NEC3 Engineering & Construction Contract

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

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

for **KUSILE POWER STATION INSTALLATION OF ADDITIONAL CCTV CAMERAS SPECIFICATION**

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CONTRACT No.

Part C1: Agreements & Contract Data

Contents: **No of pages**

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:

INSTALLATION OF ADDITIONAL CCTV CAMERAS AT KUSILE POWER STATION FOR A PERIOD OF 12 MONTHS

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 B	The offered total of the Prices 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*

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

Clause	Statement	Data
1	**General**	
	The *conditions of contract* are the core clauses and the clauses for main Option	
		B: Priced contract with bill of quantities
	dispute resolution Option	**W1: Dispute resolution procedure**
	and secondary Options	
		X2 Changes in the law
		X5: Sectional Completion
		X7: Delay damages
		X15: Limitation of *Contractor's* liability for design to reasonable skill and care
		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)	**[●]**
	Address	**[●]**
	Tel	**[●]**
	Fax	**[●]**
	e-mail	**[●]**
10.1	The *Supervisor* is: (Name)	**[●]**

	Address	**[●]**
	Tel No.	**[●]**
	Fax No.	**[●]**
	e-mail	**[●]**
11.2(13)	The *works* are	**Installation of Additional CCTV Cameras at Kusile Power Station**
11.2(14)	The following matters will be included in the Risk Register	• **Labour and community unrests**
11.2(15)	The *boundaries of the site* are	**Kusile 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	**1 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	**31 December 2025**
11.2(9)	The *key date*s and the *condition*s to be met are:	***Condition* to be met** — ***key date***
		1 — **Site Possession** — **13 January 2025**
30.1	The *access dates* are:	**Part of the Site** — **Date**
		1 — **Kusile Power Station** — **1 x week after Contract Award**
31.1	The *Contractor* is to submit a first programme for acceptance within	**2 weeks of the Contract Date.**
31.2	The *starting date* is	**01 November 2025**
32.2	The *Contractor* submits revised programmes at intervals no longer than	**2 weeks.**
35.1	The *Employer* is not willing to take over the *works* before the Completion Date.	
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	**1 weeks**
5	**Payment**	
50.1	The *assessment interval* is	**between the 25 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.**
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:	**Emalahleni Weather Station**
	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:	**Emalahleni**
	and which are available from:	**the South African Weather Bureau and included in Annexure A to this Contract Data provided by the *Employer***
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	**N/A**
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**	
B	**Priced contract with bill of quantities**	
60.6	The *method of measurement* is	**Option B and amended as stated in Part C2.1, Pricing Assumptions.**
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

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.**

X5 Sectional Completion

X5.1 The *completion date* for each *section* of the *works* is:

Section	**Description**	***Completion date***
1	**Control Rooms**	**29 August 2025**
2	**Limestone Handling Plant**	**30 September 2025**
3	**Coal Handling Plant**	**30 September 2025**
4	**Ash Handling Plant**	**30 October 2025**
5	**Fuel Offloading**	**30 October 2025**
6	**Unit 1-6 Station Lifts**	**30 November 2025**
7	**FGD**	**15 December 2025**

X5 & X7 Sectional Completion and delay damages used together

X7.1
X5.1 Delay damages for late Completion of the *section*s of the *works* are:

section	**Description**	**Amount per day**
1	**Control Rooms**	**0,5% per day for the work not done to-date up to the maximum of 10% of the contract value**
2	**Limestone Handling Plant**	**0,5% per day for the work not done to-date up to the maximum of 10% of the contract value**
3	**Coal Handling Plant**	**0,5% per day for the work not done to-date up**

				to the maximum of 10% of the contract value
		4	**Ash Handling Plant**	**0,5% per day for the work not done to-date up to the maximum of 10% of the contract value**
		5	**Fuel Offloading**	**0,5% per day for the work not done to-date up to the maximum of 10% of the contract value**
		6	**Unit 1-6 Station Lifts**	**0,5% per day for the work not done to-date up to the maximum of 10% of the contract value**
		7	**FGD**	**0,5% per day for the work not done to-date up to the maximum of 10% of the contract value**
	Remainder of the *works*			**0,5% per day for the work not done to-date up to the maximum of 10% of the contract value**
	The total delay damages payable by the *Contractor* does not exceed:	**10% of the contract value**		
X15	**Limitation of the *Contractor*'s liability for his design to reasonable skill & care**	**There is no reference to Contract Data in this Option and terms in italics are identified elsewhere in this Contract Data.**		
X16	**Retention (not used with Option F)**			
	The *retention percentage* is	**5% of each invoice value, 50% to be released on completion of the works and the remaining 50% will be released after defects period.**		
X18	**Limitation of liability**			
X18.1	The *Contractor*'s liability to the *Employer* for indirect or consequential loss is limited	**R0.0 (zero Rand)**		

	to:	
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) 5 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 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 *works*, Plant and Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the *Contractor*)	Loss of or damage to property *Employer*'s property The replacement cost where not covered by the *Employer*'s insurance

caused by activity in connection with this contract	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.

C1.2 Contract Data

Part two - Data provided by the *Contractor*

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)[1] 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:	**CV's (and further key persons data including CVs) are appended to Tender Schedule entitled .**

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

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			
B	**Priced contract with bill of quantities**			
11.2(21) 11.2(31)	The *bill of quantities* is in The tendered total of the Prices is	**(in figures)** **(in words), excluding VAT**		
B	**Priced contract with bill of quantities**	**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:	

PART 2: PRICING DATA
ECC3 Option B

Document reference	Title	No of pages
C2.1	Pricing assumptions: Option B	3
C2.2	The *bill of quantities*	15

C2.1 Pricing assumptions: Option B

1. How work is priced and assessed for payment

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

Identified and defined terms 11 11.2

(21) The Bill of Quantities is the *bill of quantities* as changed in accordance with this contract to accommodate implemented compensation events and for accepted quotations for acceleration.

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

- the quantity of the work which the *Contractor* has completed for each item in the Bill of Quantities multiplied by the rate and
- a proportion of each lump sum which is the proportion of the work covered by the item which the *Contractor* has completed.

Completed work is work without Defects which would either delay or be covered by immediately following work.

(31) The Prices are the lump sums and the amounts obtained by multiplying the rates by the quantities for the items in the Bill of Quantities.

This confirms that Option B is a re-measurement contract and the bill comprises only items measured using quantities and rates or stated as lump sums. Value related items are not used. Time related items are items measured using rates where the rate is a unit of time.

2. Function of the Bill of Quantities

Clause 55.1 in Option B states, “Information in the Bill of Quantities 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 Bill, 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 Bill of Quantities. The Bill of Quantities is only a pricing document.

3. Guidance before pricing and measuring

Employers preparing tenders or contract documents, and tendering contractors are advised to consult the sections dealing with the bill of quantities in the NEC3 Engineering and Construction Contract Guidance Notes before preparing the *bill of quantities* or before entering rates and lump sums into the *bill*.

There is no general provision in Option B for payment for materials on Site before incorporation into the *works*. If secondary Option X14 Advanced payment has not been used then the tendering contractor may obtain the same effect by inserting appropriate items in the method related charges where the *method of measurement* allows, or alternatively making allowance in the rates of the *bill of quantities* for the financing of Plant and Materials until they are incorporated in the *works.*

When compensation events arise, the default position is that the Bill of Quantities is not used to calculate the cost effect of the event. Defined Cost and the resulting Fee is used and Defined Cost includes all components of cost which the *Contractor* is likely to incur, including so called P & G items. Rates and lump sums from the Bill of Quantities, or from any other source, may be used instead of Defined Cost and the Fee only if the *Contractor* and *Project Manager* agree. If they are unable to agree, then Defined Cost

plus Fee is used.

4. Measurement and payment

4.1. Symbols

The units of measurement described in the Bill of Quantities are metric units abbreviated as follows:

Abbreviation	Unit
%	percent
h	hour
ha	hectare
kg	kilogram
kl	kilolitre
km	kilometre
km-pass	kilometre-pass
kPa	kilopascal
kW	kilowatt
l	litre
m	metre
mm	millimetre
m^2	square metre
m^2-pass	square metre pass
m^3	cubic metre
m^3-km	cubic metre-kilometre
MN	meganewton
MN.m	meganewton-metre
MPa	megapascal
No.	number
sum	Lump sum
t	tonne (1000kg)

4.2. General assumptions

4.2.1. Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance has been made in the quantities for waste.

4.2.2. The Prices and rates stated for each item in the Bill of Quantities shall be treated as being fully inclusive of all work, risks, liabilities, obligations, overheads, profit and everything necessary as incurred or required by the *Contractor* in carrying out or providing that item.

4.2.3. An item against which no Price is entered will be treated as covered by other Prices or rates in the *bill of quantities*.

4.2.4. The quantities contained in the Bill of Quantities may not be final and do not necessarily represent the actual amount of work to be done. The quantities of work assessed and certified for payment by the *Project Manager* at each assessment date will be used for determining payments due.

4.2.5. The short descriptions of the items of payment given in the *bill of quantities* are only for the purposes of identifying the items. Detail regarding the extent of the work entailed under each item is provided in the Works Information.

4.3. Departures from the *method of measurement*

4.3.1.

4.4. Amplification of or assumptions about measurement items

The following is provided to assist in the interpretation of descriptions given in the *method of measurement*. In the event of any ambiguity or inconsistency between the statements in the *method of measurement* and this section, the interpretation given in this section shall be used.

