NEC3 Engineering & Construction Contract

Between **ESKOM HOLDINGS SOC Ltd**
(Reg No. 2002/015527/30)

and **[Insert at award stage]**
(Reg No. _____)

for **Kriel Power Station DPI (Proof Inverters) Replacement with UPSs (Uninterruptible Power Supplies) in all units**

Contents:		**No of pages**
Part C1	**Agreements & Contract Data**	**[●]**
Part C2	**Pricing Data**	**[●]**
Part C3	**Scope of Work**	**[●]**
Part C4	**Site Information**	**[●]**

CONTRACT No. **[Insert at award stage]**

Part C1: Agreements & Contract Data

Contents:		No of pages
C1.1	**Form of Offer and Acceptance**	**[●]**
	[to be inserted from Returnable Documents at award stage]	
C1.2a	**Contract Data provided by the *Employer***	**[●]**
C1.2b	**Contract Data provided by the *Contractor***	**[●]**
	[to be inserted from Returnable Documents at award stage]	
C1.3	**Proforma Guarantees**	**[●]**

C1.1 Form of Offer & Acceptance

Offer

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract for the procurement of:

Kriel Power Station DPI (Proof Inverters) Replacement with UPSs (Uninterruptible Power Supplies) at Unit 3,4,5 &6

The tenderer, identified in the Offer signature block, has examined the documents listed in the Tender Data and addenda thereto and by submitting this Offer has accepted the Conditions of Tender.

By the representative of the tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance the tenderer offers to perform all of the obligations and liabilities of the *Contractor* under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the *conditions of contract* identified in the Contract Data.

Options A B, C or D	The offered total of the Prices exclusive of VAT is	**R [●]**
Option E or F	The first forecast of the total Defined Cost plus the Fee exclusive of VAT is	**R [●]**
	Sub total	**R [●]**
	Value Added Tax @ 15% is	**R [●]**
	The offered total of the amount due inclusive of VAT is[1]	**R [●]**
	(in words) **[●]**	

This Offer may be accepted by the Employer by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, whereupon the tenderer becomes the party named as the *Contractor* in the *conditions of contract* identified in the Contract Data.

Signature(s) .....

Name(s) .....

Capacity .....

For the tenderer: .....

(Insert name and address of organisation)

Name & signature of witness ..... Date .....

Tenderer's CIDB registration number (if applicable) .....

[1] This total is required by the *Employer* for budgeting purposes only. Actual amounts due will be assessed in terms of the *conditions of contract*.

Acceptance

By signing this part of this Form of Offer and Acceptance, the Employer identified below accepts the tenderer's Offer. In consideration thereof, the Employer shall pay the Contractor the amount due in accordance with the *conditions of contract* identified in the Contract Data. Acceptance of the tenderer's Offer shall form an agreement between the Employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract, are contained in:

Part C1	Agreements and Contract Data, (which includes this Form of Offer and Acceptance)
Part C2	Pricing Data
Part C3	Scope of Work: Works Information
Part C4	Site Information

and drawings and documents (or parts thereof), which may be incorporated by reference into the above listed Parts.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Returnable Schedules as well as any changes to the terms of the Offer agreed by the tenderer and the Employer during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Form of Offer and Acceptance. No amendments to or deviations from said documents are valid unless contained in this Schedule.

The tenderer shall within two weeks of receiving a completed copy of this agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the *conditions of contract* identified in the Contract Data at, or just after, the date this agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the tenderer receives one fully completed original copy signed between them of this document, including the Schedule of Deviations (if any).

Unless the tenderer (now *Contractor*) within five working days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the Parties.

Signature(s) .....

Name(s) .....

Capacity .....

for the Employer

.....
(Insert name and address of organisation)

Name & signature of witness .....

Date .....

Note: If a tenderer wishes to submit alternative tenders, use another copy of this Form of Offer and Acceptance.

Schedule of Deviations to be completed by the *Employer* prior to contract award

Note:

1. This part of the Offer & Acceptance would not be required if the contract has been developed by negotiation between the Parties and is not the result of a process of competitive tendering.
2. The extent of deviations from the tender documents issued by the Employer prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender.
3. A tenderer's covering letter must not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid be the subject of agreement reached during the process of Offer and Acceptance, the outcome of such agreement shall be recorded here and the final draft of the contract documents shall be revised to incorporate the effect of it.

No.	Subject	Details
1	**[●]**	**[●]**
2	**[●]**	**[●]**
3	**[●]**	**[●]**
4	**[●]**	**[●]**
5	**[●]**	**[●]**
6	**[●]**	**[●]**
7	**[●]**	**[●]**

By the duly authorised representatives signing this Schedule of Deviations below, the Employer and the tenderer agree to and accept this Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules, as well as any confirmation, clarification or changes to the terms of the Offer agreed by the tenderer and the Employer during this process of Offer and Acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Form shall have any meaning or effect in the contract between the parties arising from this Agreement.

	For the tenderer:	**For the Employer**
Signature	.....	.....
Name	.....	.....
Capacity	.....	.....
On behalf of	..... *(Insert name and address of organisation)*	..... *(Insert name and address of organisation)*
Name & signature of witness	.....	.....
Date	.....	.....

C1.2 ECC3 Contract Data

Part one - Data provided by the *Employer*

Clause	Statement	Data
1	**General**	
	The *conditions of contract* are the core clauses and the clauses for main Option	
		A: Priced contract with activity schedule
	dispute resolution Option	**W1: Dispute resolution procedure**
	and secondary Options	
		X1: Price adjustment for inflation
		X2 Changes in the law
		X7: Delay damages
		X16: Retention
		X18: Limitation of liability
		Z: *Additional conditions of contract*
	of the NEC3 Engineering and Construction Contract, April 2013 (ECC3)	
10.1	The *Employer* is (Name):	**Eskom Holdings SOC Ltd (reg no: 2002/015527/30), a state owned company incorporated in terms of the company laws of the Republic of South Africa**
	Address	**Registered office at Megawatt Park, Maxwell Drive, Sandton, Johannesburg**
10.1	The *Project Manager* is: (Name)	Kgomotso Ngweye
	Address	Kriel Power Station Private Bag x5009 Kriel 2271
	Tel	017 615 2450
	Fax	086 667 1588
	e-mail	**Kgomotso.ngweye@eskom.co.za**
10.1	The *Supervisor* is: (Name)	Ted Magwaza
	Address	Kriel Power Station Private Bag x5009 Kriel 2271

	Tel No.	017 615 2972
	Fax No.	
	e-mail	MagwazCT@eskom.co.za
11.2(13)	The *works* are	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.
11.2(14)	The following matters will be included in the Risk Register	- Approval of drawings by CoE and Eskom internal process (SCCC) - Unavailability of plant
11.2(15)	The *boundaries of the site* are	Unit 1-6 Switchgear substations at Kriel Power Station
11.2(16)	The Site Information is in	**Part 4: Site Information**
11.2(19)	The Works Information is in	**Part 3: Scope of Work and all documents and drawings to which it makes reference.**
12.2	The *law of the contract* is the law of	**the Republic of South Africa**
13.1	The *language of this contract* is	**English**
13.3	The *period for reply* is	**One week**
2	**The *Contractor's* main responsibilities**	**Data required by this section of the core clauses is provided by the *Contractor* in Part 2 and terms in italics used in this section are identified elsewhere in this Contract Data.**
3	**Time**	
11.2(3)	The *completion date* for the whole of the *works* is	**[•].**
11.2(9)	The *key date*s and the *condition*s to be met are:	

	***Condition* to be met**	***key date***
1	Detail design and reviews	1 month
2	Supply of UPSs and all associated material etc cables	4 months

		3	Decommission and removal existing DPI system	1 week
			Installation of the new UPS system	2 months
			Commissioning	One week per unit
30.1	The *access dates* are:	**Part of the Site**		**Date**
		1	Site Access and establishment	To be agreed at contract award
		2	Unit 5 decommissioning and installation	Based on outage schedule
		3	Unit 4 decommissioning and installation	
		4	Unit 3 decommissioning and installation	
		5	Unit 2 decommissioning and installation	
		6	Unit 1 decommissioning and installation	
		7	Unit 6 decommissioning and installation	
31.1	The *Contractor* is to submit a first programme for acceptance within	From within 2 weeks of Contract signature		
31.2	The *starting date* is	As soon as possible after contract award		
32.2	The *Contractor* submits revised programmes at intervals no longer than	Two weeks.		
35.1	The *Employer* is not willing to take over the *works* before the Completion Date.	[No data needed if this statement is included]		
4	**Testing and Defects**			
42.2	The *defects date* is	52 weeks after Completion of the whole of the *works*.		
43.2	The *defect correction period* is	one week		
	except that the *defect correction period* for	Failure of equipment during commissioning is 2 days		
	and the *defect correction period* for	Failure of the whole system is 1 day		
5	**Payment**			
50.1	The *assessment interval* is	between the 25th and 30th day of each successive month.		
51.1	The *currency of this contract* is the	South African Rand.		

51.2	The period within which payments are made is	4 weeks from receipt of a valid invoice
51.4	The *interest rate* is	**the publicly quoted prime rate of interest (calculated on a 365 day year) charged from time to time by the Standard Bank of South Africa Limited (as certified, in the event of any dispute, by any manager of such bank, whose appointment it shall not be necessary to prove) for amounts due in Rands and** **(ii) the LIBOR rate applicable at the time for amounts due in other currencies. LIBOR is the 6 month London Interbank Offered Rate quoted under the caption "Money Rates" in The Wall Street Journal for the applicable currency or if no rate is quoted for the currency in question then the rate for United States Dollars, and if no such rate appears in The Wall Street Journal then the rate as quoted by the Reuters Monitor Money Rates Service (or such service as may replace the Reuters Monitor Money Rates Service) on the due date for the payment in question, adjusted *mutatis mutandis* every 6 months thereafter and as certified, in the event of any dispute, by any manager employed in the foreign exchange department of The Standard Bank of South Africa Limited, whose appointment it shall not be necessary to prove.**

6 Compensation events

60.1(13)	The place where weather is to be recorded is:	Bethal South African Weather Bureau
	The *weather measurements* to be recorded for each calendar month are,	the cumulative rainfall (mm) the number of days with rainfall more than 10 mm the number of days with minimum air temperature less than 0 degrees Celsius the number of days with snow lying at 09:00 hours South African Time and these measurements:
	The *weather measurements* are supplied by	South African Weather Bureau
	The *weather data* are the records of past *weather measurements* for each calendar month which were recorded at:	Bethal
	and which are available from:	**the South African Weather Bureau and included in Annexure A to this Contract Data provided by the *Employer***
60.1(13)	Assumed values for the ten year return *weather data* for each *weather measurement* for each calendar month	**As stated in Annexure A to this Contract Data provided by the *Employer*.**

	are:	**Note: If this arrangement is used, delete the rows above for 60.1(13) and delete this note.**
7	**Title**	**There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data.**
8	**Risks and insurance**	
80.1	These are additional *Employer*'s risks	1.Long lead times for delivery of equipment 2. Outage Movement
84	**Insurance cover**	

84.1 When requested by a Party, the other Party provides certificates from his insurer or broker stating that the insurances required by this contract are in force.

84.2 The *Contractor* provides the insurances stated in the Insurance Table A.

84.3 The insurances provide cover for events which are at the *Contractor*'s risk from the *starting date* until the earlier of Completion and the date of the termination certificate.

INSURANCE TABLE A

Insurance against	Minimum amount of cover or minim limit of indemnity
Loss of or damage to the *work*s, Plant and Materials	The replacement cost where not covered by the *Employer*'s insurance The *Employer*'s policy deductible, as Contract Date, where covered by the *Employer*'s insurance
Loss of or damage to Equipment	The replacement cost
Liability for loss of or damage to property (except the *work*s, Plant and Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the *Contractor*) caused by activity in connection with this contract	Loss of or damage to property *Employer*'s property The replacement cost where not covered by the *Employer*'s insurance The *Employer*'s policy deductible, as Contract Date, where covered by the *Employer*'s insurance Other property The replacement cost Bodily injury to or death of a person The amount required by applicable l
Liability for death of or bodily injury to employees of the *Contractor* arising out	The amount required by the applicat

of and in the course of their employment in connection with this contract	law

87 The *Employer* provides the insurances stated in the Insurance Table B.

INSURANCE TABLE B

Insurance against or name of policy	**Minimum amount of cover or minimum limit of indemnity**
Assets All Risk	Per the insurance policy document
Contract Works insurance	Per the insurance policy document
Environmental Liability	Per the insurance policy document
General and Public Liability	Per the insurance policy document
Transportation (Marine)	Per the insurance policy document
Motor Fleet and Mobile Plant	Per the insurance policy document
Terrorism	Per the insurance policy document
Cyber Liability	Per the insurance policy document
Nuclear Material Damage and Business Interruption	Per the insurance policy document
Nuclear Material Damage Terrorism	Per the insurance policy document

9 Termination

There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data.

10 Data for main Option clause

A Priced contract with activity schedule

There is no reference to Contract Data in this Option and terms in italics are identified elsewhere in this Contract Data.

11 Data for Option W1

W1.1 The *Adjudicator* is

the person selected from the ICE-SA Division (or its successor body) of the South African Institution of Civil Engineering Panel of Adjudicators by the Party intending to refer a dispute to him. (see www.ice-sa.org.za). If the Parties do not agree on an Adjudicator the Adjudicator will be appointed by the Arbitration Foundation of Southern Africa (AFSA).

