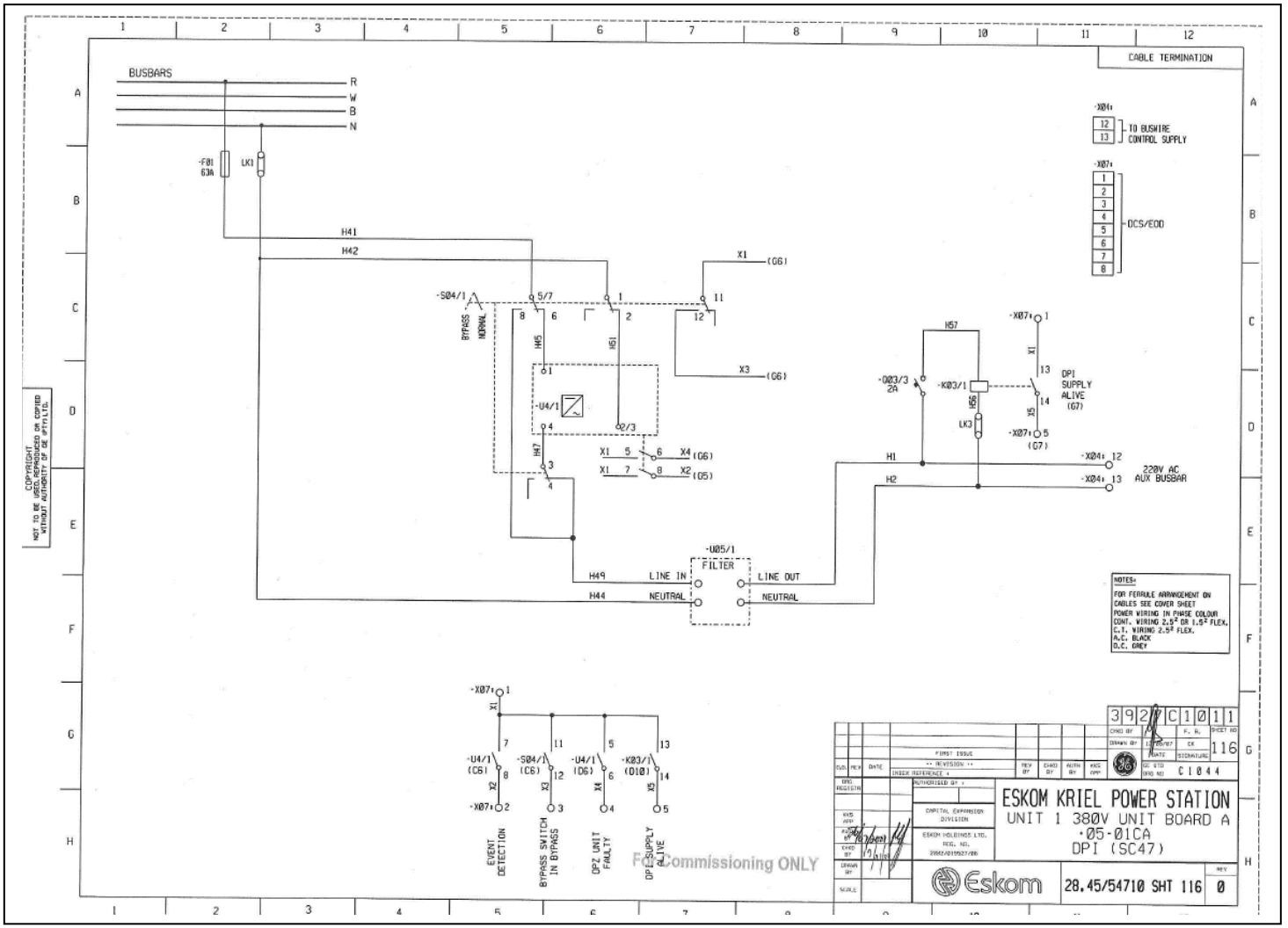
10.7 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 6