C2.2 the *bill of quantities*

Item nr	Description	Unit	Quantity	Rate	Price
ITEM NO	**DESCRIPTION**				
	ITEM 1				
1	**PRELIMINARIES AND GENERAL**				
1.1	Establishment of Facilities on the Site	Once Off	1		
1.2	Entry Medicals	Once Off	67		
1.3	Exit Medicals	Once Off	67		
1.4	PPE (Once Off)	Once Off	67		
1.5	Fall Protection Harnesses	Once Off	20		
1.6	Security / Police Clearance certification	Once Off	67		
1.7	Safety File	Once Off	1		
1.8	Site Office Container (1 Non insulated, with Air-Con): 6m x 3m	Once Off	1		
1.9	Workshop Container (1 No): 6m x 3m	Once Off	1		
1.10	Site Storage Container (1 No for 5 years): 6m x 3m	Once Off	1		
1.11	Ablutions (2 off)	Once Off	2		
1.12	Site Bakkie 4 x 4 Double Cab (2 No for 12 Months)	Monthly	12		
1.13	Kombie 22 Seater (2 No for 12 Months)	Monthly	12		
1.14	Kombie 15 Seater (1 No for 12 Months)	Monthly	12		
1.15	Training (10 Daily Sessions)	Day	10		

	ITEM 2				
2	**DESIGN, SITE RESOURCES AND SUPPORT FROM HONEYWELL**				
	ITEM 2.1				
	DESIGN RESOURCES				
2.1.1	Pr. Electrical Engineer (Min 5 - 10 Years Experience) (1 off)	Hours	640		
2.1.2	ICT Specialist (Minimum 5 - 10 Years Experience) (1 off)	Hours	960		
2.1.3	Draughtsman (5 - 9 Years Experience) (1 off)	Hours	1920		
	ITEM 2.2				
2.2	**SUPPORT FROM HONEYWELL**				
2.2.1	Site Support and Interfacing (Provide a Detailed Cost Breakdown)	Sum	1		
	ITEM 2.3				
2.3	**SITE RESOURCES**				
2.2.1	Project Manager (Min 5 - 10 Years Experience) (1 off)	Hours	1440		
2.2.2	Site Supervisor (Min 5 - 10 Years Experience) (4 off)	Hours	5760		
2.2.3	QA/QC Manager (Min 5 Years Experience) (1 off)	Hours	1440		
2.2.4	Safety Officer (Min 5 Years Experience 1 off)	Hours	1440		
2.2.5	Technician (Min 5 Years Experience) (1 off)	Hours	960		
2.2.6	Skilled Electrician (Min 5 Years Experience) (4 off)	Hours	4480		
2.2.7	Semi-skilled Labour (24 off)	Hours	27680		
2.2.8	General Labour (31 off)	Hours	37760		
	ITEM 3				
3	**TOOLS AND EQUIPMENT**				
3.1	Tool Boxes	No	14		
3.2	Cable Tester	No	4		

3.3	Multimeter	No	1		
3.4	Fibre Splicing	No	3		
3.5	Hand Drills	No	14		
3.6	Grinders	No	14		
3.7	Welding tools	No	6		
3.8	Ladders	No	14		
	ITEM 4				
4	**BOP CONTROL ROOM OPERATOR MONITORING CENTRE**				
4.1	**Supply and Delivery of 128 - Channel NVR system, Software, monitoring Station, Fibre Network, & Cabling**				
4.1.1	**128 Channel NVR**				
4.1.1.1	32 GB memory; 16 TB storage, 2U,12 bay racking mount kit with locking bezel' 2 x USB Front, 2 x USB 3.0; 4 x RJ45 Network; 1 x VGA, Rear, 1 x VGA Front; 110/220 VAC 50/60 Hz Input Voltage; 110V/220V Auto Sensing; Average BTU rating = 880 BTU/Hr, peak 2800 BTU/Hr; Recording and Monitoring Performance: 380 fps @1080p, 1-way audio, 800 Mbps, Including NVR Software Licences	No	4		
4.1.2	**Software**				
4.1.2.1	Webserver, CCTV Software, Digital Video Splitter, Firewall	No	4		
4.1.3	**Monitoring Station**				
4.1.3.1	Windows PC with operating System, 2 x 24 inch screens & software	No	8		
4.1.3.2	Wireless Mouse	No	4		
4.1.3.3	HDMI Cable	No	8		
4.1.3.4	Back-up Storage	No	4		
4.1.3.5	2 kVA UPS	No	3		
4.1.4	**Fibre Network**	No	1		
4.1.4.1	32-Port Ethernet Switch	No	1		

4.1.4.2	64-Port Ethernet Switch	No	4		
4.1.4.3	8-Port Ethernet Switch	No	4		
4.1.4.4	Fibre Network/Ethernet link	No	4		
4.1.4.5	12U Rack Cabinet IP55	No	4		
4.1.4.6	PSU 48VDC 3A Power Pack	No	4		
4.1.4.7	48V DC 9AH Rechargeable Sealed Battery	No	1		
4.1.5	**Cabling**				
4.1.5.1	4 mm2/4C/PCV/SWA/PVC Power Supply	m	100		
4.1.5.2	CAT 7/7A Network Cable ST Pure Copper Ethernet Cable	m	100		
4.1.5.3	12 Core 50/125 Multimode (Corrugated Steel Tape)	m	3000		
4.1.5.4	10mm2 PVC Earth wire	m	100		
	Cable Termination				
4.1.6.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	2		
4.1.6.2	Fibre optic Splicing (12 Core)	No	6		
4.1.6.3	Fibre Optic Flyleads	No	12		
4.1.6.4	CAT 7/7A RJ45 Termination	No	20		
4.1.6.5	10mm2 PVC PVC Earth Wire termination	No	8		
4.1.7	**Cable Routing**				
4.1.7.1	Galvanised Steel Conduit 20mm diameter				
4.1.7.2	Galvanised Steel Conduit PVC Round Boxes 1-4 way				
4.1.7.3	110mm 6m PE, pipe/sleeve, include sealing and draw wires				
4.1.7.4	OL 8300				
4.2	**PLANT AREAS: LIMESTONE PLANT, ASH HANDLING, FUEL OFFLOADING,**				
4.2.1	Fibre Network Switches				
4.2.1.1	16-Port PoE + Access Switch	No	2		
4.2.1.2	32-Port PoE + Access Switch	No	15		

4.2.1.3	64-Port PoE +Access Switch	No	5		
4.2.1.4	PoE Extender	No	29		
4.2.1.5	12U Rack Cabinet IP55	No	22		
4.2.1.6	PSU 12VDC 3A Power Pack	No	22		
4.2.1.7	12V DC 9AH Rechargeable Sealed Battery	No	44		
4.2.2	**Cameras**				
4.2.2.1	IR Fixed Bullet Camera 1/2.7"; CMOS Sensor 1080p or 5MP; WDR, IP Based, 3.6mm lens, 12VDC, IP 67 IP ONVIF	No	331		
4.2.2.2	PTZ IR Camera 1/2.8" CMOS Sensor 1080p or 2MP WDR, IP Based, 3.6mm lens, 12VDC, IP 67 (IR Distance 200m)	No	38		
4.2.2.3	5MP Network IR Outdoor Bullet Camera, WDR 120 dB, 1/2.8" CMOS, 2.7-13.5mm MFZ, 4 IR LEDs, PoE+,H.265 HEVC Smart Codec, IP66/67/IK10/NEMA4X, Gre	No	4		
4.2.2.4	Camera Enclosure	No	331		
4.2.2.5	Camera Dust Proof Junction Box	No	373		
4.2.2.6	Wall Mounted Bracket	No	317		
4.2.2.7	Camera lightning protection	No	363		
4.2.2.8	Camera Steel Pole - 4m AGL Including Foundation	No	40		
4.2.2.9	Camera Concrete Hallow pole - 12m AGL	No	24		
4.2.3	**Cabling**				
4.2.3.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	2200		
4.2.3.2	CAT 7/7A Network Cable STP Pure Copper Ethernet Cable	M	9350		
4.2.3.3	12 Core 50/125 Multimode (corrugated steel tape)	M	3300		
4.2.3.4	10mm2 PVC PVC Earth Wire	M	3922		
4.2.4	**Cable Termination**				
4.2.4.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	44		
4.2.4.2	Fibre optic Splicing (12 Core)	No	44		
4.2.4.3	Fibre Optic Flyleads	No	44		

4.2.4.4	CAT 7/7A RJ45 Termination	No	718		
4.2.4.5	10mm2 PVC PVC Earth Wire termination	No	36		
4.2.5	**Cable Routing**				
4.2.5.1	Galvanised Steel Conduit 20mm diameter	M	11070		
4.2.5.2	76mm Wide Cable Ladder	M	400		
4.2.5.3	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	369		
4.2.5.4	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	530		
4.2.5.5	OL 8300	M	400		
4.2.5.6	COC	No	22		
	ITEM 5				
5	**MAIN CONTROL ROOM (EOD)**				
5.1	Supply and Delivery of 128 - Channel NVR system, Software, monitoring Station, Fibre Network, & Cabling				
5.1.1	**128 Channel NVR**				
5.1.1.1	32 GB memory; 16 TB storage, 2U,12 bay racking mount kit with locking bezel' 2 x USB Front, 2 x USB 3.0; 4 x RJ45 Network; 1 x VGA, Rear, 1 x VGA Front; 110/220 VAC 50/60 Hz Input Voltage; 110V/220V Auto Sensing; Average BTU rating = 880 BTU/Hr, peak 2800 BTU/Hr; Recording and Monitoring Performance: 380 fps @1080p, 1-way audio, 800 Mbps, Including NVR Software Licences	No	2		
5.1.2	**Software**				
5.1.2.1	Webserver, CCTV Software, Digital Video Splitter, Firewall	No	2		
5.1.3	**Monitoring Station**				
5.1.3.1	Windows PC with operating System, 2 x 24 inch screens & software	No	4		
5.1.3.2	Wireless Mouse	No	2		