	Address	**[•]**
	Tel No.	**[•]**
	Fax No.	**[•]**
	e-mail	**[•]**
W1.2(3)	The *Adjudicator nominating body* is:	**the Chairman of ICE-SA a joint Division of the South African Institution of Civil Engineering and the London Institution of Civil Engineers. (See www.ice-sa.org.za) or its successor body.**
W1.4(2)	The *tribunal* is:	**arbitration.**
W1.4(5)	The *arbitration procedure* is	**the latest edition of Rules for the Conduct of Arbitrations published by The Association of Arbitrators (Southern Africa) or its successor body.**
	The place where arbitration is to be held is	**South Africa**
	The person or organisation who will choose an arbitrator - if the Parties cannot agree a choice or - if the arbitration procedure does not state who selects an arbitrator, is	**the Chairman for the time being or his nominee of the Association of Arbitrators (Southern Africa) or its successor body.**

12 Data for secondary Option clauses

X1	**Price adjustment for inflation**			
X1.1(a)	The *base date* for indices is	**[•].**		
X1.1(c)	The proportions used to calculate the Price Adjustment Factor are:	**proportion**	**linked to index for**	**Index prepared by**
		35%	**Labour – Table C3**	**Seifsa C3**
		10%	**Transport – Table L2**	**Seifsa L2**
		45%	**Electrical Enginering – Table G-1**	**Seifsa G1**
		15%	**Non-adjustable**	
	Total	**100%**		
X2	**Changes in the law**	**There is no reference to Contract Data in this Option and terms in italics are identified elsewhere in this Contract Data.**		
X7	**Delay damages**			
X7.1	Delay damages for Completion of the whole of the *works* are	**2% of the Price of the delayed item per day of delay, up to a maximum of 10% of the Price of the delayed item**		
X16	**Retention**			

X16.1	The *retention free amount* is The *retention percentage* is	**Zero** **10% of contract price**
X18	**Limitation of liability**	
X18.1	The *Contractor*'s liability to the *Employer* for indirect or consequential loss is limited to:	**R0.0 (zero Rand)**
X18.2	For any one event, the *Contractor*'s liability to the *Employer* for loss of or damage to the *Employer*'s property is limited to:	**the amount of the deductibles relevant to the event**
X18.3	The *Contractor*'s liability for Defects due to his design which are not listed on the Defects Certificate is limited to	**The greater of** • **the total of the Prices at the Contract Date and** • **the amounts excluded and unrecoverable from the *Employer*'s assets policy for correcting the Defect (other than the resulting physical damage which is not excluded) plus the applicable deductible as at contract date.**

X18.4	The *Contractor*'s total liability to the *Employer* for all matters arising under or in connection with this contract, other than excluded matters, is limited to:	**the total of the Prices other than for the additional excluded matters.**
		
		The *Contractor's* total liability for the additional excluded matters is not limited.
		
		The additional excluded matters are amounts for which the *Contractor* is liable under this contract for
		
		• **Defects due to his design which arise before the Defects Certificate is issued,**
		• **Defects due to manufacture and fabrication outside the Site,**
		• **loss of or damage to property (other than the *works*, Plant and Materials),**
		  • **death of or injury to a person and**
		  • **infringement of an intellectual property right.**

X18.5	The *end of liability date* is	**(i) [•] years after the *defects date* for latent Defects and** **(ii) the date on which the liability in question prescribes in accordance with the Prescription Act No. 68 of 1969 (as amended or in terms of any replacement legislation) for any other matter.** **A latent Defect is a Defect which would not have been discovered on reasonable inspection by the *Employer* or the *Supervisor* before the *defects date*, without requiring any inspection not ordinarily carried out by the *Employer* or the *Supervisor* during that period.**

		If the *Employer* or the *Supervisor* do undertake any inspection over and above the reasonable inspection, this does not place a greater responsibility on the *Employer* or the *Supervisor* to have discovered the Defect.
Z	**The *Additional conditions of contract* are**	**Z1 to Z15 always apply.**

Z1 Cession delegation and assignment

Z1.1 The *Contractor* does not cede, delegate or assign any of its rights or obligations to any person without the written consent of the *Employer.*

Z1.2 Notwithstanding the above, the *Employer* may on written notice to the *Contractor* cede and delegate its rights and obligations under this contract to any of its subsidiaries or any of its present divisions or operations which may be converted into separate legal entities as a result of the restructuring of the Electricity Supply Industry.

Z2 Joint ventures

Z2.1 If the *Contractor* constitutes a joint venture, consortium or other unincorporated grouping of two or more persons or organisations then these persons or organisations are deemed to be jointly and severally liable to the *Employer* for the performance of this contract.

Z2.2 Unless already notified to the *Employer*, the persons or organisations notify the *Project Manager* within two weeks of the Contract Date of the key person who has the authority to bind the *Contractor* on their behalf.

Z2.3 The *Contractor* does not alter the composition of the joint venture, consortium or other unincorporated grouping of two or more persons without the consent of the *Employer* having been given to the *Contractor* in writing.

Z3 Change of Broad Based Black Economic Empowerment (B-BBEE) status

Z3.1 Where a change in the *Contractor's* legal status, ownership or any other change to his business composition or business dealings results in a change to the *Contractor*'s B-BBEE status, the *Contractor* notifies the *Employer* within seven days of the change.

Z3.2 The *Contractor* is required to submit an updated verification certificate and necessary supporting documentation confirming the change in his B-BBEE status to the *Project Manager* within thirty days of the notification or as otherwise instructed by the *Project Manager*.

Z3.3 Where, as a result, the *Contractor's* B-BBEE status has decreased since the Contract Date the *Employer* may either re-negotiate this contract or alternatively, terminate the *Contractor*'s obligation to Provide the Works.

Z3.4 Failure by the *Contractor* to notify the *Employer* of a change in its B-BBEE status may constitute a reason for termination. If the *Employer* terminates in terms of this clause, the procedures on termination are P1, P2 and P3 as stated in clause 92, and the amount due is A1 and A3 as stated in clause 93.

Z4 Confidentiality

Z4.1 The *Contractor* does not disclose or make any information arising from or in connection with this contract available to Others. This undertaking does not, however, apply to information

which at the time of disclosure or thereafter, without default on the part of the *Contractor*, enters the public domain or to information which was already in the possession of the *Contractor* at the time of disclosure (evidenced by written records in existence at that time). Should the *Contractor* disclose information to Others in terms of clause 25.1, the *Contractor* ensures that the provisions of this clause are complied with by the recipient.

Z4.2 If the *Contractor* is uncertain about whether any such information is confidential, it is to be regarded as such until notified otherwise by the *Project Manager*.

Z4.3 In the event that the *Contractor* is, at any time, required by law to disclose any such information which is required to be kept confidential, the *Contractor*, to the extent permitted by law prior to disclosure, notifies the *Employer* so that an appropriate protection order and/or any other action can be taken if possible, prior to any disclosure. In the event that such protective order is not, or cannot, be obtained, then the *Contractor* may disclose that portion of the information which it is required to be disclosed by law and uses reasonable efforts to obtain assurances that confidential treatment will be afforded to the information so disclosed.

Z4.4 The taking of images (whether photographs, video footage or otherwise) of the *works* or any portion thereof, in the course of Providing the Works and after Completion, requires the prior written consent of the *Project Manager*. All rights in and to all such images vests exclusively in the *Employer*.

Z4.5 The *Contractor* ensures that all his subcontractors abide by the undertakings in this clause.

Z5 Waiver and estoppel: Add to core clause 12.3:

Z5.1 Any extension, concession, waiver or relaxation of any action stated in this contract by the Parties*,* the *Project Manager*, the *Supervisor*, or the *Adjudicator* does not constitute a waiver of rights, and does not give rise to an estoppel unless the Parties agree otherwise and confirm such agreement in writing.

Z6 Health, safety and the environment: Add to core clause 27.4

Z6.1 The *Contractor* undertakes to take all reasonable precautions to maintain the health and safety of persons in and about the execution of the *works*. Without limitation the *Contractor*:

- accepts that the *Employer* may appoint him as the “Principal Contractor” (as defined and provided for under the Construction Regulations 2014 (promulgated under the Occupational Health & Safety Act 85 of 1993) (“the Construction Regulations”) for the Site;
- 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 *works*; and
- undertakes, in and about the execution of the *works*, 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.

Z6.2 The *Contractor*, in and about the execution of the *works*, 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.

Z7 Provision of a Tax Invoice and interest. Add to core clause 51

Z7.1 Within one week of receiving a payment certificate from the *Project Manager* in terms of core clause 51.1, the *Contractor* provides the *Employer* with a tax invoice in accordance with the *Employer*'s procedures stated in the Works Information, showing the amount due for payment equal to that stated in the payment certificate.

Z7.2 If the *Contractor* does not provide a tax invoice in the form and by the time required by this contract, the time by when the *Employer* is to make a payment is extended by a period equal in time to the delayed submission of the correct tax invoice. Interest due by the *Employer* in terms of core clause 51.2 is then calculated from the delayed date by when payment is to be made.

Z7.3 The *Contractor* (if registered in South Africa in terms of the companies Act) is required to comply with the requirements of the Value Added Tax Act, no 89 of 1991 (as amended) and to include the *Employer*'s VAT number 4740101508 on each invoice he submits for payment.

Z8 Notifying compensation events

Z8.1 Delete from the last sentence in core clause 61.3, "unless the *Project Manager* should have notified the event to the *Contractor* but did not".

Z9 *Employer's* limitation of liability

Z9.1 The *Employer's* liability to the *Contractor* for the *Contractor's* indirect or consequential loss is limited to R0.00 (zero Rand)

Z9.2 The *Contractor*'s entitlement under the indemnity in 83.1 is provided for in 60.1(14) and the *Employer*'s liability under the indemnity is limited.

Z10 Termination: Add to core clause 91.1, at the second main bullet point, fourth sub-bullet point, after the words "against it":

Z10.1 or had a business rescue order granted against it.

Z11 Addition to secondary Option X7 Delay damages (if applicable in this contract)

Z11.1 If the amount due for the *Contractor*'s payment of delay damages reaches the limits stated in this Contract Data for Option X7 or Options X5 and X7 used together, the *Employer* may terminate the *Contractor*'s obligation to Provide the Works using the same procedures and payment on termination as those applied for reasons R1 to R15 or R18 stated in the Termination Table.

Z12 Ethics

For the purposes of this Z-clause, the following definitions apply:

Affected Party means, as the context requires, any party, irrespective of whether it is the *Contractor* or a third party, such party's employees, agents, or Subcontractors or Subcontractor's employees, or any one or more of all of these parties' relatives or friends,

Coercive Action means to harm or threaten to harm, directly or indirectly, an Affected Party or the property of an Affected Party, or to otherwise influence or attempt to influence an Affected Party to act unlawfully or illegally,

Collusive Action means where two or more parties co-operate to achieve an unlawful or illegal purpose, including to influence an Affected Party to act unlawfully or illegally,

Committing Party means, as the context requires, the *Contractor*, or any member thereof in the case of a joint venture, or its employees, agents, or Subcontractor or the Subcontractor's employees,

Corrupt Action means the offering, giving, taking, or soliciting, directly or indirectly, of a good or service to unlawfully or illegally influence the actions of an Affected Party,

Fraudulent Action means any unlawfully or illegally intentional act or omission that misleads, or attempts to mislead, an Affected Party, in order to obtain a financial or other benefit or to avoid an obligation or incurring an obligation,

Obstructive Action means a Committing Party unlawfully or illegally destroying, falsifying, altering or concealing information or making false statements to materially impede an investigation into allegations of Prohibited Action, and

Prohibited Action means any one or more of a Coercive Action, Collusive Action Corrupt Action, Fraudulent Action or Obstructive Action.

Z12.1 A Committing Party may not take any Prohibited Action during the course of the procurement of this contract or in execution thereof.

Z12.2 The *Employer* may terminate the *Contractor*'s obligation to Provide the Services if a Committing Party has taken such Prohibited Action and the *Contractor* did not take timely and appropriate action to prevent or remedy the situation, without limiting any other rights or remedies the *Employer* has. It is not required that the Committing Party had to have been found guilty, in court or in any other similar process, of such Prohibited Action before the *Employer* can terminate the *Contractor*'s obligation to Provide the Services for this reason.

Z12.3 If the *Employer* terminates the *Contractor*'s obligation to Provide the Services for this reason, the amounts due on termination are those intended in core clauses 92.1 and 92.2.

Z12.4 A Committing Party co-operates fully with any investigation pursuant to alleged Prohibited Action. Where the *Employer* does not have a contractual bond with the Committing Party, the *Contractor* ensures that the Committing Party co-operates fully with an investigation.

Z13 Insurance

Z 13.1 Replace core clause 84 with the following:

Insurance cover

84

84.1 When requested by a Party, the other Party provides certificates from his insurer or broker stating that the insurances required by this contract are in force.

84.2 The *Contractor* provides the insurances stated in the Insurance Table A.

84.3 The insurances provide cover for events which are at the *Contractor*'s risk from the *starting date* until the earlier of Completion and the date of the termination certificate.

INSURANCE TABLE A

Insurance against	Minimum amount of cover or minim limit of indemnity
Loss of or damage to the *works*, Plant and Materials	The replacement cost where not covered by the *Employer*'s insurance

	The *Employer*'s policy deductible, as at Contract Date, where covered by the *Employer*'s insurance
Loss of or damage to Equipment	The replacement cost
Liability for loss of or damage to property (except the *work*s, Plant and Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the *Contractor*) caused by activity in connection with this contract	Loss of or damage to property *Employer*'s property The replacement cost where not covered by the *Employer*'s insurance The *Employer*'s policy deductible, as at Contract Date, where covered by the *Employer*'s insurance Other property The replacement cost Bodily injury to or death of a person The amount required by applicable law
Liability for death of or bodily injury to employees of the *Contractor* arising out of and in the course of their employment in connection with this contract	The amount required by the applicable law

Z 13.2 **Replace core clause 87 with the following:**
The *Employer* provides the insurances stated in the Insurance Table B.