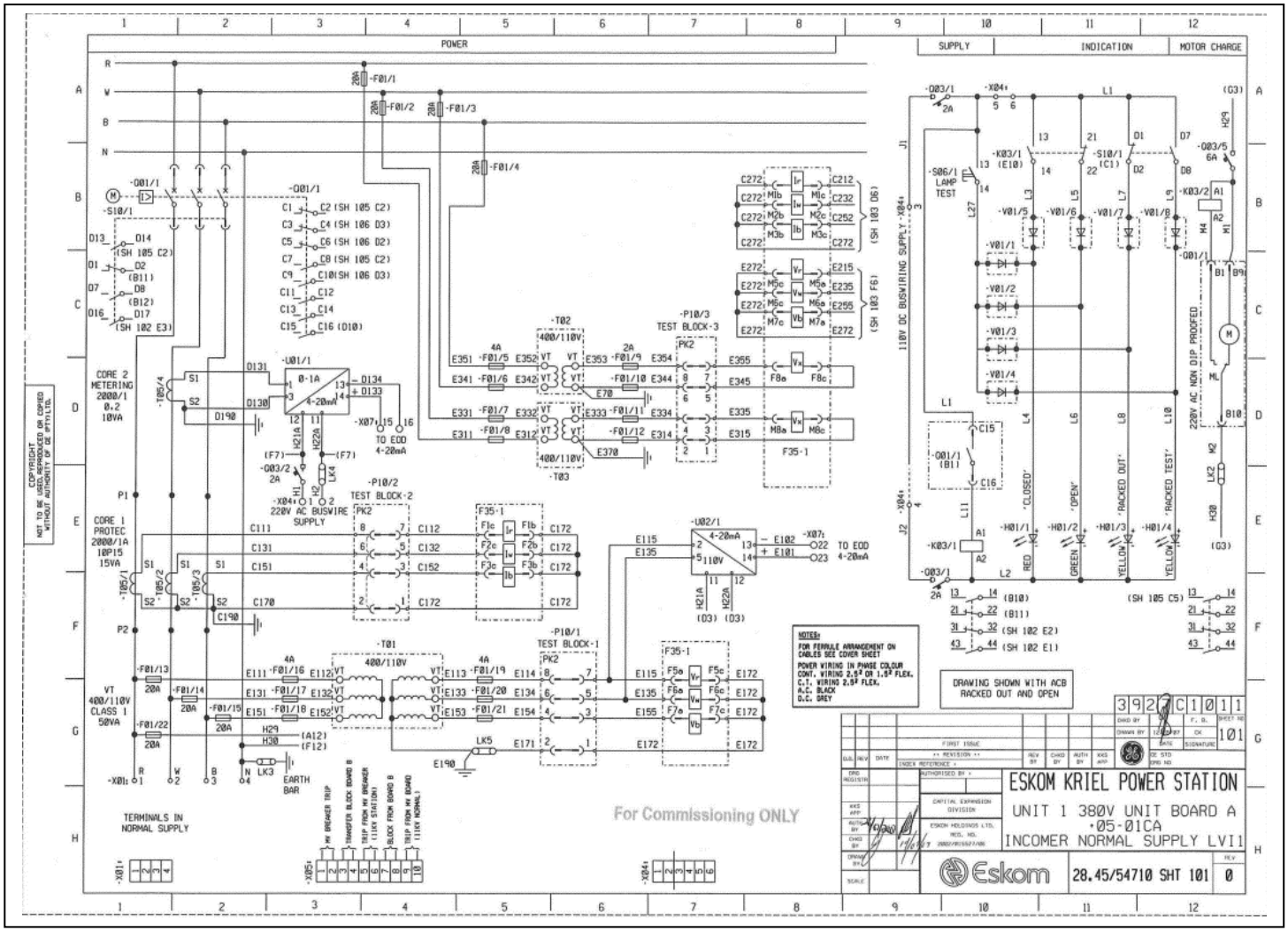
10.8 380V Unit board general arrangement



10.9 DPI circuit layout



10.10 380V unit board incomer supply circuit



10.11 380V Unit board fault summary

Fault Current Summary

	kA
400V Unit Board A Incomer	26.584
400V Unit Board B Incomer	26.894
400V Unit Board C Incomer	27.611
400V Unit Board D Incomer	26.695
Essential Board A Feeder - from Unit Board A	22.542
Essential Board B Feeder - from Unit Board B	25.189
Essential Board A Inc - from Diesel Generator A	6.809
Essential Board B Inc - from Diesel Generator B	6.809
Unit Valve and Damper Board A Feeder	13.228
Unit Valve and Damper Board B Feeder	15.785

C3.2 *Contractor*'S WORKS INFORMATION

This section of the Works Information will always be contract specific depending on the nature of the *works*. It is most likely to be required for design and construct contracts where the tendering *Contractor* will have proposed specifications and schedules for items of Plant and Materials and workmanship, which once accepted by the *Employer* prior to award of contract now become obligations of the *Contractor* per core clause 20.1.

Typical sub headings could be

a) *Contractor*'s design
b) Plant and Materials specifications and schedules
c) Other

This section could also be compiled as a separate file.