5.1.3.3	HDMI Cable	No	2		
5.1.3.4	Back-up Storage	No	2		
5.1.3.5	2 kVA UPS	No	3		
5.1.4	**Fibre Network Switches**				
5.1.4.1	32-Port Ethernet Switch	No	1		
5.1.4.2	64-Port Ethernet Switch	No	1		
5.1.4.3	8-Port Ethernet Switch	No	4		
5.1.4.4	Fibre Network/Ethernet link	No	4		
5.1.4.5	12U Rack Cabinet IP55	No	1		
5.1.4.6	PSU 48VDC 3A Power Pack	No	4		
5.1.4.7	48V DC 9AH Rechargeable Sealed Battery	No	4		
5.1.5	**Cabling**				
5.1.5.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	100		
5.1.5.2	CAT 7/7A Network Cable ST Pure Copper Ethernet Cable	M	100		
5.1.5.3	12 Core 50/125 Multimode (Corrugated Steel Tape)	M	1000		
5.1.5.4	10mm2 PVC Earth wire	M	100		
5.1.6	**Cable Termination**				
5.1.6.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	2		
5.1.6.2	Fibre optic Splicing (12 Core)	No	6		
5.1.6.3	Fibre Optic Flyleads	No	12		
5.1.6.4	CAT 7/7A RJ45 Termination	No	20		
5.1.6.5	10mm2 PVC PVC Earth Wire termination	No	8		
5.1.7	**Cable Routing**				
5.1.7.1	Galvanised Steel Conduit 20mm diameter	M	80		
5.1.7.2	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	6		
5.1.7.3	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	10		
5.1.7.4	OL 8300	m	120		

5.2	**PLANT AREAS: UNIT STATION LIFTS**				
5.2.1	**Network Switches**				
5.2.1.1	64-Port PoE +Access Switch	No	6		
5.2.1.2	PoE Extender	No	24		
5.2.1.3	12U Rack Cabinet IP55	No	6		
5.2.1.4	PSU 12VDC 3A Power Pack	No	6		
5.2.1.5	12V DC 9AH Rechargeable Sealed Battery	No	12		
5.2.2	**Cameras**				
5.2.2.1	IR Fixed Bullet Camera 1/2.7"; CMOS Sensor 1080p or 5MP; WDR, IP Based, 3.6mm lens, 12VDC, IP 67 IP ONVIF	No			
5.2.2.2	Camera Enclosure	No	162		
5.2.2.3	Camera Dust Proof Junction Box	No	162		
5.2.2.4	Wall Mounted Bracket	No	162		
5.2.2.5	Camera lightning protection	No	162		
5.2.3	**Cabling**				
5.2.3.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	1200		
5.2.3.2	"CAT 7/7A Network Cable STP	M	4860		
5.2.3.3	12 Core 50/125 Multimode (corrugated steel tape)	M	1800		
5.2.3.4	10mm2 PVC PVC Earth Wire	M	1620		
5.2.4	**Cable Termination**				
5.2.4.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	12		
5.2.4.2	Fibre optic Splicing (12 Core)	No	12		
5.2.4.3	Fibre Optic Flyleads	No	12		
5.2.4.4	CAT 7/7A RJ45 Termination	No	162		
5.2.4.5	10mm2 PVC PVC Earth Wire termination	No	12		
5.2.4	Cable Termination	No	12		

5.2.5	**Cable Routing**				
5.2.5.1	Galvanised Steel Conduit 20mm diameter	M	8100		
5.2.5.2	76mm Wide Cable Ladder	M	480		
5.2.5.3	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	324		
5.2.5.4	OL 8300	M	300		
5.2.5.5	COC	M	1		
	ITEM 6				
6	**FGD CONTROL ROOM**				
6.1	**Supply and Delivery of 128 - Channel NVR system, Software, monitoring Station, Fibre Network, & Cabling**				
6.1.1	**128 Channel NVR**				
6.1.1.1	32 GB memory; 16 TB storage, 2U,12 bay racking mount kit with locking bezel' 2 x USB Front, 2 x USB 3.0; 4 x RJ45 Network; 1 x VGA, Rear, 1 x VGA Front; 110/220 VAC 50/60 Hz Input Voltage; 110V/220V Auto Sensing; Average BTU rating = 880 BTU/Hr, peak 2800 BTU/Hr; Recording and Monitoring Performance: 380 fps @1080p, 1-way audio, 800 Mbps, Including NVR Software Licences	No	1		
6.1.2	**Software**				
6.1.2.1	Webserver, CCTV Software, Digital Video Splitter, Firewall	No	1		
6.1.3	**Monitoring Station**				
6.1.3.1	Windows PC with operating System, 2 x 24 inch screens & software	No	2		
6.1.3.2	Wireless Mouse	No	1		
6.1.3.3	HDMI Cable	No	2		
6.1.3.4	Back-up Storage	No	1		
6.1.3.5	2 kVA UPS	No	3		

6.1.4	**Fibre Network Switches**				
6.1.4.1	32-Port Ethernet Switch	No	1		
6.1.4.2	8-Port Ethernet Switch	No	1		
6.1.4.3	Fibre Network/Ethernet link	No	1		
6.1.4.4	12U Rack Cabinet IP55	No	1		
6.1.4.5	PSU 48VDC 3A Power Pack	No	4		
6.1.4.6	48V DC 9AH Rechargeable, Sealed Battery	No	4		
6.1.5	**Cabling**				
6.1.5.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	20		
6.1.5.2	CAT 7/7A Network Cable ST Pure Copper Ethernet Cable	M	100		
6.1.5.3	12 Core 50/125 Multimode (Corrugated Steel Tape)	M	400		
6.1.5.4	10mm2 PVC Earth wire	M	45		
6.1.6	**Cable Termination**				
6.1.6.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	2		
6.1.6.2	Fibre optic Splicing (12 Core)	No	6		
6.1.6.3	Fibre Optic Flyleads	No	12		
6.1.6.4	CAT 7/7A RJ45 Termination	No	20		
6.1.6.5	10mm2 PVC PVC Earth Wire termination	No	8		
6.1.7	**Cable Routing**				
6.1.7.1	Galvanised Steel Conduit 20mm diameter	M	40		
6.1.7.2	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	6		
6.1.7.3	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	10		
6.1.7.4	OL 8300	M	20		
6.2	**PLANT AREAS: FGD**				
6.2.1	**Network Switches**				
6.2.1.1	16-Port PoE + Access Switch	No	3		

6.2.1.2	32-Port PoE + Access Switch	No	2		
6.2.1.3	PoE Extender	No	7		
6.2.1.4	12U Rack Cabinet IP55	No	5		
6.2.1.5	PSU 12VDC 3A Power Pack	No	5		
6.2.1.6	12V DC 9AH Rechargeable Sealed Battery	No	10		
6.2.2	**Cameras**				
6.2.2.1	IR Fixed Bullet Camera 1/2.7"; CMOS Sensor 1080p or 5MP; WDR, IP Based, 3.6mm lens, 12VDC, IP 67 IP ONVIF	No	71		
6.2.2.2	Camera Enclosure	No	71		
6.2.2.3	Camera Dust Proof Junction Box	No	71		
6.2.2.4	Wall Mounted Bracket	No	71		
6.2.2.5	Camera lightning protection	No	71		
6.2.3	**Cabling**				
6.2.3.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	300		
6.2.3.2	CAT 7/7A Network Cable STP Pure Copper Ethernet Cable	M	2840		
6.2.3.3	12 Core 50/125 Multimode (corrugated steel tape)	M	800		
6.2.3.4	10mm2 PVC PVC Earth Wire	M	100		
6.2.4	**Cable Termination**				
6.2.4.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	10		
6.2.4.2	Fibre optic Splicing (12 Core)	No	10		
6.2.4.3	Fibre Optic Flyleads	No	20		
6.2.4.4	CAT 7/7A RJ45 Termination	No	142		
6.2.4.5	10mm2 PVC PVC Earth Wire termination	No	8		
6.2.5	**Cable Routing**				
6.2.5.1	Galvanised Steel Conduit 20mm diameter	M	2130		
6.2.5.2	76mm Wide Cable Ladder	M	100		
6.2.5.3	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	71		

6.2.5.4	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	2		
6.2.5.5	OL 8300	M	100		
6.2.5.6	COC	No	1		
	ITEM 7				
7	**SECURITY CONTROL ROOM**				
7.1	**Supply and Installation of 128 - Channel NVR system, Software, monitoring Station, Fibre Network, & Cabling**				
7.1.1	**128 Channel NVR**				
7.1.1.1	32 GB memory; 16 TB storage, 2U,12 bay racking mount kit with locking bezel' 2 x USB Front, 2 x USB 3.0; 4 x RJ45 Network; 1 x VGA, Rear, 1 x VGA Front; 110/220 VAC 50/60 Hz Input Voltage; 110V/220V Auto Sensing; Average BTU rating = 880 BTU/Hr, peak 2800 BTU/Hr; Recording and Monitoring Performance: 380 fps @1080p, 1-way audio, 800 Mbps, Including NVR Software Licences	No	3		
7.1.2	**Software**				
7.1.2.1	Webserver, CCTV Software, Digital Video Splitter, Firewall	No	3		
7.1.3	**Monitoring Station**				
7.1.3.1	Windows PC with operating System, 2 x 24 inch screens & software	No	6		
7.1.3.2	Wireless Mouse	No	3		
7.1.3.3	HDMI Cable	No	6		
7.1.3.4	Back-up Storage	No	3		
7.1.3.5	2 kVA UPS	No	3		
7.1.4	**Fibre Network Switches**				
7.1.4.1	32-Port Ethernet Switch	No	1		
7.1.4.2	64-Port Ethernet Switch	No	1		
7.1.4.3	8-Port Ethernet Switch	No	3		
7.1.4.4	Fibre Network/Ethernet link	No	3		