INSURANCE TABLE B

Insurance against or name of policy	**Minimum amount of cover or minimum l of indemnity**
Assets All Risk	Per the insurance policy document
Contract Works insurance	Per the insurance policy document
Environmental Liability	Per the insurance policy document
General and Public Liability	Per the insurance policy document
Transportation (Marine)	Per the insurance policy document
Motor Fleet and Mobile Plant	Per the insurance policy document
Terrorism	Per the insurance policy document
Cyber Liability	Per the insurance policy document
Nuclear Material Damage and Business Interruption	Per the insurance policy document
Nuclear Material Damage Terrorism	Per the insurance policy document

Z14 Nuclear Liability

Z14.1 The *Employer* is the operator of the Koeberg Nuclear Power Station (KNPS), a nuclear installation, as designated by the National Nuclear Regulator of the Republic of South Africa, and is the holder of a nuclear licence in respect of the KNPS.

Z14.2 The *Employer* is solely responsible for and indemnifies the *Contractor* or any other person against any and all liabilities which the *Contractor* or any person may incur arising out of or resulting from nuclear damage, as defined in Act 47 of 1999, save to the extent that any liabilities are incurred due to the unlawful intent of the *Contractor* or any other person or the presence of the *Contractor* or that person or any property of the *Contractor* or such person at or in the KNPS or on the KNPS site, without the permission of the *Employer* or of a person acting on behalf of the *Employer*.

Z14.3 Subject to clause Z14.4 below, the *Employer* waives all rights of recourse, arising from the aforesaid, save to the extent that any claims arise or liability is incurred due or attributable to the unlawful intent of the *Contractor* or any other person, or the presence of the *Contractor* or that person or any property of the *Contractor* or such person at or in the KNPS or on the KNPS site, without the permission of the *Employer* or of a person acting on behalf of the *Employer*.

Z14.4 The *Employer* does not waive its rights provided for in section 30 (7) of Act 47 of 1999, or any replacement section dealing with the same subject matter.

Z14.5 The protection afforded by the provisions hereof shall be in effect until the KNPS is decommissioned.

Z15 Asbestos

For the purposes of this Z-clause, the following definitions apply:

AAIA means approved asbestos inspection authority.

ACM means asbestos containing materials.

AL means action level, i.e. a level of 50% of the OEL, i.e. 0.1 regulated asbestos fibres per ml of air measured over a 4 hour period. The value at which proactive actions is required in order to control asbestos exposure to prevent exceeding the OEL.

Ambient Air means breathable air in area of work with specific reference to breathing zone, which is defined to be a virtual area within a radius of approximately 30cm from the nose inlet.

Compliance Monitoring means compliance sampling used to assess whether or not the personal exposure of workers to regulated asbestos fibres is in compliance with the Standard's requirements for safe processing, handling, storing, disposal and phase-out of asbestos and asbestos containing material, equipment and articles.

OEL means occupational exposure limit.

Parallel Measurements means measurements performed in parallel, yet separately, to existing measurements to verify validity of results.

Safe Levels means airborne asbestos exposure levels conforming to the Standard's requirements for safe processing, handling, storing, disposal and phase-out of asbestos and asbestos containing material, equipment and articles.

Standard means the *Employer*'s Asbestos Standard 32-303: Requirements for Safe Processing, Handling, Storing, Disposal and Phase-out of Asbestos and Asbestos Containing Material, Equipment and Articles.

SANAS means the South African National Accreditation System.

TWA means the average exposure, within a given workplace, to airborne asbestos fibres, normalised to the baseline of a 4 hour continuous period, also applicable to short term exposures, i.e. 10-minute TWA.

Z15.1 The *Employer* ensures that the Ambient Air in the area where the *Contractor* will Provide the Services conforms to the acceptable prescribed South African standard for asbestos, as per the regulations published in GNR 155 of 10 February 2002, under the Occupational Health and Safety Act, 1993 (Act 85 of 1993) ("Asbestos Regulations"). The OEL for asbestos is 0.2 regulated asbestos fibres per millilitre of air as a 4-hour TWA, averaged over any continuous period of four hours, and the short term exposure limit of 0.6 regulated asbestos fibres per millilitre of air as a 10-minute TWA, averaged over any 10 minutes, measured in accordance with HSG248 and monitored according to HSG173 and OESSM.

Z15.2 Upon written request by the *Contractor*, the *Employer* certifies that these conditions prevail. All measurements and reporting are effected by an independent, competent, and certified occupational hygiene inspection body, i.e. a SANAS accredited and Department of Employment and Labour approved AAIA. The *Contractor* may perform Parallel Measurements and related control measures at the *Contractor*'s expense. For the purposes of compliance the results generated from Parallel Measurements are evaluated only against South African statutory limits as detailed in clause Z15.1. Control measures conform to the requirements stipulated in the AAIA-approved asbestos work plan.

Z15.3 The *Employer* manages asbestos and ACM according to the Standard.

Z15.4 In the event that any asbestos is identified while Providing the Services, a risk assessment is conducted and if so required, with reference to possible exposure to an airborne concentration of above the AL for asbestos, immediate control measures are implemented and relevant air monitoring conducted in order to declare the area safe.

Z15.5 The *Contractor*'s personnel are entitled to stop working and leave the contaminated area forthwith until such time that the area of concern is declared safe by either Compliance Monitoring or an AAIA approved control measure intervention, for example, per the emergency asbestos work plan, if applicable.

Z15.6 The *Contractor* continues to Provide the Services, without additional control measures presented, on presentation of Safe Levels. The contractually agreed dates to Provide the Services, including the Completion Date, are adjusted accordingly. The contractually agreed dates are extended by the notification periods required by regulations 3 and 21 of the Asbestos Regulations, 2001.

Z15.7 Any removal and disposal of asbestos, asbestos containing materials and waste, is done by a registered asbestos contractor, instructed by the *Employer* at the *Employer*'s expense, and conducted in line with South African legislation.

Annexure A: One-in-ten-year-return *weather data* obtained from SA Weather Bureau for [weather station]

If any one of these *weather measurements* recorded within a calendar month, before the Completion Date for the whole of the *works* and at the place stated in this Contract Data is shown to be more adverse than the amount stated below then the *Contractor* may notify a compensation event.

	Weather measurement				
Month	Cumulative rainfall (mm)	Number of days with rain more than 10mm	Number of days with min air temp **<** 0 deg.C	Number of days with snow lying at 08:00 CAT	[Other measurements if applicable]
January			**0**	**0**	
February	**50.9**	**1**	**0**	**0**	
March	**256.2**	**2**	**0**	**0**	
April	**2**	**0**	**0**	**0**	
May	**31.5**	**0**	**0**	**0**	
June	**0.8**	**0**	**20**	**0**	
July	**0.6**	**0**	**23**	**0**	
August	**2.2**	**0**	**6**	**0**	
September	**8.8**	**0**	**6**	**0**	
October	**65.3**	**0**	**0**	**0**	
November	**62.2**	**0**	**0**	**0**	
December	**58.8**	**0**	**0**	**0**	

Only the difference between the more adverse recorded weather and the equivalent measurement given above is taken into account in assessing a compensation event.

C1.2 Contract Data

Part two - Data provided by the *Contractor*

[Instructions to the contract compiler: (delete this notes before issue to tenderers with an enquiry) Whenever a cell is shaded in the left hand column it denotes this data is optional. If not required select and delete the whole row, otherwise insert the required Data.]

Notes to a tendering contractor:

1. Please read both the NEC3 Engineering and Construction Contract (April 2013) and the relevant parts of its Guidance Notes (ECC3-GN)[2] in order to understand the implications of this Data which the tenderer is required to complete. An example of the completed Data is provided on pages 156 to 158 of the ECC3 (April 2013) Guidance Notes.
2. The number of the clause which requires the data is shown in the left hand column for each statement however other clauses may also use the same data
3. Where a form field like this [ ] appears, data is required to be inserted relevant to the option selected. Click on the form field ***once*** and type in the data. Otherwise complete by hand and in ink.

Completion of the data in full, according to Options chosen, is essential to create a complete contract.

Clause	Statement	Data
10.1	The *Contractor* is (Name): Address Tel No. Fax No.	
11.2(8)	The *direct fee percentage* is The *subcontracted fee percentage* is	**%** **%**
11.2(18)	The *working areas* are the Site and	
24.1	The *Contractor's* key persons are: 1 Name: Job: Responsibilities: Qualifications: Experience: 2 Name: Job Responsibilities: Qualifications: Experience:	

[2] Available from Engineering Contract Strategies Tel 011 803 3008, Fax 011 803 3009 or see www.ecs.co.za

		CV's (and further key persons data including CVs) are appended to Tender Schedule entitled .		
11.2(3)	The *completion date* for the whole of the *works* is			
11.2(14)	The following matters will be included in the Risk Register			
11.2(19)	The Works Information for the *Contractor*'s design is in:			
31.1	The programme identified in the Contract Data is			
A	**Priced contract with activity schedule**			
11.2(20) 11.2(30)	The *activity schedule* is in The tendered total of the Prices is	**(in figures)** **(in words), excluding VAT**		
A	**Priced contract with activity schedule**	**Data for the Shorter Schedule of Cost Components**		
41 in SSCC	The percentage for people overheads is:	**%**		
21 in SSCC	The published list of Equipment is the last edition of the list published by The percentage for adjustment for Equipment in the published list is	**Minus %**		
22 in SSCC	The rates of other Equipment are:	**Equipment**	**Size or capacity**	**Rate**
61 in SSCC	The hourly rates for Defined Cost of design outside the Working Areas are **Note: Hourly rates are estimated 'cost to company of the employee' and not selling rates.** **Please insert another schedule if foreign resources may also be used**	**Category of employee**		**Hourly rate**
62 in SSCC	The percentage for design overheads is	**%**		

63 in SSCC	The categories of design employees whose travelling expenses to and from the Working Areas are included in Defined Cost are:	
	Note: Hourly rates are estimated 'cost to company of the employee' and not selling rates. **Please insert another schedule if foreign resources may also be used**	
62 in SCC & SSCC	The percentage for design overheads is	**_____%**
63 in SCC & SSCC	The categories of design employees whose travelling expenses to and from the Working Areas are included as a cost of design of the *works* and Equipment done outside the Working Areas are:	

PART 2: PRICING DATA

ECC3 Option A

Document reference	Title	No of pages
C2.1	Pricing assumptions: Option A	
C2.2	The *activity schedule*	

C2.1 Pricing assumptions: Option A

How work is priced and assessed for payment

Clause 11 in NEC3 Engineering and Construction Contract, (ECC3) Option A states:

Identified and defined terms 11 11.2 (20) The Activity Schedule is the *activity schedule* unless later changed in accordance with this contract.

(27) The Price for Work Done to Date is the total of the Prices for

- each group of completed activities and
- each completed activity which is not in a group.

A completed activity is one which is without Defects which would either delay or be covered by immediately following work.

(30) The Prices are the lump sum prices for each of the activities on the Activity Schedule unless later changed in accordance with this contract.

This confirms that Option A is a lump sum form of contract where the work is broken down into activities, each of which is priced by the tendering contractor as a lump sum. Only completed activities are assessed for payment at each assessment date; no part payment is made if the activity is not completed by the assessment date.

Function of the Activity Schedule

Clause 54.1 in Option A states: “Information in the Activity Schedule is not Works Information or Site Information”. This confirms that specifications and descriptions of the work or any constraints on how it is to be done are not included in the Activity Schedule but in the Works Information. This is further confirmed by Clause 20.1 which states, “The *Contractor* Provides the Works in accordance with the Works Information”. Hence the *Contractor* does **not** Provide the Works in accordance with the Activity Schedule. The Activity Schedule is only a pricing document.

Link to the programme

Clause 31.4 states that “The *Contractor* provides information which shows how each activity on the Activity Schedule relates to the operations on each programme which he submits for acceptance”. Ideally the tendering contractor will develop a high level programme first then resource each activity and thus arrive at the lump sum price for that activity both of which can be entered into the *activity schedule*.

Preparing the *activity schedule*

Generally it is the tendering contractor who prepares the *activity schedule* by breaking down the work described within the Works Information into suitable activities which can be well defined, shown on a programme and priced as a lump sum.

The *Employer*, in his Instructions to Tenderers or in a Tender Schedule, may have listed some items that he requires the *Contractor* to include in his *activity schedule* and be priced accordingly.

It is assumed that in preparing his *activity schedule* the *Contractor:*

- Has taken account of the guidance given in the ECC3 Guidance Notes pages 19 and 20;
- Understands the function of the Activity Schedule and how work is priced and paid for;
- Is aware of the need to link the Activity Schedule to activities shown on his programme;
- Has listed and priced activities in the *activity schedule* which are inclusive of everything necessary and incidental to Providing the Works in accordance with the Works Information, as it was at the time of tender, as well as correct any Defects not caused by an *Employer's* risk;
- Has priced work he decides not to show as a separate activity within the Prices of other listed activities in order to fulfil the obligation to complete the *works* for the tendered total of the Prices.
- Understands there is no adjustment to the lump sum Activity Schedule price if the amount, or quantity, of work within that activity later turns out to be different to that which the *Contractor* estimated at time of tender. The only basis for a change to the Prices is as a result of a compensation event.

An activity schedule could have the following format:

Item No.	**Programme Reference**	**Activity description**	**Price**

C2.2 the *activity schedule*

Item No	Description	Unit	Price
100	**Preliminary & General**		
101	Site establishment	Sum	
102	**Health and Safety Requirements** (Medicals, Safety file, induction, PPE, etc)	Sum	
103	Site de-establishment	Sum	
	Preliminary & General Total excluding VAT		
200	**DELIVERY COSTS**		
200.1	Delivery of material to site including offoading	Sum	1
	DELIVERY COSTS Total excl VAT		
300	**DECOMMISSIONING**		
301	Decommissioning of DPI system	Sum	1
400	**DESIGN AND APPROVAL OF EQUIPMENT**		
	Battery with the UPS requirements of 5kW with standby time of 30 minutes. standard (Stationary Vented Nickel Cadmium Battery Standard) and Semi Sealed Nickel Cadmium Battery Spec		
401	Design and submission for approval	Sum	1
	DESIGN AND APPROVAL OF EQUIPMENT Total excl VAT		
500	**SUPPLY**		
501	UNINTERRUPTIBLE POWER SUPPLY: APPLICATION: SINGLE; INPUT: 400 V; RATING: 5 KVA; OUTPUT VOLTAGE: 400 V; OUTPUT CURRENT: 7.22 A; SPECIFICATION: ESKOM 240-53114248; OEM P/N: UPS312-05KVA0240MS; DRAWING NO: DDT-9246 REV 0; 240MIN; 50HZ; 12 PULSE	Sum	1
502	Battery with the UPS requirements of 5kW with standby time of 30 minutes. standard (Stationary Vented Nickel Cadmium Battery Standard) and Semi Sealed Nickel Cadmium Battery Spec	Sum	
503	Electrical Power Cables	Sum	
504	Signal cable	Sum	
505	Supply of COC	Sum	
506	Plant Confidication	Sum	
	SUPPLY Total excl VAT		
600	**INSTALLATION**		
601	UNINTERRUPTIBLE POWER SUPPLY: APPLICATION: SINGLE; INPUT: 400 V; RATING: 5 KVA; OUTPUT VOLTAGE: 400 V; OUTPUT CURRENT: 7.22 A; SPECIFICATION: ESKOM 240-53114248; OEM P/N: UPS312-05KVA0240MS; DRAWING NO: DDT-9246 REV 0; 240MIN; 50HZ;	Sum	

	12 PULSE			
	Battery with the UPS requirements of 5kW with standby time of 30 minutes. standard (Stationary Vented Nickel Cadmium Battery Standard) and Semi Sealed Nickel Cadmium Battery Spec	Sum		
	Electrical Power Cables	Sum		
	Signal cable	Sum		
	Plant Confidication	Sum		
	INSTALLATION Total excl VAT			
700	**CONTROL AND INSTRUMENTATION**			
701	Software configuration (RTU config)	Sum		
	PRELIMINARY COMMISIONING Total excl VAT			
800	**CIVIL ENGINEERING WORKS**			
801	Site Assesment	Sum		
	Supply Detail design of the civil works for approval	Sum		
	Civil work after assesment	Sum		
	FINAL COMMISIONAT			
900	**TEST AND COMMISIONING**			
901	Factory Acceptance Test	Sum		
902	Commissioning	Sum		
	TEST AND COMMISIONING Total excl VAT			
1000	**TRAINING**			
1001	Formal training of Engineering, Maintenance and operating personnel	Sum		
	TRAINING Total excl VAT			
	Total of All Cost excl VAT			

PART 3: SCOPE OF WORK

Document reference	KRIEL POWER STATION DPI (PROOF INVERTERS) REPLACEMENT WITH UPSS (UNINTERRUPTIBLE POWER SUPPLIES) AT UNIT 3,4,5 &6	No of pages
	This cover page	1
C3.1	*Employer*'s Works Information	
C3.2	*Contractor*'s Works Information	
	Total number of pages	

C3.1: EMPLOYER'S WORKS INFORMATION

Contents

When the document is complete, insert a 'Table of Contents'. To do this go to: Insert, → Reference, → Index and tables → Table of Contents. Three levels and the title (but not the subtitle) may be shown if the formats used in this template are retained.

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.

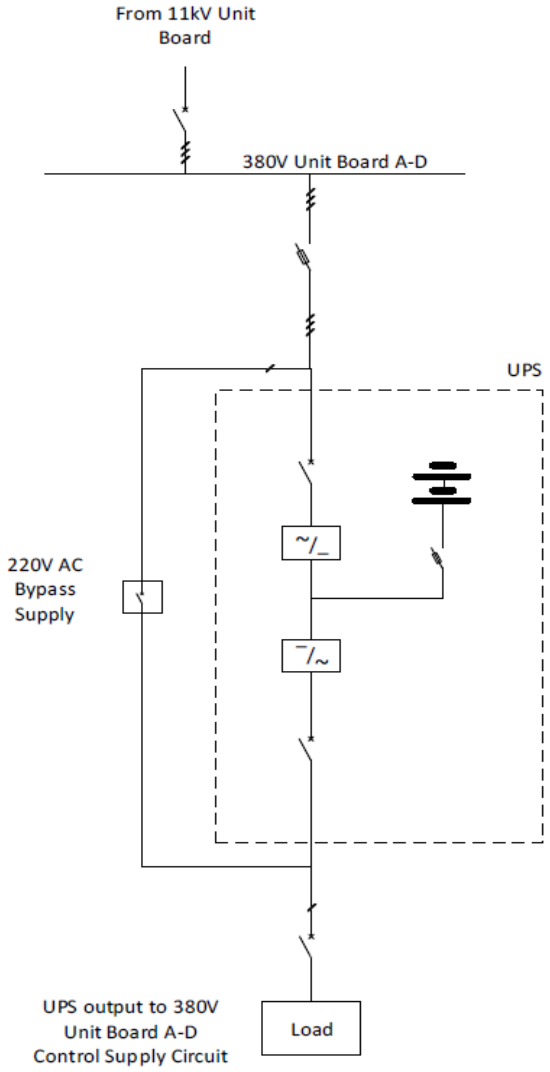


Figure 1: UPS configuration on the 380V unit board

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

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
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

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	Discussions to take place as soon as a risk is notified	Kriel Soweto VC Boardroom/ Ms teams	*Contractor*, *Project Manager,* Co-ordinator and Contracts Supervisor
Overall contract progress and feedback	Weekly basis during installation Wednesdays 10:00-11:30	Kriel Soweto VC Boardroom/ Ms teams	*Project Manager*, *Contractor,* Co-ordinator and Contracts supervisor
Daily feedback Progress	Daily 09:00am	Project manager or Coordinator's Office outage board room/Ms Teams	*Project Manager,* Co-ordinator and Contract Supervisors
Daily Safety Toolbox Talks	Daily before work starts on site with signed attendance registers by *Contractor's* employees and signed off minutes by the *Contractor*'s Site Manager	*Contractor*s Yard	*Contractor* and his employees
Contractor Monthly Safety Meeting	Once a month on Wednesdays during Contractors SHEQ meeting 14:00-16:00	Kwanala Hall	Project Site Manager Safety Officers,

If the *Contractor* can't attend any meeting his feedback should be formally communicated through to the *Project Manager.*

The *Contractor* will provide a detailed feedback report on a daily basis during Outages providing accurate feedback on the status of *service* carried out by the *Contractor*. This report should indicate accurate progress of *service* and if any constraints are experienced, the *Contractor* to communicate with the *Project Manager* and mitigate the risks with action plans.

Meetings of a specialist nature may be convened as specified elsewhere in this Service Information or if not so specified by persons and at times and locations to suit the Parties, the nature and the progress of the *service*. 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

The *Contractor* submits a programme within 2 weeks of the contract date. The program shall be in Microsoft excel or Projects format. Which shows all interrelations between the activities by use of links to complete the Works.

2.6.1 Requirements for *Contractors* programme

The programme has a revision number and a space for the *Contractor* and *Employer's* acceptance signatures.

The *Contractor* develops this programme to show as minimum

- The project starts and finish dates
- The completion dates for each task
- All interfaces with the *Employer*, and the times reserved by the *Employer* as stated in the Works Information.
- Where applicable, the *Contracto*r will show activities that are sub-contracted.
- Where applicable, the *Contractor* will also indicate when free issue materials, or any other receivables, are to be provided by the *Employer* to the *Contractor.*
- The Programme includes items such as:
    - Document submissions
    - Procurements
    - Off-site fabrication/assembly
    - Transport time
    - Site mobilisation
    - Installation
    - Testing
    - Commissioning
    - Handover
    - Training
    - Drawings

2.6.2 Planning Requirements

For final installation planning and/or design requirements, plant access can be made available to the *Contractor* after awarding of contract.

For final planning installation planning, there must be close co-operation between the *Contractor* and the *Employer*

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

The *Contractor* to provide a key list of personnel who will carry out the work on site with their qualifications attached. A company organogram will be needed by the *Project Manager* to communicate accordingly to comply with the NEC3 Engineering and Construction Contract communication structures. *Contractor* to refer to Kriel Power Station *Contractor* SHE Requirements RSR0001

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*.

2.7.1 Plant Safety Regulations Permits

It is the sole responsibility of the *Contractor* to ensure at all times there is an authorised Responsible Person to take out permits for the execution of the *service*. The *Employer* will provide all training necessary for the selected *Contractor's* personnel to be authorised on Eskom Plant Safety Regulation.

2.8 Invoicing and payment

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:

The *Contractor* shall address the tax invoice to:

Eskom Holdings SOC Ltd
Reg. No. 2002/015527/30
Accounts Payable
Email to: Invoiceseskomlocal@eskom.co.za

The *Contractor* keeps records of all invoices submitted and paid up to the end of the project, as well as details of Actual Costs.
All invoices are hand delivered to the Kriel Finance Department (Account payables) 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

Contractor is required to follow the correct process to ensure the payment is effected in accordance with contractual payment terms.

Contractor is required to follow the correct process to ensure payment is effected in accordance with contractual payment terms:

2.8.1 Service related invoices

a) Once the *service* have been delivered/completed both parties have to agree that the *service* has been delivered/completed successfully prior to invoicing
b) An assessment payment certificate must be completed between the *Contractor* and *Service Manager* according to the *service* performed. Both parties have to sign the assessment/certificate
c) A copy of assessment/payment certificate must be obtained by the *Contractor* to enable the creation of an invoice and to prevent any discrepancies. A copy of the assessment/payment certificate must be attached to the original invoice
d) *Service Manager* performs a service entry and Goods Receipt on the SAP system. (Assessment/Payment Certificate issued as a source document for Service Entry Goods Receipt)
e) *Service Manager* will the forward the Service entry and Goods Receipt Note number to the *Contractor* within 3 working days after the service has been rendered and the Assessment/Payment certificate signed
f) *Contractor* must forward the original invoices together with a copy of the Assessment/Payment certificate to the Eskom Documentation Centre.

2.8.2 Goods Delivered Invoices

a) Once the Goods are delivered, the *Service Manager* preforms a Goods Receipt on the SAP system. (The delivery note is used as source document for Goods Receipt. The invoice should not be used as a delivery note)
b) *Service Manager* will then forward the Goods Receipt note to the Vendor immediately or within 3 working days after the Goods are delivered.
c) Vendors must then forward the Invoices together with a copy of the Assessment/Payment certificate to the Eskom Documentation Centre

2.8.3 Invoices linked to commodity prices

a) The requirements are the same as for Goods Delivered Invoices.
b) Invoices which are linked to commodity prices will result in CPA (Contract Price Adjustment).
c) Attach a copy of the material invoice that has been previously paid to the CPA invoice, as well as the calculation sheet and all indices attached other than SEIFSA.
d) The relevant Eskom Department will then complete the CPA calculation sheet and forwards it to the Eskom Documentation Centre.

2.8.4 Retention Invoices

a) The requirements are the same as for Goods Delivered and service related Invoices.
b) Where Retention is applicable on the contract, the Eskom SAP system will automatically create the Retention, and the amount deducted from the invoiced amount.
c) Invoices related to retentions release require a defect or completion certificate and a retention release certificate from the *Project Manager* and must be attached to the original invoice. The original invoice for the retention to be released must be accompanied by the approved and signed completion/defect certificate and retention release certificate and forwarded by the *Project Manager* to the Documentation Centre to effect payment.

2.8.5 Foreign exchange Invoices

a) The requirements are the same as for Goods Delivered and *service* related Invoices.
b) The following has to be attached to the Invoice before it will be processed: Commercial invoice. Bill of entry (SAD500), SARS release notification, Customs worksheet, Bill of Lading or Airway Bill and approved Exchange Control Approval (EXCON).

2.8.6 General Information related to Eskom Invoices

a) *Contractor* must ensure that the Service Entry and Goods Receipt Note number appears on the invoice. (It can be printed or hand written on the invoice).
b) Eskom Purchase Order number must appear on invoice.
c) Invoices must be VAT compliant in line with the VAT Act requirements.
d) Invoices submitted must reflect the bank account details. A once off copy of the banking details may be forwarded to the Documentation Centre and it will be attached to each scanned invoice.
e) Invoices must be original or certified as an original in line with the VAT Act. No electronic invoices will be accepted.
f) Eskom's correct name "**Eskom Holdings SOC Limited**" must appear on the invoice.
g) The Eskom VAT registration number: **4740 101 508** must appear on the invoice.
h) No pro-forma invoices will be accepted.
i) *Contractor* cannot be utilized by Eskom for more than 3 times without a contract being established.

Note:
1. Invoices must be delivered to the Eskom Documentation Centre, as this will speed up the payment process and ensure that invoices are not lost and payments delayed. There is no need for *Project Manager* to sign invoices as they perform Goods Receipt in the system. The assessment certificate and Goods Receipt serves as the approval of payment.
2. Eskom Documentation Centre will review invoices according to a checklist and on completion scan the documentation into Accounts Payable processing system (Documentation can only be scanned where the Purchase order no. and Goods Receipt Note no. is reflected on the invoice, and the invoice complies with the VAT Act).