7.1.4.5	12U Rack Cabinet IP55	No	2		
7.1.4.6	PSU 48VDC 3A Power Pack	No	4		
7.1.4.7	48V DC 9AH Rechargeable, Sealed Battery	No	4		
7.1.5	Cabling				
7.1.5.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	100		
7.1.5.2	CAT 7/7A Network Cable ST Pure Copper Ethernet Cable	M	100		
7.1.5.3	12 Core 50/125 Multimode (Corrugated Steel Tape)	M	1000		
7.1.5.4	10mm2 PVC Earth wire	M	100		
7.1.6	**Cable Termination**				
7.1.6.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	2		
7.1.6.2	Fibre optic Splicing (12 Core)	No	6		
7.1.6.3	Fibre Optic Flyleads	No	6		
7.1.6.4	CAT 7/7A RJ45 Termination	No	10		
7.1.6.5	10mm2 PVC PVC Earth Wire termination	No	8		
7.1.7	**Cable Routing**				
7.1.7.1	Galvanised Steel Conduit 20mm diameter	M	100		
7.1.7.2	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	10		
7.1.7.3	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	10		
7.1.7.4	OL 8300	M	120		
7.2	**PLANT AREAS: FGD**				
7.2.1	**Network Switches**				
7.2.1.1	16-Port PoE + Access Switch	No	20		
7.2.1.2	32-Port PoE + Access Switch	No	14		
7.2.1.3	64-Port PoE +Access Switch	No	2		
7.2.1.4	PoE Extender	No	35		
7.2.1.5	12U Rack Cabinet IP55	No	33		
7.2.1.6	PSU 12VDC 3A Power Pack	No	33		
7.2.1.7	12V DC 9AH Rechargeable Sealed Battery	No	66		

7.2.2	**Cameras**				
7.2.2.1	IR Fixed Bullet Camera 1/2.7"; CMOS Sensor 1080p or 5MP; WDR, IP Based, 3.6mm lens, 12VDC, IP 67 IP ONVIF	No	177		
7.2.2.2	5MP Network IR Outdoor Bullet Camera, WDR 120 dB, 1/2.8" CMOS, 2.7-13.5mm MFZ, 4 IR LEDs, PoE+,H.265 HEVC Smart Codec, IP66/67/IK10/NEMA4X, Gre	No	2		
7.2.2.3	Dome Camera 1/2.8' CMOS Sensor 1080p or 5MP WDR, IP Based, 2.8mm, Fixed Iris, F2.0, 12VDC, IP 67 ONVIF	No	49		
7.2.2.4	Camera Enclosure	No	177		
7.2.2.5	Camera Dust Proof Junction Box	No	226		
7.2.2.6	Wall Mounted Bracket	No	133		
7.2.2.7	Camera lightning protection	No	226		
7.2.2.8	Camera Steel Pole - 4m AGL Including Foundation	No	8		
7.2.2.9	Camera Concrete Hallow pole - 12m AGL	No	2		
7.2.3	**Cabling**				
7.2.3.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	1280		
7.2.3.2	CAT 7/7A Network Cable STP, Pure Copper Ethernet Cable	M	7410		
7.2.3.3	12 Core 50/125 Multimode (corrugated steel tape)	M	7100		
7.2.3.4	10mm2 PVC PVC Earth Wire	M	470		
7.2.4	**Cable Termination**				
7.2.4.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	62		
7.2.4.2	Fibre optic Splicing (12 Core)	No	54		
7.2.4.3	Fibre Optic Flyleads	No	28		
7.2.4.4	CAT 7/7A RJ45 Termination	No	200		
7.2.4.5	10mm2 PVC PVC Earth Wire termination	No	44		
7.2.5	**Cable Routing**				
7.2.5.1	Galvanised Steel Conduit 20mm diameter	M	3980		

7.2.5.2	76mm Wide Cable Ladder	M	820		
7.2.5.3	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	226		
7.2.5.4	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	42		
7.2.5.5	OL 8300	M	502		
7.2.5.6	COC	No	20		

PART 3: SCOPE OF WORK

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C3.1: EMPLOYER'S WORKS INFORMATION

Contents

1 Description of the *works*

1.1 Executive overview

The purpose of this document is to outline the technical specifications for the installation of a comprehensive surveillance camera system at Kusile Power Station. The surveillance system is intended to enhance the security measures at the power plant, ensuring the safety of personnel, protecting critical infrastructure, and enabling effective incident response.

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

CCTV systems provide surveillance capabilities used in protection of people, assets, and systems. A CCTV system serves mainly as a security force multiplier, providing surveillance for a larger area, more of the time, than would be feasible with security personnel alone. CCTV systems are often used to support comprehensive security systems by incorporating video coverage and security alarms for barriers, intrusion detection, and access control. For example, a CCTV system can provide the means to assess an alarm generated by an intrusion detection system and record the event.
The cameras installed at Kusile Power Station are not enough to cover all critical areas, the various stakeholders have identified more areas that require surveillance for protection of people, plant, systems, and monitoring of critical plants where visuals will help controllers to manage and control the plant better.
To design such an integrated system with required interfaces, a comprehensive site survey to support the development of detailed equipment specifications, installation design, and ultimately a thorough system test requires a specialised skill set. These skills and capabilities cannot be sourced within the organisation.

1.3 Interpretation and terminology

The following abbreviations are used in this Works Information:

Abbreviation	Meaning given to the abbreviation
AGC	Automatic Gain Control
CCTV	Closed-Circuit Television
DVM	Digital Video Manager
DVR	Digital Video Recorder
FPS	Frames per Second
LCD	Liquid Crystal Display
ONVIF	Open Network Video Interface Forum
RAM	Reliability, Availability and Maintainability
SNR	Signal to Noise Ratio
WBC	White Balance Control

1.4 Definitions

1.4.1 Disclosure Classification

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

Table 1: Definition of Terms

Term	Definition
Automatic Gain Control	Automatic gain control (AGC) increases the cameras sensitivity automatically when the ambient light deteriorates.
Availability	Relates to the ability of the system-of-interest to be accessed and operated when needed.
Back Light Compensation	Electronically compensates for high background lighting to give details which would normally be silhouetted.
CCTV Camera	The unit that contains an imaging device that produces a video signal from an optical image.
CCTV system	A system that consists of camera equipment as well as any monitoring and associated equipment for transmission and controlling purposes that is necessary for surveillance of a defined security zone.
Constrained	A statement that expresses measurable bounds for an element or function of the system. That is, a constraint is a factor that is imposed on the solution by compulsion and may limit or modify the design changes.
Coverage Distance	The distance covered visually between a fixed camera's position and the next camera.
Frames Frequency	The number of frames per second (fps).
Maintainability	Relates to the ability of the intended system to be easily serviced or repaired, including the ability to be easily diagnosed. In this context, maintainability is synonymous with 'Repairability' or 'Serviceability'.
May	Expresses a non-mandatory suggestion with optional compliance by the implementer.
Must	Preferably not used in requirement statements. If both "shall" and "must" are used there is an implication of difference in the degree of responsibility upon the implementer, which is undesirable.
ONVIF Compliance	ONVIF is an international specification with the aim of 'promoting and developing global standards for interfaces of IP-based physical security products.
Reliability	Relates to the ability of the intended system to perform within the specification limits with correct and consistent results over time. This includes the numerical reliability characteristics (with confidence levels, if appropriate).
Remotely Configurable	Ability to change camera settings through a network.
Shall	Expresses a mandatory demand or a binding requirement.
Should	Expresses a non-mandatory preference, desire, target or recommendation. Other implementations of the requirement can be accepted, but the implementer (if challenged) should be able to demonstrate that these other implementations are equivalent or better.
Signal to Noise Ratio	The ratio between useful television signal and disturbing noise signal.
White Balance Control	Automatically adjusts a colour camera's colour to maintain white areas.
Wide Dynamic Range	Ability of camera to provide clear images when there are very light and very dark areas simultaneously in the camera's field of view.
Will	Expresses the future tense or a declaration of intent. For example, "The operator will initialise the system by…" conveys an item of information for the designer but it does not constitute a requirement on the designer.

1.5 Details Of The Scope Of Works

1.5.1 Identification

The areas will be identified for the additional CCTV cameras at Kusile Power Station. The composition of these areas will consist of a combination of cameras covering them and will be as follows Table 2 to 4.

Table 2: BOP Control Room required cameras for plant monitoring.

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	LIMESTONE HANDLING PLANT	COAL HANDLING	ASH HANDLING	FUEL OFFLOADING	TOTAL QTY
1	**BOP CONTROL ROOM OPERATOR MONITORING CENTRE**							
1.1	**Supply and Delivery of 128 - Channel NVR system, Software, monitoring Station, Fibre Network, & Cabling**							
1.1.1	**128 Channel NVR**							
1.1.1.1	32 GB memory; 16 TB storage, 2U,12 bay racking mount kit with locking bezel' 2 x USB Front, 2 x USB 3.0; 4 x RJ45 Network; 1 x VGA, Rear, 1 x VGA Front; 110/220 VAC 50/60 Hz Input Voltage; 110V/220V Auto Sensing; Average BTU rating = 880 BTU/Hr, peak 2800 BTU/Hr; Recording and Monitoring Performance: 380 fps @1080p, 1-way audio, 800 Mbps, Including NVR Software Licences	No	4	Nil	Nil	Nil	Nil	4
1.1.2	**Software**							
1.1.2.1	Webserver, CCTV Software, Digital Video Splitter, Firewall	No	4	Nil	Nil	Nil	Nil	4
1.1.3	**Monitoring Station**							
1.1.3.1	Windows PC with operating System, 2 x 24 inch screens & software	No	8	Nil	Nil	Nil	Nil	8
1.1.3.2	Wireless Mouse	No	4	Nil	Nil	Nil	Nil	4
1.1.3.3	HDMI Cable	No	8	Nil	Nil	Nil	Nil	8
1.1.3.4	Back-up Storage	No	4	Nil	Nil	Nil	Nil	4
1.1.3.5	2 kVA UPS	No	3	Nil	Nil	Nil	Nil	3
1.1.4	**Fibre Network**							
1.1.4.1	32-Port Ethernet Switch	No	1	Nil	Nil	Nil	Nil	1
1.1.4.2	64-Port Ethernet Switch	No	1	Nil	Nil	Nil	Nil	1