3. Invoices are processed and released for payment by Accounts Payable Section only where the source documentation is 100% correct)

2.9 Insurance provided by the *Employer*

As stated in the contract data clause 84 and 87.1

2.10 Contract change management

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*

In order to substantiate the Defined Cost of Compensation Events, the *Employer* may require the *Contractor* to keep records of amounts paid by him for people employed by the *Contractor*, Plant and Materials, work subcontracted by the *Contractor* and Equipment.

The *Contractor*'s Site Manager will complete the site daily log and this will be submitted to the *Project Manager* for his signature before 12 am of the following morning barring weekends. The Friday and weekend logs will be submitted before 12 am Mondays. The log will include but not be limited to the following:

- Date and day.
- Weather.
- Site Conditions.
- Work Done.
- People who are employed by the *Contractor*
- Work sub-contracted by the *Contractor*
- Any incidents during that period.

Any communication and documentation during this service agreement to be filed in the contract file. This file is in the possession of the *Project Manager* at all times.

2.13 Training workshops and technology transfer

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

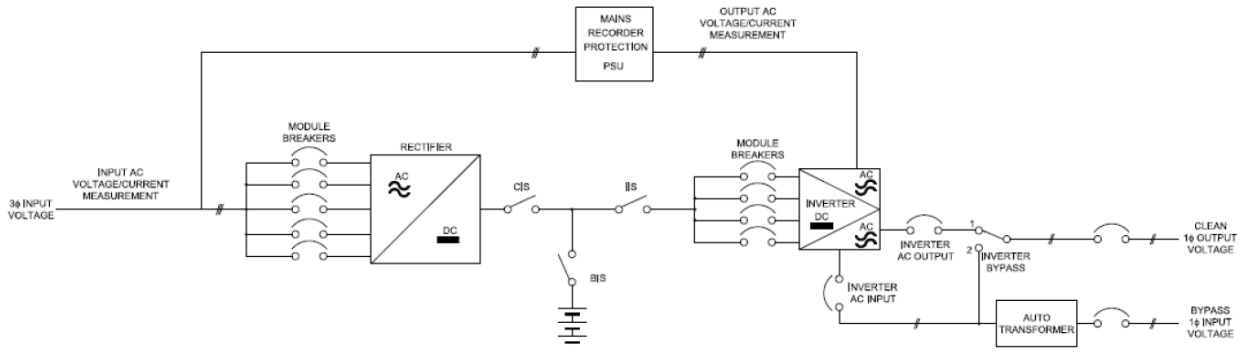


Figure 2: Single line diagram for control supply UPS

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

32.1 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.	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

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

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

3.4.10 Packaging

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

3.5 Use of *Contractor*'s design

The *Employer* may use the *Contractor*'s design for any purpose in relation to the excitation systems at Kriel Power Station.

3.6 Design of Equipment

None

3.7 Equipment required to be included in the *works*

The *Contractor* shall provide all equipment needed for the works.

3.8As-built drawings, operating manuals and maintenance schedules

3.8.1 General

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

3.8.2 Drawings

The following drawings shall be provided:

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

3.8.3 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.

3.8.4 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

4.1 People

4.1.1 Minimum requirements of people employed on the Site

The *Contractor* shall comply with Basic Condition of Employment Act and Labour Relation's Act for the use of labour in executing the works to give effect to the right to fair labour practices referred to in section 23(1) of the Constitution by establishing and making provision for the regulation of basic conditions of employment, and there by comply with obligations of the Republic as a member state of the Internal Labour Organisation and to provide for matters connected therewith.

It is the Contractor's sole responsibility to ensure all its employees have permits to perform work in the Republic of South Africa.

Supplier Development Localisation and Industrialisation (Will become contractual requirements with contract award)

a) Training proposal:
b) Subcontracting proposal:

4.1.2 BBBEE and preferencing scheme

Where a change in the *Contractor's* legal status, ownership or any other change to his business composition or business dealings results in a change to the *Contractor*'s B-BBEE status, the *Contractor* notifies the *Employer* within seven days of the change.

The *Contractor* is required to submit an updated verification certificate and necessary supporting documentation confirming the change in his B-BBEE status to the *Employer* within thirty days of the notification or as otherwise instructed by the *Employer*.

Where, as a result, the *Contractor's* B-BBEE status has decreased since the *starting date* the *Employer* may either re-negotiate this contract or alternatively, terminate the *Contractor*'s obligation to provide the *service*.

Failure by the *Contractor* to notify the *Employer* of a change in its B-BBEE status may constitute a reason for termination will be dealt with according to the NEC3 ECC penalty/termination clauses

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

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 subcontractors

The *Employer* may list which subcontractors or suppliers the *Contractor* is required to enter into subcontracts with.

If the *Contractor* subcontracts work, he is responsible for providing the Service as if he had not subcontracted. This contract applies as if a Subcontractor's employees and equipment were the *Contractor's*.

4.2.2 Subcontract documentation, and assessment of subcontract tenders

When the *Contractor* uses a Subcontractor he needs to engage with him on a NEC basis. The Subcontractor needs adhere to all processes, policies and procedures of Eskom as service should be provided as if not subcontracted to Eskom.

All reporting will happen based on the NEC standard forms or as agreed upon in the Kick off meeting.

4.2.3 Limitations on subcontracting

The *Contractor* submits the name of each proposed Subcontractor to the *Service Manager* for acceptance. A reason for not accepting the Subcontractor is that the appointment will not allow the *Contractor* to Provide the Service.

The *Contractor* does not appoint a Subcontractor until the *Service Manager* accepted them.

4.2.4 Attendance on subcontractors

The Subcontractor should attend all morning feedback Outage meetings to provide accurate feedback on the progress of *service*. Assessment meetings between *Project Manager* and the *Contractor* should be avoided by the Subcontractor.

4.3 Plant and Materials

4.3.1 Quality

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*

None

4.3.3 *Contractor*'s procurement of Plant and Materials

None

4.3.4 Spares and consumables

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

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.
    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

N/A

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

N/A

4.7 Cataloguing requirements by the *Contractor*

N/A

5. Construction

5.1 Temporary works, Site services & construction constraints

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

1. Before work starts on Site, a Site inaugural meeting is held between the Contractor and the Employer, where details of the Works are discussed and clarified;
2. The Contractor's Site Supervisor is on Site for the entire duration of the Works.
3. General access to the power station is controlled and Site induction has to be completed before work will be allowed to start.
4. It is mandatory that the Contractor adheres to all security regulations in force during the period of the contract.
5. Before entry to the Site will be allowed, everyone will undergo an alcohol breathalyser test which needs to be passed. This is one of the five Life-saving Rules to which the Contractor is required to adhere to at all times.

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

1) The Contractor satisfies himself and comply with the Site conditions presented during induction.
2) The Contractor is required to comply with all Site restrictions pertaining to the Site's roads, walkways and barricades.

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

1. Normal working hours:
   a) Monday to Thursday: 07h00 – 16h15
   b) Fridays: 07h00 – 12h00

2. Outage working hours are as follows:
   a) Monday to Sundays: 07h00 – 18h30

5.1.4 Health and safety facilities on Site

The health and safety facilities on Site will be discussed in detail during the Site induction

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

N/A

5.1.6 Title to materials from demolition and excavation

The *Contractor* has no title to plant and/or materials resulting from him carrying out the *Works*

5.1.7 Cooperating with and obtaining acceptance of Others

The *Contractor* has no title to plant and/or materials resulting from him carrying out the *Works*

5.1.8 Publicity and progress photographs

All activities are performed according to the Accepted Programme

5.1.9 *Contractor*'s Equipment

No notice boards, advertising rights, media relations, and photography and progress photographs will be allowed without appropriate authorisation.

5.1.10 Equipment provided by the *Employer*

1. The Contractor provides the Employer with a complete list of materials, tools, Equipment and or machinery before bringing it onto Site.
2. The Contractor provides and maintains all test and measuring Equipment required for all tests to the required accuracy. The accuracy of test Equipment is required to be better than ± 0.1 %.
3. The type and class of Equipment used is subject to the Acceptance by the Employer.
4. The Contractor's measuring Equipment is accompanied by valid calibration certificates from an approved authority.
5. The Project Manager may at any stage during the Contract require such Equipment to be checked by an approved laboratory or the South African Bureau of Standards.

5.1.11 Site services and facilities

5.1.11.1 Refuse Disposal

The Employer provides special colour coded bins as per the table below for refuse disposal. These bins are emptied by the Employer free of charge. The Contractor ensures that all workers under his control strictly adhere to the correct use of refuse bins as stated in the Plant.

Blue Bins	Scraps Metal Only
White Bins	Domestic Refuse
Yellow Bins	Asbestos Material
Brown Bins	Building Rubble
Red Bins	Oil or Chemical containing refuse.

5.1.11.2 Supply of Electricity

- Employer will make available to the Contractor 220/230-volt electrical supply free of charge from the closest existing point of supply.
- The Contractor is to make provision for the necessary extensions and plug points.
- All Electrical boards must be inspected and tested before connecting to a power supply and then a CoC must be issued by the Contractor
- The Contractor will adhere to the Electrical Installation Regulations of 1992

5.1.11.3 Medical Facilities

- The Contractor provides a First Aid service to his employees and subcontractor. In the case where these prove to be inadequate, like in the event of a serious injury, the Employer's Medical Centre and facilities are available.
- Outside the Employer's office hours, the Employer's First Aid Services are only available for serious injuries and life threatening situations.
- The Employer is entitled, however, to recover the costs incurred, in the use of the above Employer's facilities, from the Contractor.

5.1.11.4 Toilet Facilities

The Employer provides the Contractor access to toilet facilities.
Temporary chemical toilets are provided by the Contractor where deemed necessary.

5.1.12 Facilities provided by the *Contractor*

- The *Contractor* shall provide, for his own use adequate size offices.
- A cleaning service must also be provided.
- Domestic rubbish will be removed free of charge.
- The *Contractor* shall dismantle and clear off site all such infrastructure at the discretion of the *Service Manager* on completion of the contract.
- No such dismantling and clearance work shall be carried out without prior approval by the *Service Manager.*
- Any electrical equipment or appliances used by the *Contractor* shall conform to the applicable South African Safety standards and Kriel standard PSR 010, and shall be maintained in safe and proper working condition.
- The *Employer* shall have the right to stop the *Contractor*'s use of any electrical equipment or appliance, which in the *Employer's* opinion does not conform to the foregoing.

5.1.12.1 Site Location

- The boundary of the site is within the Power Station boundary fences.
- The *Contractor* is to mark the boundaries of his site clearly.
- The *Contractor* is to ensure that all his material and equipment is always within the boundaries of his site.
- A site for the *Contractor* will be provided if needed. (The exact position will be determined on site).
- The *Contractor* will ensure further treatment of the yard area to keep all neat and tidy at all times.
- The *Contractor* shall also include for such items as security, watch and access arrangements to his yard area.
- The *Contractor* shall not occupy any site area other than that located to him
- On completion of the service on Site, all areas allocated to the *Contractor* shall be re-instated to their former condition to the satisfaction of *Employer*

5.1.12.2 *Contractor*'s site requirements

- The *Contractor* supplies, installs, properly maintains and removes all temporary construction facilities and utilities necessary for the complete performance of the *service*
- Including the following:

- The *Contractor's* yard should adhere to sound housekeeping, failing with this the *Employer* may use another *Contractor* to clean up the *Contractor's* yard. These costs will be carried by the *Contractor*.
- Any damage to installed lighting is repaired at the *Contractor*'s expense.
- The reticulation of electricity, water and any other services required by the *Contractor* from a supplied central distribution point.
- Hazardous Substances to be contained as per Eskom requirements.
- Transportation on and off site
- Telephone connections may be available and the *Contractor* applies via the *Purchaser's Representative* for a connection. Connection fees and calls are for the *Contractor's* account.

- Compressed air and gases
- Maintenance of lay-down and storage areas
- Electric panels and distribution wiring for erection and within *Contractor*'s yard
- Security of *Contractor*'s yard
- Temporary lighting to ensure safe working conditions.

5.1.12.3 Accommodation

The provision of accommodation for *Contractor*'s personnel is the responsibility of the *Contractor*.
The *Contractor* or any of his employees or subcontractors is not allowed to use the *Employer's* dining facilities. The shop next to the main office building may be utilized by the *Contractors*.

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

N/A

5.1.14 Survey control and setting out of the *works*

N/**A**

5.1.15 Excavations and associated water control

N/A

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

1) The Contractor minimises interference of any nature with regards to existing services, cable and pipe trench covers.
2) In the event that the Contractor damages one of the above, the penalty would be for the Contractor.

5.1.17 Control of noise, dust, water and waste

The *Contractor* ensures that all activities comply with the safety requirements.

5.1.18 Sequences of construction or installation

All activities are performed according to the Accepted Programme.

5.1.19 Giving notice of work to be covered up

All notices and warnings will follow the ECC3 requirements.

5.1.20 Hook ups to existing works

The floor & surrounding space is limited and the Contractor will assess the area properly in order to execute the works successfully and timeously

5.2 Completion, testing, commissioning and correction of Defects

5.2.1 Work to be done by the Completion Date

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

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

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 test

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

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 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

Access will be granted to the Contractor for defects correction as per core clause 43.4 in ECC3

5.2.8 Performance tests after Completion

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

N/A

6 Plant and Materials standards and workmanship

6.1 Investigation, survey and Site clearance

N/A

6.2 Building works

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

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

N/A

Other [as required]

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**

See appendix A and B

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.

PART 4: SITE INFORMATION

Document reference	Title	No of pages
	This cover page	1
C4	Site Information	
	Total number of pages	

PART 4: SITE INFORMATION

C4.1: Information about the *site* at time of tender which may affect the work in this contract

General

The Kriel Power Station is situated approximately half way between Bethal and Ogies on the R545, being just over 30 km from each town and 10 km north-west of Kriel town.

Climate

Kriel Power Station is situated in a summer rainfall area with an average annual precipitation of about 750-mm falling almost entirely during the months of October to April. The average rainfall per month generally exceeds 40 mm during this period, although drought periods do occur which can last for 20 days or longer. Drought periods occur most frequently during the months of October/November and March/April. January is statistically the highest rainfall month with an average monthly rainfall of about 130-mm. June has the lowest rainfall with an average monthly rainfall of about 7 mm.

Approximately 85% of the annual rainfall occurs in the summer months and heavy falls of 125 to 150 mm occasionally occur in a single day. The annual average number of thunderstorms is about 75. These storms are often violent with severe lightning and strong (but short-lived) gusty winds and are sometimes accompanied by hail. This region has among the highest hail frequencies in South Africa; about 4 to 7 occurrences (depending mainly on altitude) may be expected annually.

January is normally the hottest month with an average daily maximum temperature of 27°C with a mean daily temperature in winter being about 16°C. Winter average daily temperatures vary from 18, 5°C maximum to -1°C minimum. The extreme temperatures recorded range from 34, 7°C to minus 12, 4°C for the period 1920 - 1984. (Source: Weather Bureau, Pretoria)

Winds are generally light to moderate except during thunderstorms. Generally the prevailing wind directions are from the North West during the day and from the east at night. During daytime, the prevailing winds are from the north-western direction. During night-time, the prevailing winds are from the north-eastern direction. The highest recorded average wind speed is 17, 6 km/hour. The average wind velocity over the year is 14, 5 km/hour.

(Source: MSN weather & Weather 24, average records 2008 - 2009.)

Weather Data

THE ASSUMED 1 IN 10 YEAR RAINFALL FIGURES ARE:

Month	Cumulative rain (mm)	No of days with rainfall > 10mm
January	200	6
February	150	6
March	120	5
April	110	4
May	40	3
June	20	2
July	30	2
August	30	2
September	60	3
October	140	6
November	160	7
December	170	6

Relative Humidity

Records for Bethal (2008 - 2009)
The average relative humidity on an annual base are as follows:
08:00 = 80%
14:00 = 52%
20:00 = 73%

Prevailing Winds

Records for Bethal (2008 - 2009)
Winds are mostly north-westerly except for February and March when they are easterly to south-easterly. The highest wind speeds are recorded from the south-east: on average 14km/h.

Other Climatic Factors

Records for Bethal (2008 - 2009)
Thunder occurs mostly from November to January with average of 35.7 days annually.

a) Hail occurs mostly in December with average of 2.8 days annually.
b) Fog occurs mostly in the winter months with an average of 19 days annually.
c) Snow rarely occurs
d) Cloud coverage is highest in the summer months with annual average as follows:
   - 08:00 = 2.8/8
   - 14:00 = 3.8/8
   - 20:00 = 3.1/8

   Evaporation for the area is in rage of 75mm to 190mm per month. The highest evaporation occurs in December, and the lowest in June.

Topography

The surface topography of the Kriel area is typical of the Mpumalanga Highveld consisting in the main of a gently undulating plateau. The flood plains of the local streams are at an average elevation of ± 1540 meters above mean sea level and drainage generally is a northerly direction.

Air Quality

The existing and potential sources of air pollution in Kriel area are the following:

- Kriel Power Station stack emissions
- Kriel Power Station dry dust (fly ash) handling plant
- Dust blow from the Eskom coal stock yard
- Dust blow from the roads in the area
- Seasonal dust blow caused by ploughing of farmlands, and dust blow off denuded fields
- Dust blow from dried out exposed surfaces of the wet ash dam.

However, Eskom utilises the majority of the top surface of the ash dam as an evaporation pan for polluted water, which means that the exposed surface is constantly wet. The sides of the ash dam have largely been rehabilitated, with the result that dust blow from the ash dam.

Access limitations

The contractor safety system file will be required as mitigation against safety hazards which must comply with requirements of Kriel Power Station. Arrangements must be made with Employer so that access can be gained without any restriction/ constraints to work onsite that may not be immediately apparent from an inspection of the site. Contractor will be required to do induction before access to site can be granted.

8. Appendix A – Vendor Document Submittal Schedule

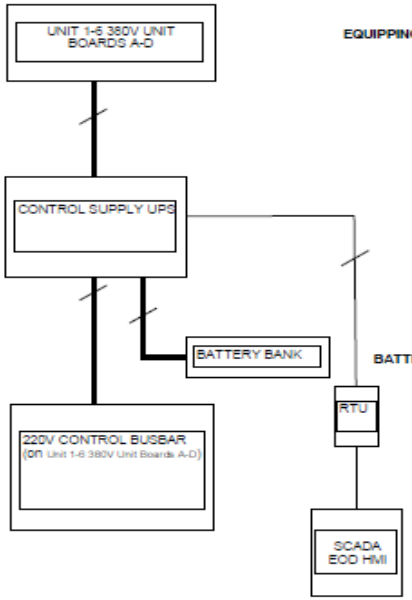
			PROJECT METHODOLOGY													TECHNICAL DOCUMENTATION REQUIREMENTS	
C	=	The *Main Contractor* submits the documents to the *Employer* as a deliverable for either, Completion or starting, of the applicable Activity	ENQUIRY/TENDER	UP-FRONT TRAINING	BASIC ENGINEERING			DETAILED ENGINEERING		MANUFACTURING		PROCUREMENT AND INSTALLATION		COMMISSIONING		FINALISATION/ HANDOVER	E =
																	=
	=	The document is maintained by the *Contractor* and available to the *Employer* on request															← (First Character of Revision
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	INSTALLATION	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

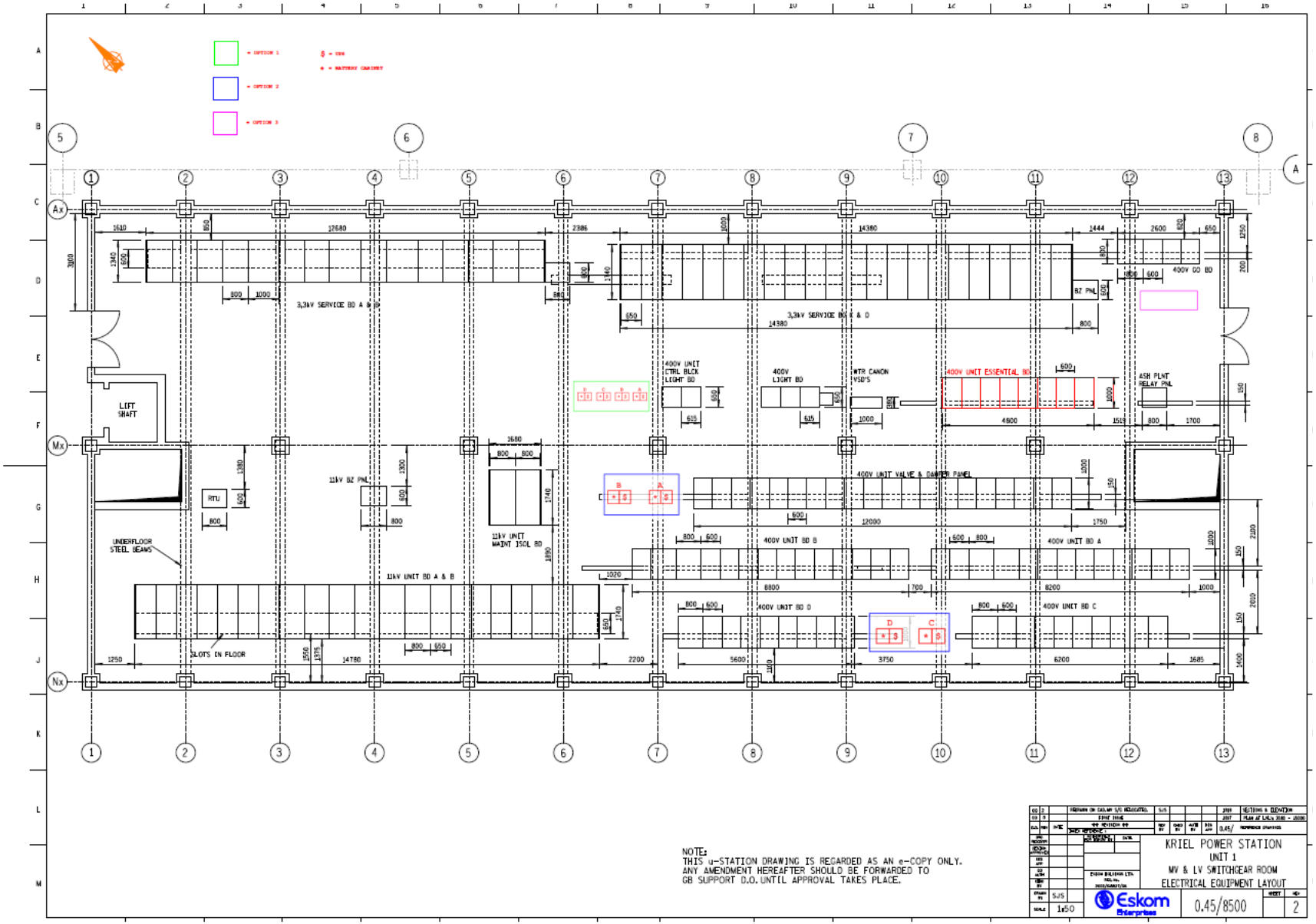
10.1 Equipment list

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)	
10	Unit 3 380V unit board B	DPI 54L version 2	10 & B004	+05-03CB	5kVA (+125%	

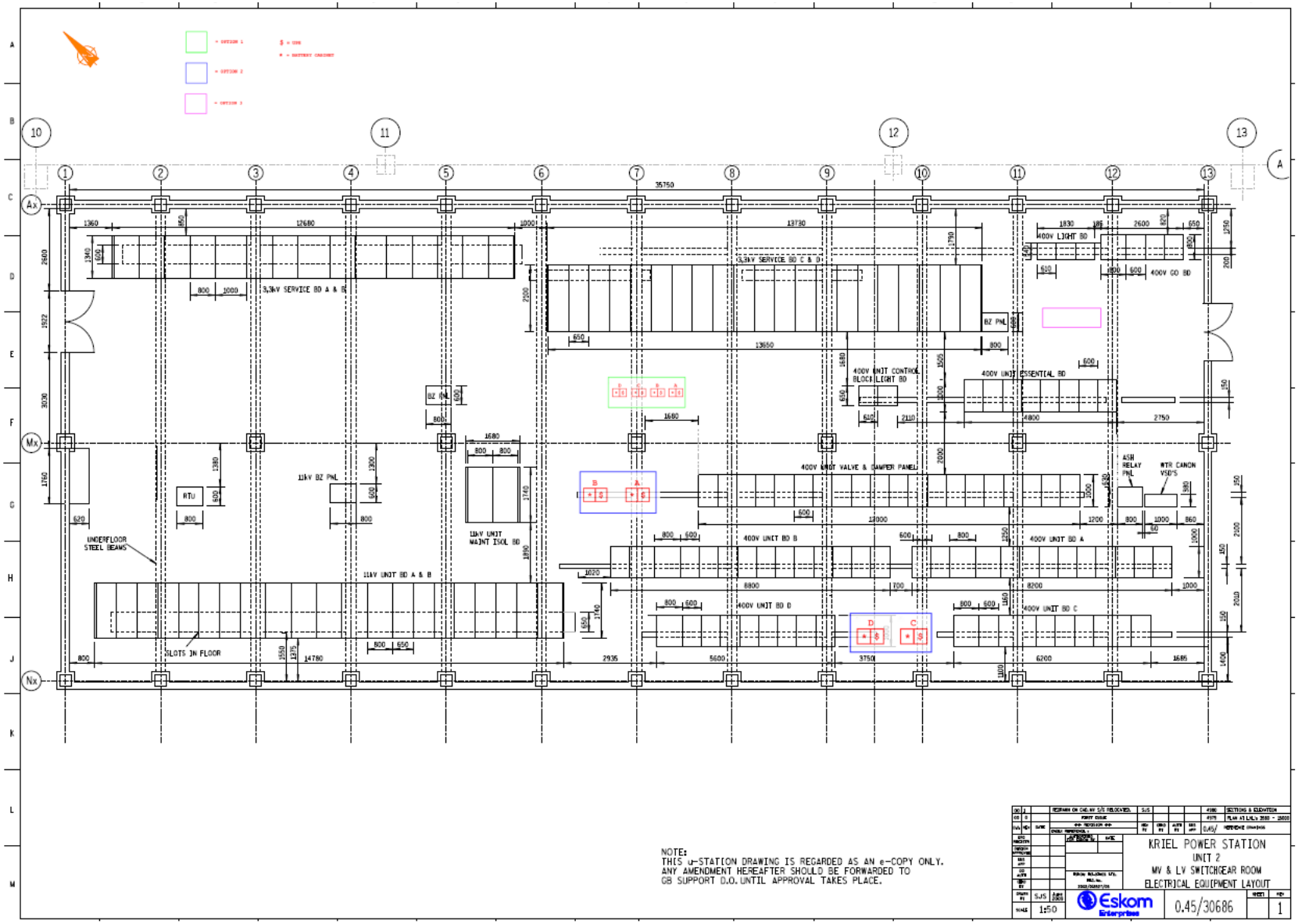
					overload capacity for 10 minutes)	
11	Unit 3 380V unit board C	DPI 54L version 2	09 & B006	+05-03CC	5kVA (+125% overload capacity for 10 minutes)	**0.45/30689**
12	Unit 3 380V unit board D	DPI 54L version 2	08 & B006	+05-03CD	5kVA (+125% overload capacity for 10 minutes)	
13	Unit 4 380V unit board A	DPI 54L version 2	08 & B004	+05-04CA	5kVA (+125% overload capacity for 10 minutes)	
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)	**0.45/54755**
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)	**0.45/30696**
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)	
28	Unit 6 380V unit board D	DPI 54L version 2	08 & B006	+05-06CD	5kVA (+125% overload capacity for 10 minutes)	