1.1.4.3	8-Port Ethernet Switch	No	4	Nil	Nil	Nil	Nil	4
1.1.4.4	Fibre Network/Ethernet link	No	4	Nil	Nil	Nil	Nil	4
1.1.4.5	12U Rack Cabinet IP55	No	4	Nil	Nil	Nil	Nil	4

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	LIMESTONE HANDLING PLANT	COAL HANDLING	ASH HANDLING	FUEL OFFLOADING	TOTAL QTY
1.1.4.6	PSU 48VDC 3A Power Pack	No	4	Nil	Nil	Nil	Nil	4
1.1.4.7	48V DC 9AH Rechargeable Sealed Battery	No	4	Nil	Nil	Nil	Nil	4
1.1.5	**Cabling**							
1.1.5.1	4 mm2/4C/PCV/SWA/PVC Power Supply	m	100	Nil	Nil	Nil	Nil	100
1.1.5.2	CAT 7/7A Network Cable ST Pure Copper Ethernet Cable	m	100	Nil	Nil	Nil	Nil	100
1.1.5.3	12 Core 50/125 Multimode (Corrugated Steel Tape)	m	3000	Nil	Nil	Nil	Nil	3000
1.1.5.4	10mm^2 PVC Earth wire	m	100	Nil	Nil	Nil	Nil	100
1.1.6	**Cable Termination**							
1.1.6.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	2	Nil	Nil	Nil	Nil	2
1.1.6.2	Fibre optic Splicing (12 Core)	No	6	Nil	Nil	Nil	Nil	6
1.1.6.3	Fibre Optic Flyleads	No	12	Nil	Nil	Nil	Nil	12
1.1.6.4	CAT 7/7A RJ45 Termination	No	20	Nil	Nil	Nil	Nil	20
1.1.6.5	10mm2 PVC PVC Earth Wire termination	No	8	Nil	Nil	Nil	Nil	8
1.1.7	**Cable Routing**							
1.1.7.1	Galvanised Steel Conduit 20mm diameter	m	80	Nil	Nil	Nil	Nil	80
1.1.7.2	Galvanised Steel Conduit PVC Round Boxes 1-4 way	m	6	Nil	Nil	Nil	Nil	6
1.1.7.4	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	10	Nil	Nil	Nil	Nil	10
1.1.7.5	OL 8300	m	120	Nil	Nil	Nil	Nil	120
1.2	**PLANT AREAS: LIMESTONE PLANT, ASH HANDLING, FUEL OFFLOADING,**							
1.2.1	**Fibre Network Switches**							
1.2.1.1	16-Port PoE + Access Switch	No	Nil	Nil	Nil	2	Nil	2
1.2.1.2	32-Port PoE + Access Switch	No	Nil	1	6	7	1	15
1.2.1.3	64-Port PoE +Access Switch	No	Nil	Nil	2	3	Nil	5
1.2.1.4	PoE Extender	No	Nil	1	18	8	2	29

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	LIMESTONE HANDLING PLANT	COAL HANDLING	ASH HANDLING	FUEL OFFLOADING	TOTAL QTY
1.2.1.5	12U Rack Cabinet IP55	No	Nil	1	8	12	1	22
1.2.1.6	PSU 12VDC 3A Power Pack	No	Nil	1	8	12	1	22
1.2.1.7	12V DC 9AH Rechargeable Sealed Battery	No	Nil	2	16	24	2	44
1.2.2	**Cameras**							
1.2.2.1	IR Fixed Bullet Camera 1/2.7"; CMOS Sensor 1080p or 5MP; WDR, IP Based, 3.6mm lens, 12VDC, IP 67 IP ONVIF	No	Nil	6	181	130	14	331
1.2.2.2	PTZ IR Camera 1/2.8" CMOS Sensor 1080p or 2MP WDR, IP Based, 3.6mm lens, 12VDC, IP 67 (IR Distance 200m)	No	Nil	2	34	2	Nil	38
1.2.2.3	5MP Network IR Outdoor Bullet Camera, WDR 120 dB, 1/2.8" CMOS, 2.7-13.5mm MFZ, 4 IR LEDs, PoE+,H.265 HEVC Smart Codec, IP66/67/IK10/NEMA4X, Gre	No	Nil	Nil	Nil	Nil	4	4
1.2.2.4	Camera Enclosure	No	Nil	6	181	130	14	331
1.2.2.5	Camera Dust Proof Junction Box	No	Nil	8	215	132	18	373
1.2.2.6	Wall Mounted Bracket	No	Nil	8	181	110	18	317
1.2.2.7	Camera lightning protection	No	Nil	8	215	132	8	363
1.2.2.8	Camera Steel Pole - 4m AGL Including Foundation	No	Nil	2	14	20	4	40
1.2.2.9	Camera Concrete Hallow pole - 12m AGL	No	Nil	2	20	2	Nil	24
1.2.3	**Cabling**							
1.2.3.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	Nil	100	800	1200	100	2200
1.2.3.2	CAT 7/7A Network Cable STP Pure Copper Ethernet Cable	M	Nil	350	5000	3000	1000	9350
1.2.3.3	12 Core 50/125 Multimode (corrugated steel tape)	M	Nil	500	2000	600	200	3300
1.2.3.4	10mm2 PVC PVC Earth Wire	M	Nil	352	2150	1320	100	3922
1.2.4	**Cable Termination**							
1.2.4.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	Nil	2	16	24	2	44
1.2.4.2	Fibre optic Splicing (12 Core)	No	Nil	2	16	24	2	44
1.2.4.3	Fibre Optic Flyleads	No	Nil	2	16	24	2	44
1.2.4.4	CAT 7/7A RJ45 Termination	No	Nil	8	430	264	16	718
1.2.4.5	10mm2 PVC PVC Earth Wire termination	No	Nil	8	8	12	8	36

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	LIMESTONE HANDLING PLANT	COAL HANDLING	ASH HANDLING	FUEL OFFLOADING	TOTAL QTY
1.2.5	**Cable Routing**							
1.2.5.1	Galvanised Steel Conduit 20mm diameter	M	Nil	240	6450	3960	420	11070
1.2.5.2	76mm Wide Cable Ladder	M	Nil	100	100	100	100	400
1.2.5.3	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	Nil	8	215	132	14	369
1.2.5.5	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	Nil	10	500	10	10	530
1.2.5.6	OL 8300	M	Nil	100	100	100	100	400
1.2.5.7	COC	No	Nil	1	8	12	1	22

Table 3: Main Control Room required cameras for plant monitoring.

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	UNIT 1-6 STATION LIFTS	TOTAL QTY
2	**MAIN CONTROL ROOM (EOD)**				
2.1	**Supply and Delivery of 128 - Channel NVR system, Software, monitoring Station, Fibre Network, & Cabling**				
2.1.1	**128 Channel NVR**				
2.1.1.1	32 GB memory; 16 TB storage, 2U,12 bay racking mount kit with locking bezel' 2 x USB Front, 2 x USB 3.0; 4 x RJ45 Network; 1 x VGA, Rear, 1 x VGA Front; 110/220 VAC 50/60 Hz Input Voltage; 110V/220V Auto Sensing; Average BTU rating = 880 BTU/Hr, peak 2800 BTU/Hr; Recording and Monitoring Performance: 380 fps @1080p, 1-way audio, 800 Mbps, Including NVR Software Licences	No	2	Nil	2
2.1.2	**Software**				
2.1.2.1	Webserver, CCTV Software, Digital Video Splitter, Firewall	No	2	Nil	2
2.1.3	**Monitoring Station**				
2.1.3.1	Windows PC with operating System, 2 x 24 inch screens & software	No	4	Nil	4
2.1.3.2	Wireless Mouse	No	2	Nil	2
2.1.3.3	HDMI Cable	No	2	Nil	2
2.1.3.4	Back-up Storage	No	2	Nil	2
2.1.3.5	2 kVA UPS	No	3	Nil	3
2.1.4	**Fibre Network Switches**				
2.1.4.1	32-Port Ethernet Switch	No	1	Nil	1
2.1.4.2	64-Port Ethernet Switch	No	1	Nil	1
2.1.4.3	8-Port Ethernet Switch	No	4	Nil	4
2.1.4.4	Fibre Network/Ethernet link	No	4	Nil	4
2.1.4.5	12U Rack Cabinet IP55	No	1	Nil	1
2.1.4.6	PSU 48VDC 3A Power Pack	No	4	Nil	4
2.1.4.7	48V DC 9AH Rechargeable Sealed Battery	No	4	Nil	4

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	UNIT 1-6 STATION LIFTS	TOTAL QTY
2.1.5	**Cabling**				
2.1.2.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	100	Nil	100
2.1.5.2	CAT 7/7A Network Cable ST Pure Copper Ethernet Cable	M	100	Nil	100
2.1.5.3	12 Core 50/125 Multimode (Corrugated Steel Tape)	M	1000	Nil	1000
2.1.5.4	10mm^2 PVC Earth wire	M	100	Nil	100
2.1.6	**Cable Termination**				
2.1.6.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	2	Nil	2
2.1.6.2	Fibre optic Splicing (12 Core)	No	6	Nil	6
2.1.6.3	Fibre Optic Flyleads	No	12	Nil	12
2.1.6.4	CAT 7/7A RJ45 Termination	No	20	Nil	20
2.1.6.5	10mm2 PVC PVC Earth Wire termination	No	8	Nil	8
2.1.7	**Cable Routing**				
2.1.7.1	Galvanised Steel Conduit 20mm diameter	M	80	Nil	80
2.1.7.2	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	6	Nil	6
2.1.7.3	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	10	Nil	10
2.1.7.4	OL 8300	m	120	Nil	120
2.2	**PLANT AREAS: UNIT STATION LIFTS**				
2.2.1	**Network Switches**				
2.2.1.1	64-Port PoE +Access Switch	No	Nil	6	6
2.2.1.2	PoE Extender	No	Nil	24	24
2.2.1.3	12U Rack Cabinet IP55	No	Nil	6	6
2.2.1.4	PSU 12VDC 3A Power Pack	No	Nil	6	6
2.2.1.5	12V DC 9AH Rechargeable Sealed Battery	No	Nil	12	12

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	UNIT 1-6 STATION LIFTS	TOTAL QTY
2.2.2	**Cameras**				
2.2.2.1	IR Fixed Bullet Camera 1/2.7"; CMOS Sensor 1080p or 5MP; WDR, IP Based, 3.6mm lens, 12VDC, IP 67 IP ONVIF	No	Nil	162	162
2.2.2.2	Camera Enclosure	No	Nil	162	162
2.2.2.3	Camera Dust Proof Junction Box	No	Nil	162	162
2.2.2.4	Wall Mounted Bracket	No	Nil	162	162
2.2.2.5	Camera lightning protection	No	Nil	162	162
2.2.3	**Cabling**				
2.2.3.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	Nil	1200	1200
2.2.3.2	CAT 7/7A Network Cable STP Pure Copper Ethernet Cable	M	Nil	4860	4860
2.2.3.3	12 Core 50/125 Multimode (corrugated steel tape)	M	Nil	1800	1800
2.2.3.4	10mm2 PVC PVC Earth Wire	M	Nil	1620	1620
2.2.4	**Cable Termination**				
2.2.4.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	Nil	12	12
2.2.4.2	Fibre optic Splicing (12 Core)	No	Nil	12	12
2.2.4.3	Fibre Optic Flyleads	No	Nil	12	12
2.2.4.4	CAT 7/7A RJ45 Termination	No	Nil	162	162
2.2.4.5	10mm2 PVC PVC Earth Wire termination	No	Nil	12	12
2.2.5	**Cable Routing**				
2.2.5.1	Galvanised Steel Conduit 20mm diameter	M	Nil	8100	8100
2.2.2.2	76mm Wide Cable Ladder	M	Nil	480	480
2.2.5.3	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	Nil	324	324
2.2.5.4	OL 8300	M	Nil	300	300
2.2.5.5	COC	M	Nil	1	1

Table 4: FGD Control Room required cameras for plant monitoring

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	FGD	TOTAL QTY
3	**FGD CONTROL ROOM**				
3.1	**Supply and Delivery of 128 - Channel NVR system, Software, monitoring Station, Fibre Network, & Cabling**				
3.1.1	**128 Channel NVR**				
3.1.1.1	32 GB memory; 16 TB storage, 2U,12 bay racking mount kit with locking bezel' 2 x USB Front, 2 x USB 3.0; 4 x RJ45 Network; 1 x VGA, Rear, 1 x VGA Front; 110/220 VAC 50/60 Hz Input Voltage; 110V/220V Auto Sensing; Average BTU rating = 880 BTU/Hr, peak 2800 BTU/Hr; Recording and Monitoring Performance: 380 fps @1080p, 1-way audio, 800 Mbps, Including NVR Software Licences	No	1	Nil	1
3.1.2	**Software**				
3.1.2.1	Webserver, CCTV Software, Digital Video Splitter, Firewall	No	1	Nil	1
3.1.3	**Monitoring Station**				
3.1.3.1	Windows PC with operating System, 2 x 24 inch screens & software	No	2	Nil	2
3.1.3.2	Wireless Mouse	No	1	Nil	1
3.1.3.3	HDMI Cable	No	2	Nil	2
3.1.3.4	Back-up Storage	No	1	Nil	1
3.1.3.5	2 kVA UPS	No	3	Nil	3
3.1.4	**Fibre Network Switches**				
3.1.4.1	32-Port Ethernet Switch	No	1	Nil	1
3.1.4.2	8-Port Ethernet Switch	No	1	Nil	1
3.1.4.3	Fibre Network/Ethernet link	No	1	Nil	1
3.1.4.4	12U Rack Cabinet IP55	No	1	Nil	1
3.1.4.5	PSU 48VDC 3A Power Pack	No	4	Nil	4
3.1.4.6	48V DC 9AH Rechargeable, Sealed Battery	No	4	Nil	4

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	FGD	TOTAL QTY
3.1.5	**Cabling**				
3.1.5.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	20	Nil	20
3.1.5.2	CAT 7/7A Network Cable ST Pure Copper Ethernet Cable	M	100	Nil	100
3.1.5.3	12 Core 50/125 Multimode (Corrugated Steel Tape)	M	400	Nil	400
3.1.5.4	10mm^2 PVC Earth wire	M	45	Nil	45
3.1.6	**Cable Termination**				
3.1.6.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	2	Nil	2
3.1.6.2	Fibre optic Splicing (12 Core)	No	6	Nil	6
3.1.6.3	Fibre Optic Flyleads	No	12	Nil	12
3.1.6.4	CAT 7/7A RJ45 Termination	No	20	Nil	20
3.1.6.5	10mm2 PVC PVC Earth Wire termination	No	8	Nil	8
3.1.7	**Cable Routing**				
3.1.7.1	Galvanised Steel Conduit 20mm diameter	M	40	Nil	40
3.1.7.2	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	6	Nil	6
3.1.7.3	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	10	Nil	10
3.1.7.4	OL 8300	M	20	Nil	20
3.2	**PLANT AREAS: FGD**				
3.2.1	**Network Switches**				
3.2.1.1	16-Port PoE + Access Switch	No	Nil	3	3
3.2.1.2	32-Port PoE + Access Switch	No	Nil	2	2
3.2.1.4	PoE Extender	No	Nil	7	7
3.2.1.5	12U Rack Cabinet IP55	No	Nil	5	5
3.2.1.6	PSU 12VDC 3A Power Pack	No	Nil	5	5
3.2.1.7	12V DC 9AH Rechargeable Sealed Battery	No	Nil	10	10

ITEM NO	DESCRIPTION	UNIT	CONTROL ROOM	FGD	TOTAL QTY
3.2.2	**Cameras**				
3.2.2.1	IR Fixed Bullet Camera 1/2.7"; CMOS Sensor 1080p or 5MP; WDR, IP Based, 3.6mm lens, 12VDC, IP 67 IP ONVIF	No	Nil	71	71
3.2.2.2	Camera Enclosure	No	Nil	71	71
3.2.2.3	Camera Dust Proof Junction Box	No	Nil	71	71
3.2.2.4	Wall Mounted Bracket	No	Nil	71	71
3.2.2.5	Camera lightning protection	No	Nil	71	71
3.2.3	**Cabling**				
3.2.3.1	4 mm2/4C/PCV/SWA/PVC Power Supply	M	Nil	300	300
3.2.3.2	CAT 7/7A Network Cable STP Pure Copper Ethernet Cable	M	Nil	2840	2840
3.2.3.3	12 Core 50/125 Multimode (corrugated steel tape)	M	Nil	800	800
3.2.3.4	10mm2 PVC PVC Earth Wire	M	Nil	100	100
3.2.4	**Cable Termination**				
3.2.4.1	4 mm2/4C/PCV/SWA/PVC Cable termination	No	Nil	10	10
3.2.4.2	Fibre optic Splicing (12 Core)	No	Nil	10	10
3.2.4.3	Fibre Optic Flyleads	No	Nil	20	20
3.2.4.4	CAT 7/7A RJ45 Termination	No	Nil	142	142
3.2.4.5	10mm2 PVC PVC Earth Wire termination	No	Nil	8	8
3.2.5	**Cable Routing**				
3.2.5.1	Galvanised Steel Conduit 20mm diameter	M	Nil	2130	2130
3.2.5.2	76mm Wide Cable Ladder	M	Nil	100	100
3.2.5.3	Galvanised Steel Conduit PVC Round Boxes 1-4 way	M	Nil	71	71
3.2.5.4	110mm 6m PE, pipe/sleeve, include sealing and draw wires	No	Nil	2	2
3.2.5.5	OL 8300	M	Nil	100	100
3.2.5.6	COC	No	Nil	1	1

1.5.2 System Overview

A Closed-Circuit Television (CCTV) system is a comprehensive and sophisticated surveillance solution designed to enhance security and monitoring capabilities for various environments and plant areas within the parameters of Kusile Power Station. This system will employ video cameras, digital video recorders (DVRs), and associated components to capture, record, and manage visual information. Supporting Clauses

1.6 Scope

The scope of this document is limited to the additional CCTV surveillance system and strategic listed areas at Kusile Power Station. The design for the surveillance camera system shall consider the following:

1.6.1 Cameras

Specifications for cameras strategically placed to cover the identified critical areas in Table 2 to 4.

Table 5: Minimum specifications for cameras

Characteristics	Requirements
AGC	At least 30dB.
BLC	Back light compensation must be implemented.
Coverage Distance	The camera's specified coverage distance shall be 10% further than is required by the site design.
Frames Frequency	Minimum 8 fps
Lens	The lens shall be chosen to suit the application and the functional requirements of the site.
ONVIF Compliance	If cameras are IP Cameras, they shall be ONVIF compliant. It must however be noted that ONVIF compliance does not guarantee compatibility between systems.
Image Format	1/3 inch or larger.
Remotely Configurable	All cameras' settings (except focal length and focus) shall be remotely configurable, either via the DVR, or directly using Ethernet.
Resolution	A minimum horizontal resolution of 600 TV lines or 800 pixels.
SNR	The signal to noise ratio shall be ≥ 52dB.
WBC	Camera shall implement wide dynamic range and white balance control functionality to compensate for bright areas.
Wide Dynamic Range	Camera shall have Wide Dynamic Range.
Scalability and Flexibility	Camera shall cater for future expansions.
Environmental Damage Resistance	Camera sensor shall be protected from environmental damage. Mechanical Shutters are susceptible to failure and will not be accepted.

NB: all cameras shall have a 360-degree coverage and motion detection for comprehensive surveillance.

1.6.1.1 Recording and Storage

i. Continuous recording with configurable frame rates and resolutions.
ii. Storage capacity to retain footage for a minimum of 30 days/month.
iii. Redundant storage solutions for data backup.