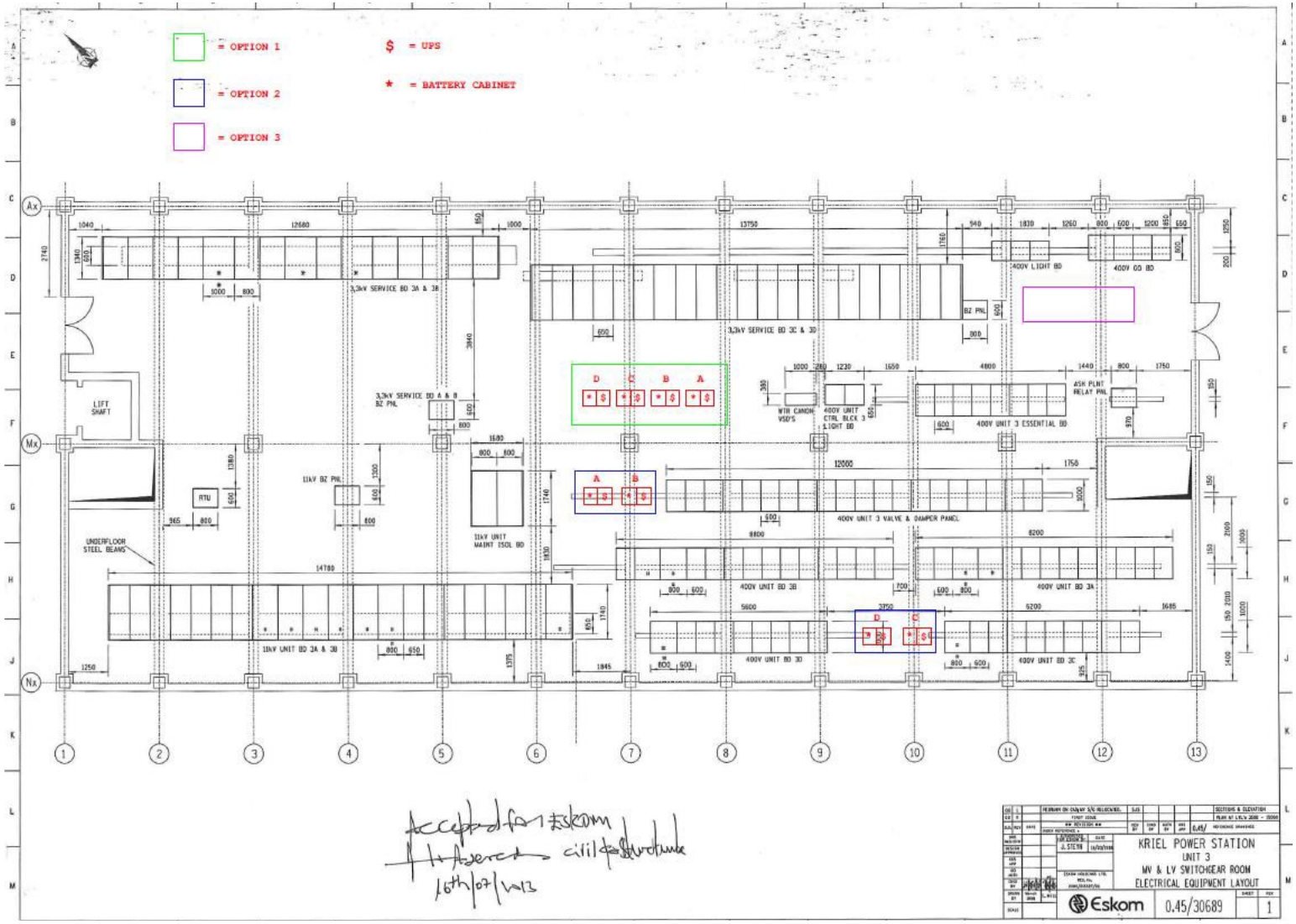
10.2 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 1



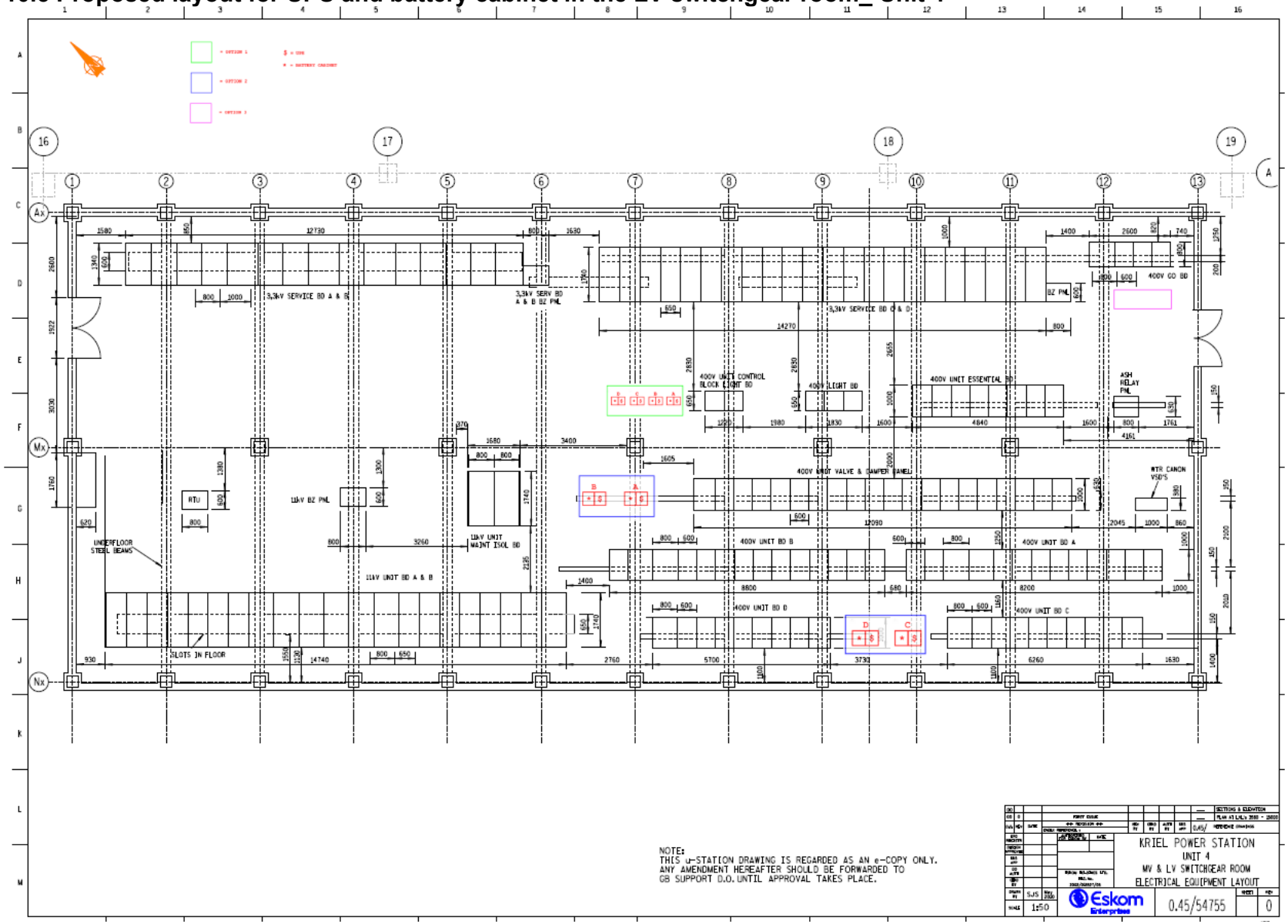
10.3 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 2



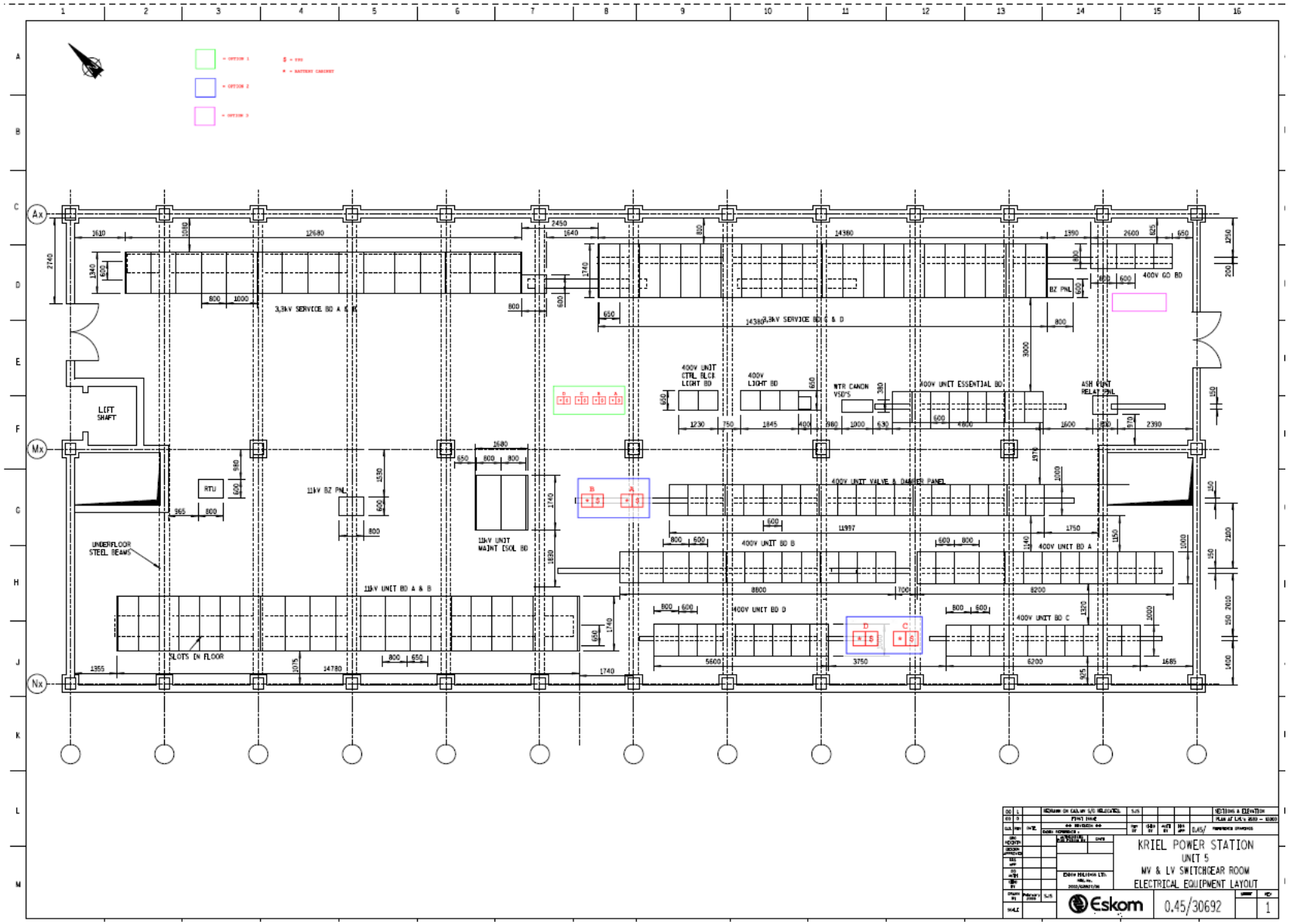
10.4 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 3