1.6.1.2 Network Infrastructure

i. Integration with the existing power plant network.
ii. Scalability to accommodate future expansion.
iii. Network security measures, including encryption and secure access protocols.

1.6.1.3 Monitoring and Control

i. Centralized monitoring station with a user-friendly interface (suitable location to be proposed/identified).
ii. Real-time monitoring capabilities for security personnel.
iii. Remote access for authorized personnel (names to be provided by the Client).

1.6.1.4 Integration

i. Seamless integration with access control systems, alarms, and other security infrastructure.
ii. Compatibility with industry-standard and national Key Point protocols.

1.6.1.5 Power Supply

i. Power-over-Ethernet (PoE) support for simplified installation.
ii. Backup power solutions to ensure continuous operation during power outages.

1.6.2 Compliance and Standards

The surveillance camera system must comply with relevant security, industry standards and regulations, including but not limited the list section **Error! Reference source not found.**. The contractor shall provide documentation certifying compliance with these standards.

1.6.3 Installation, Commissioning and Maintenance Requirements

1.6.3.1 Installation Plan

i. Detailed installation plan outlining camera placement, cabling, and mounting specifications.
ii. Compliance with safety regulations during the installation process.

1.6.3.2 Commissioning

i. Comprehensive testing and calibration of all cameras.
ii. System verification to ensure proper functioning.

1.6.4 Maintenance and Support

1.6.4.1 Warranty

i. Minimum 8 to 10 years warranty for all hardware components.
ii. Schedule for maintenance and requirements.

1.6.4.2 Maintenance Services

i. Regular maintenance schedule to ensure optimal system performance and availability.
ii. Allow for prompt response times for issue resolution.

1.6.5 Documentation

The contractor shall provide comprehensive documentation, including but not limited to:

i. System architecture diagram.
ii. User manuals for system operation and troubleshooting.
iii. As-built documentation.

NB: Documentation formatting and labelling requirements shall be as per the Eskom requirements to be provided to the successful contractor.

Table 6: Applicable Standards and Codes

Document title	Document number	Revision
[1] Video Surveillance Systems for use in Security Applications.	BS EN 62676-4	
[2] Electrical security installations - CCTV installations – CCTV surveillance systems for use in security applications.	SANS 10222-5:2007	

Table 7: Applicable Eskom Documents

Document title	Document number	Revision
[3] Specification for CCTV Surveillance with Intruder Detection.	240-91190304	2
[4] Information Security - IT/OT Remote Access Standard	32-373	
[5] Cyber Security Configuration Guideline of Networking Equipment for Operational Technology	240-91479924	
[6] Specification for Electrical Terminal Blocks	240-70413291	
[7] Definition of operational technology (OT) and OT / IT collaboration accountabilities	240-55683502	
[8] Cyber security standard for Operational Technology	240-55410927	

Table 8: Other Applicable Documents

Document title	Document number	Revision
[9] Kusile Power Station Electrical Tunnel/Trench (Conceptual layout)	146838 ES 00071	A

1.6.6 Informative

The following documents as listed in table 8 **Error! Reference source not found.**, although not invoked in this specification, provide additional information or examples.

Table 9: References

Document title	Document number	Revision
[10] Video surveillance systems for use in security applications.	IEC EN62676-4	
[11] IEEE Guide for Developing System Requirements	IEEE Std1233	1998

Specifications.		
[12] Systems and software engineering, Life cycle processes, Requirements engineering.	ISO 29148	2011
[13] European Standard: Alarm systems.	EN 50132-1	2010
[14] Planning, design, installation and operation of CCTV Surveillance Systems	BSIA	2014
[15] Quality Management Systems	ISO 9001	

2 System Requirements

The components that are common to the existing and the extension system and are required for the entire system to operate are not listed since they are already available. The extended CCTV system can be broken down into four parts. These parts indicate the chain of signalling to provide the footage from the cameras to where the footage is required.

Monitoring Stations: These are the points where a human operator accesses the live and archived/recorded footage from the cameras. These are the access points for the system, and they are made up of the physical machines and the software running on them. Desks and chairs are not included.

Camera Servers: The DVM Camera Servers run the DVM camera server software package which allows interfacing to cameras, analytics, and basic camera administration, amongst others.

Network and Cabling: This consists of network switches and the wired or fibre links joining the network components to each other and to the existing network. Included are the cable trunking, conduits and supports for the conduits.

Field Devices: These include the cameras installed in the area to be monitored as well as supporting equipment e.g., illuminators, supports, shields etc.