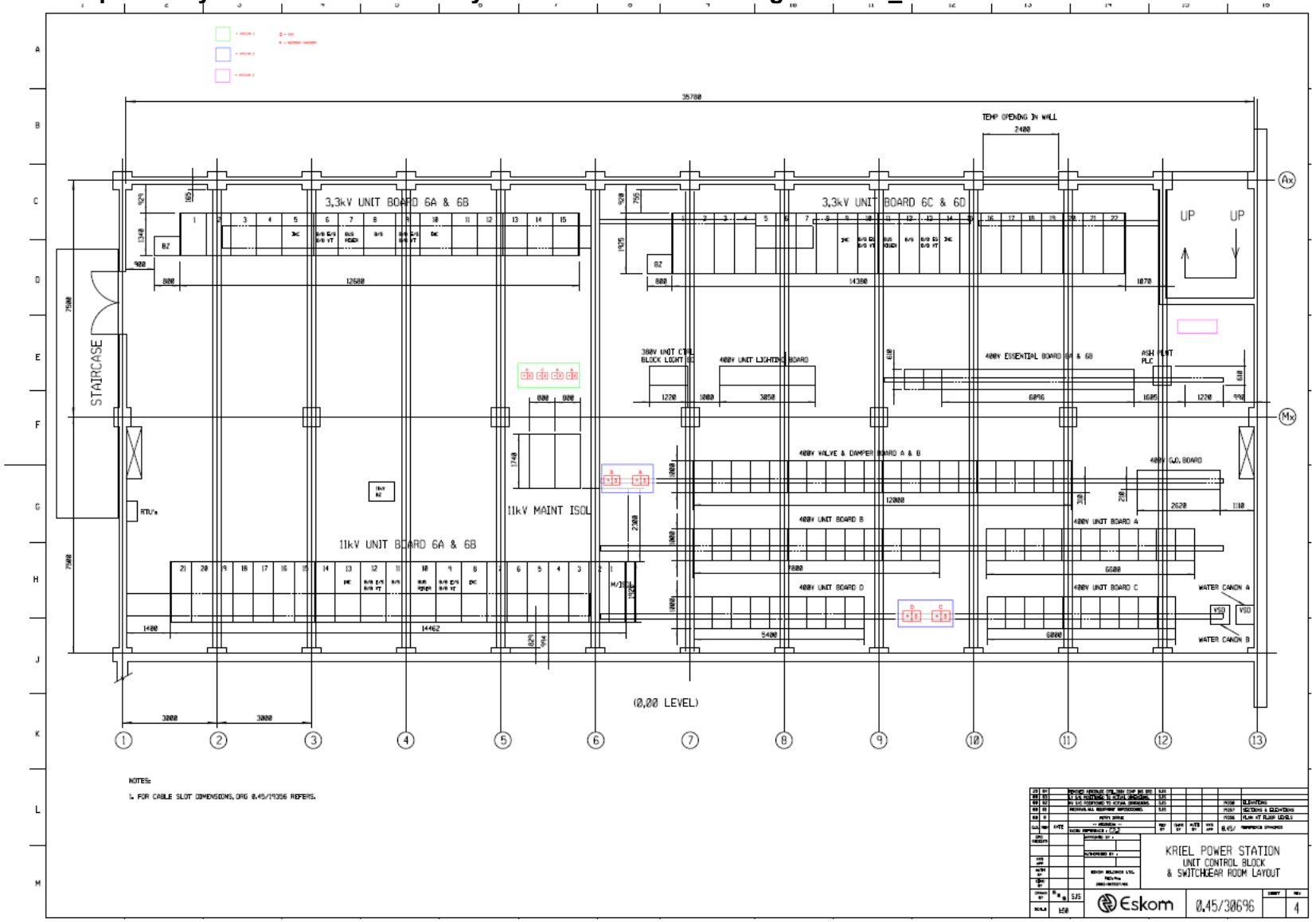
10.5 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 4



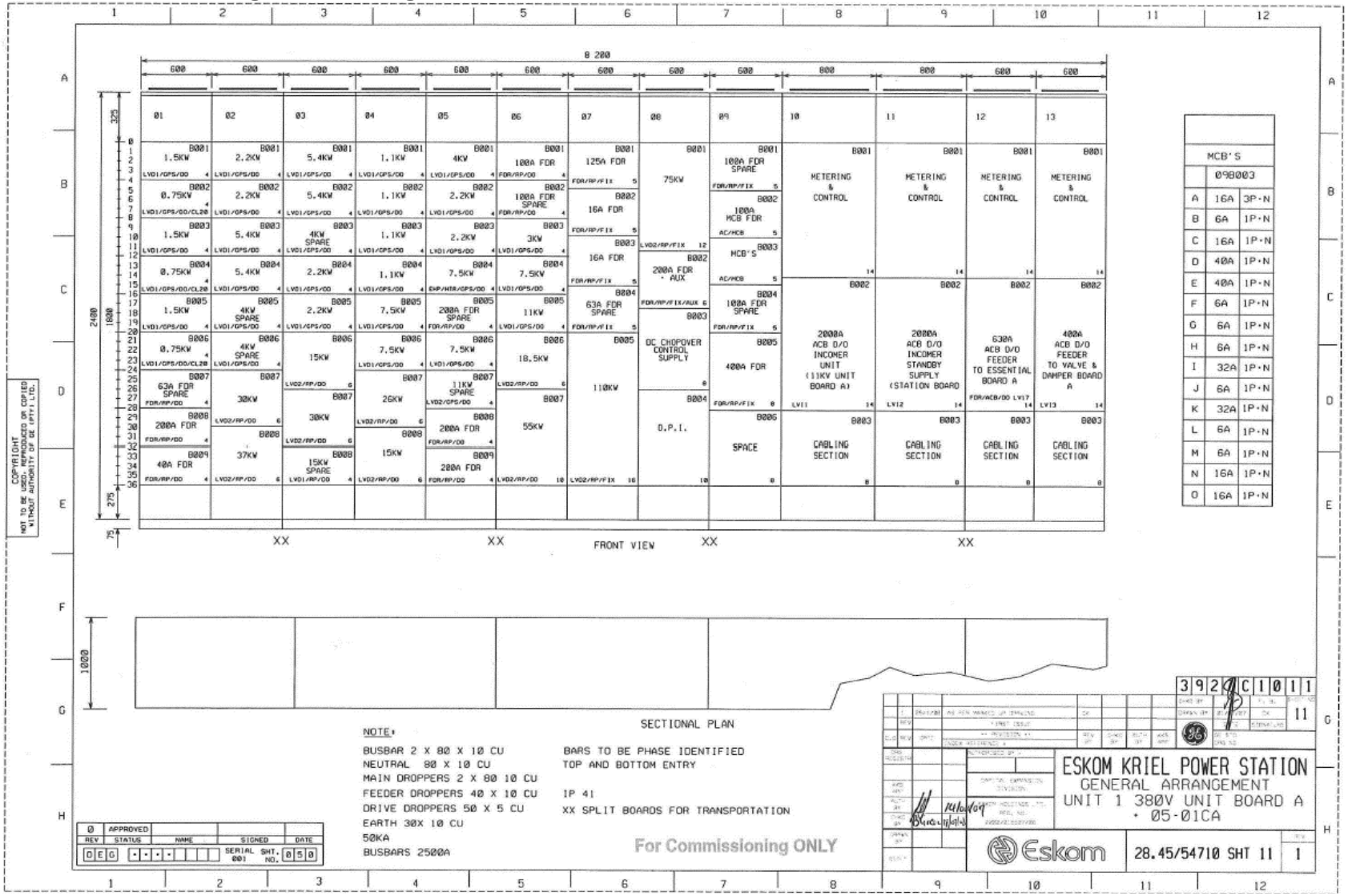
10.6 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 5



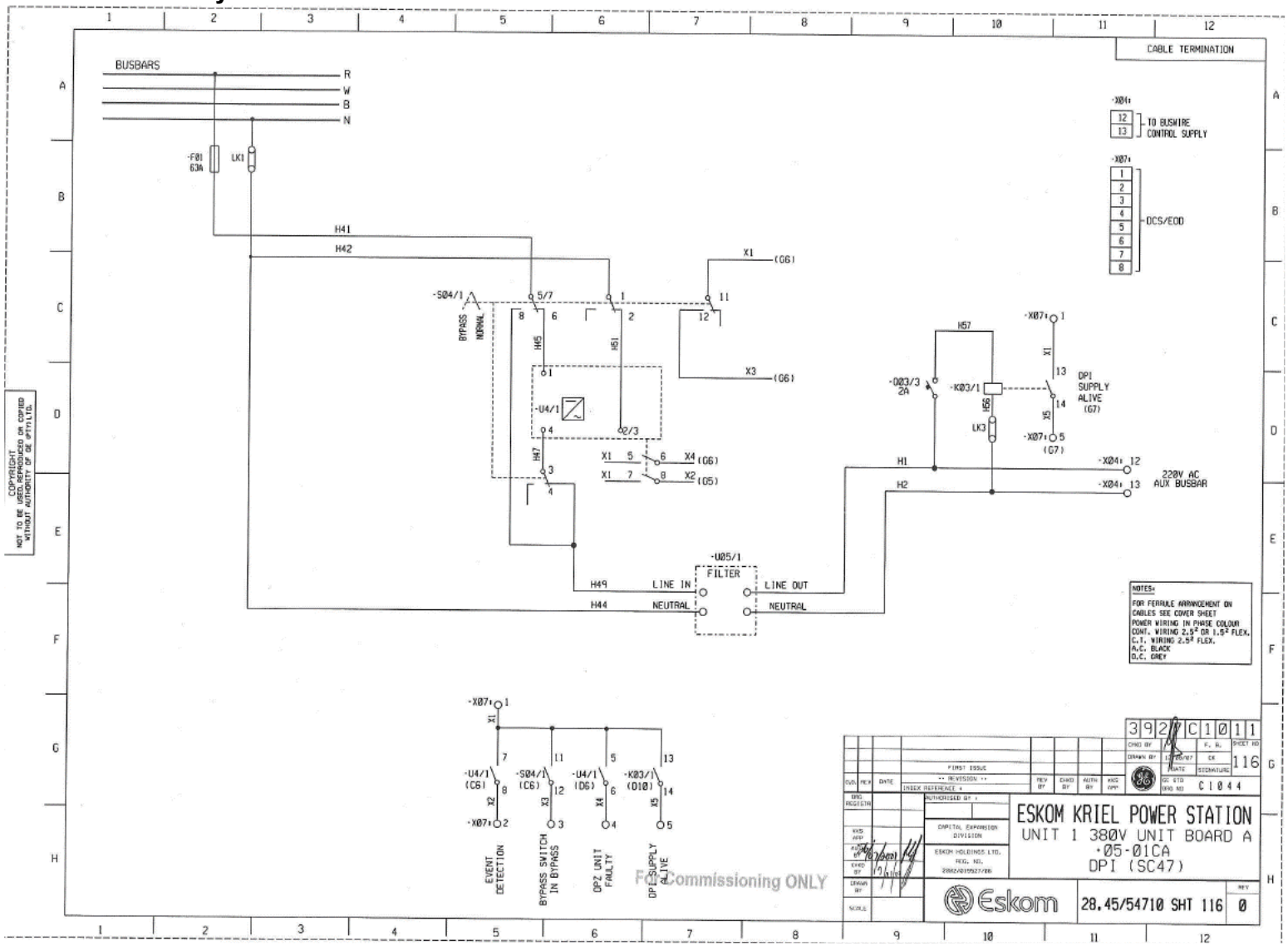
10.7 Proposed layout for UPS and battery cabinet in the LV switchgear room_ Unit 6



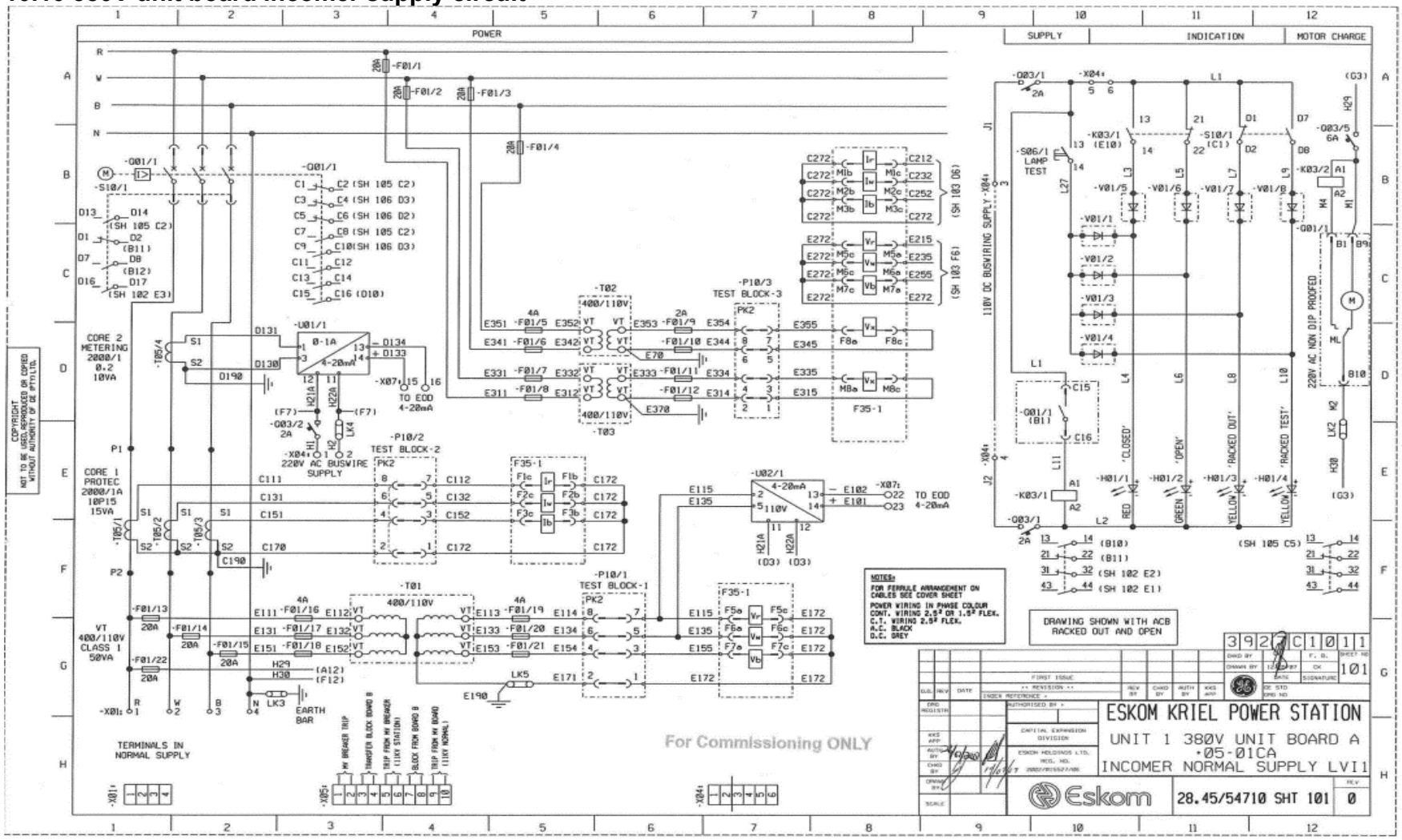
10.8 380V Unit board general arrangement



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