2.1 System Definition

2.1.1 Context

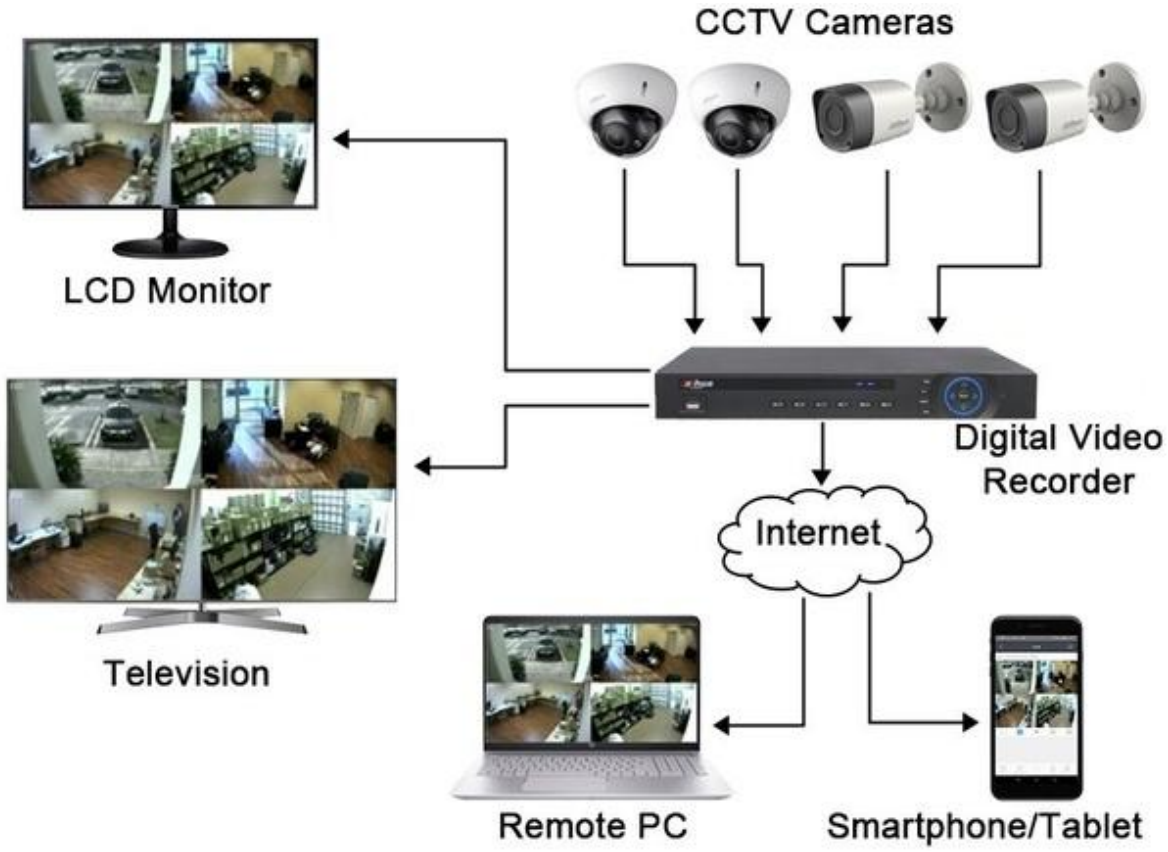

Figure 1: Overview of additional CCTV system – Plant Monitoring

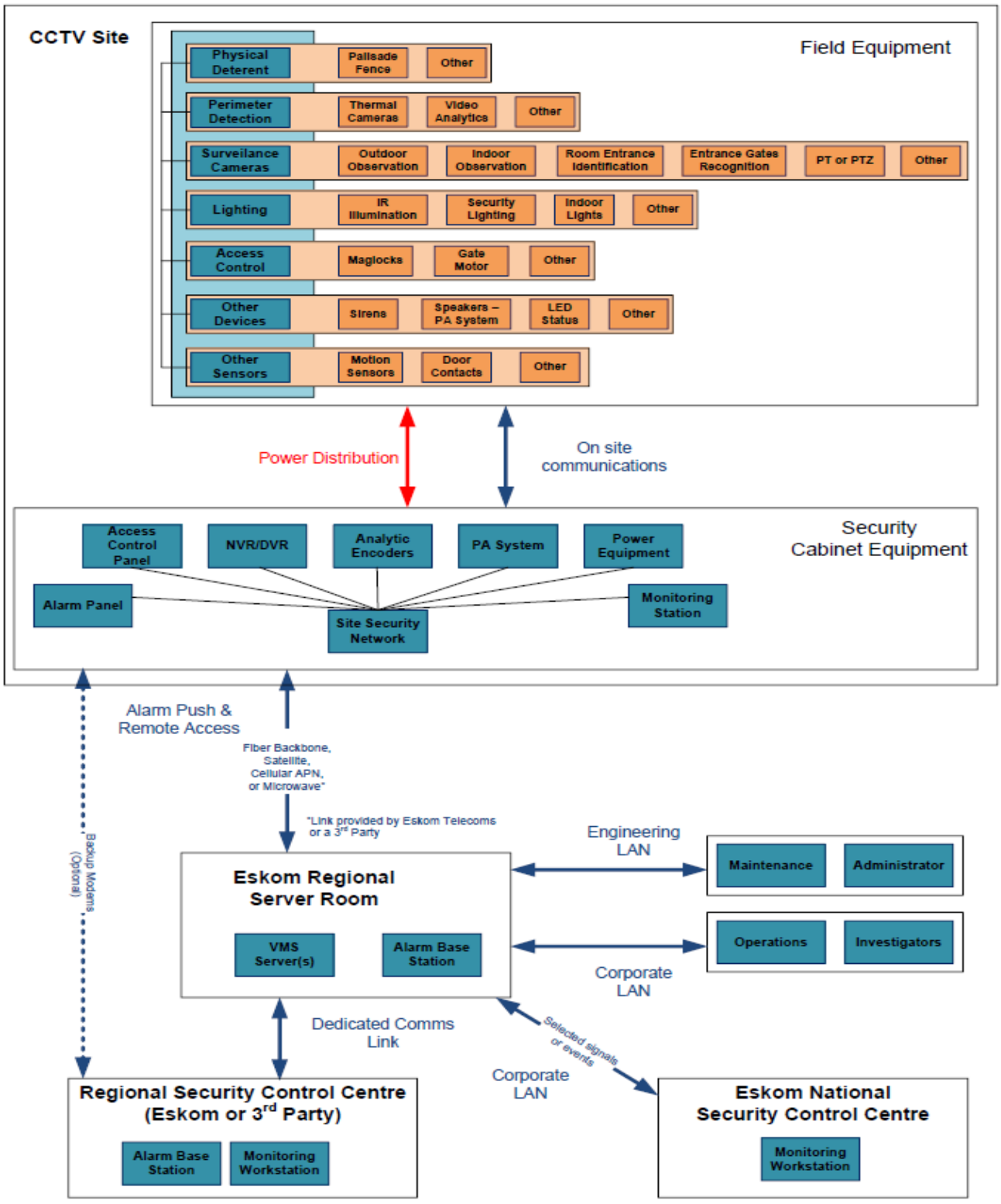

Figure 2: Functional Block Diagram of CCTV System - Security

2.1.2 External Interfaces Identification

i. The external interfaces for the monitoring system will be the remote access capabilities.
ii. The external interfaces for the security system are to the Eskom National and Reginal Security Control Centre.
iii. The designs (especially for security) shall be able to interface to the existing system (Honeywell EBI R500 and DVM R700).

2.2 REQUIRED STATES AND MODES

i. Any additions to the existing infrastructure shall not impact the current modes of operation.
ii. The system shall be available during power failures.
iii. Maintenance shall be minimal to minimise downtime.

2.3 SYSTEM FUNCTION AND PERFORMANCE REQUIREMENTS

The following formulae shall be used to evaluate the performance of CCTV and Intruder detection systems and shall be calculated monthly (adapted from DISPAVACE8).

System Availability

System Availability shall be greater than 98%

$$\boldsymbol{System\ Availability} = (\boldsymbol{Total\ hours}) / (\boldsymbol{Total\ non\ operational\ hours})\boldsymbol{Total\ Hours} \times \mathbf{100}$$

This can be calculated per site or per region.

System Reliability

Monthly System Reliability shall be greater than 95%

$$\boldsymbol{Monthly\ System\ Reliability} = \boldsymbol{Number\ of\ Faults\ in\ a\ Month} / \boldsymbol{Number\ of\ Systems\ Installed} \times \mathbf{100}$$

This can be calculated per site or per region.

System Dependability

Any single zone of the alarm / detection system shall give no more than 7 false detections in any 7-day period.

To measure this as a KPI, the following formulae below shall be used.

Monthly System Dependability shall be greater than 85%

$$\boldsymbol{Per\ Site\ System\ Dependability} = (\mathbf{1} - \boldsymbol{Number\ of\ false\ alarms\ in\ a\ month} / \mathbf{400})^2$$

This calculation is per site. Per region, the System dependability is the average of the per site values.

NOTE: This formula was chosen so as to reflect the following:

- 0 false alarms is ideal – 100% Dependable.
- 7 faults per 7 days is acceptable - 85% Dependable.
- 30 faults per 7 days indicates a poorly functioning system – 50% Dependable.
- 100 false alarms per 7 days indicates an unusable system – 0 % Dependable.

2.3.2 System Function (Monitoring)

The specific functional requirements for this type of system:

i. Observation and identification will be required from cameras that will be for monitoring purpose.

ii. The monitoring will be onsite in the plant control rooms on the operator control desks (both units and outside plant). Remote access will be for the identified personnel.

2.3.3 System Function (Security)

Not part of this scope to be done by Eskom Security.

2.4 Relationships Between States, Modes And Functions

N/A

2.5 System external interface Requirements

See section 2.1.2

2.5.1 Interface

The system will interface with existing systems at Kusile Power Station and may require access clearance from others.

2.6 External environmental requirements

All equipment shall be designed for application in 'special' environmental conditions as follows (adapted from Table 2 of IEC 60255-1):

i. Ambient air temperature: -25°C to +55°C (installed indoors); or -25°C to +70°C (installed outdoors, within enclosures).

ii. Altitude: < 2 500 m.

iii. Pollution: Location in urban areas with industrial activities and without special precautions to minimize the presence of sand or dust (conditions as per classes 3C2 and 3S2 in IEC 60721-3-3).

iv. Relative humidity (24h average): 98%.

v. All outside equipment Including fasteners and supports should be corrosion resistant and appropriate for the environment on site.

vi. After fabrication, metal surfaces including doors and removable covers shall be prepared and finished with corrosion protection.

vii. Paint work damaged during transport and delivery shall be made good as per manufacturer repair specification at no cost to Eskom. If site re-painting is necessary, the equipment and labels shall be carefully masked, and any overpaint which occurs in spite of the masking must be removed. If the damage is not repairable, Eskom reserves the right to return the equipment.

viii. All nuts, bolts and washers use for the construction to be stainless steel. Screws can be cadmium plated.

ix. Equipment installed will need added dust protection.

x. Convection cooled (fan-less) equipment are strongly preferred. If fans are used, they shall be speed controlled and the electronics shall be isolated and conformal coated to protect against dust ingress.

2.7 External Resource Utilisation Requirements

i. The expected life of equipment under conditions specified **Error! Reference source not found.**shall be a minimum of 8 to 10 years.
ii. All power cable shall be appropriately sized to ensure voltage drops along cable runs remain within the operating specifications of the equipment being powered.
iii. All equipment shall be effectively protected against overvoltage due to lighting strikes or switching surges by strategically placed surge arrestors.

iv. Descriptive cable markings shall be used as agreed to with Eskom. These shall be reflected on the drawings.
v. Cable selection and routing shall always be done in such a way that operation of equipment is not affected by electrical interference. This may be achieved by separating power and communications cables, shielding of cables, or a combination of the two.
vi. Equipment shall not be affected by electrostatic discharges that are applied directly to the equipment or to metal objects in the proximity of the equipment: All electronic equipment shall be a class 2 device as specified in IEEE 1613-2009, 8 Electrostatic discharge tests.

2.8 Physical Characteristics Requirements

Over and above the requirements covered in section 2.6 and 2.7 above the following additional requirements shall be catered for:
i. Cable routing.
ii. Outdoor cables and trenching (where required).
iii. Interface to security cabinets.
iv. Backup power supplies.
v. Communication.

2.9 Safety

The site-specific Health and Safety plan shall be accepted by an Eskom Health and Safety practitioner before any installation begins.

2.10 Reliability, Availability and Maintainability

The RAM for the CCTV system must involves a combination of quality components, robust design, proactive maintenance, and user-friendly interfaces. Regular monitoring, testing, and adherence to best practices in system design and operation contribute to the overall effectiveness of the CCTV system in providing continuous and reliable surveillance.

2.10.1 Reliability

The reliability of the system shall have the ability to consistently, accurately capture and record video footage without failures or disruptions.

2.10.2 Availability

The availability of the system being supplied over its life in percentage of time shall be 99.99% or greater measured annually.

2.10.3 Maintainability

The system should be designed to cater for ease and efficiency of repairs (availability of spares), upgrades and maintenance.

2.10.4 Affordability

The design should try to minimise costs for construction plus running costs.

2.10.5 System Life-Expectancy

i. All equipment shall be supported and maintainable until the selected technology end of life.
ii. Proven technology shall be utilized.

2.11 Security

The system shall be designed to protect the plant and the station from unauthorised access and cyber-attacks.

2.12 Design and Construction Requirements

2.12.1 General Design and Manufacturing Process Constraints

a) Flexibility, expandability, scalability, and reusability must be provided to support future areas of growth or changes in technology and purpose:

   i. **Expandability:** the capability of the intended system to be easily modified in response to potential areas of growth in requirements. Once modified, the system may require different procedures with respect to operations, maintenance, or both.

   ii. **Flexibility:** the ease with which the intended system can be modified to be able to handle input variety and input volume changes, differing from those for which the system was specifically designed. An example would be anticipated changes in the quality of coal delivered to a coal-fired power-station at some future date.

   iii. **Scalability:** the capability of the intended system to continue operating correctly with minimal change in current procedures as the system is enlarged to accommodate growth; and

   iv. **Reusability:** the capability of the intended system to be deployed into scenarios different to the initial requirement and environment.

b) Training of personnel who will use or support the system identified by the client shall be provided.

2.12.2 Sub-System Requirements

N/A.

2.12.3 Engineering Disciplinary Requirements

Kusile Power Station engineers shall be able to connect to the Local OT Security Server remotely from the Eskom Engineering (OT) LAN to perform maintenance and administrative tasks on the system.

2.12.3.1 Civil and Structural

Catered for in the design proposals.

2.12.3.2 Mechanical and Materials

Catered for in the design proposals.

2.12.3.3 Chemical and Process

N/A.

2.12.3.4 Electrical

See section 2.7

2.12.3.5 Instrumentation and Control

Manual and automatic actions for system initiation and control, indicators, alarms, manual controls that are used to operate the system, required ranges and accuracies to be provided for in the designs.

2.12.3.6 Computer Hardware and Software

For any software that may require licences (if any):

i. All licenses covering the equipment, standard software and application software provided shall be provided for.

ii. All licenses shall remain valid in the event of the failure and replacement of faulty equipment.

iii. All licenses provided shall be valid for the entire life of the system being provided.

iv. All licenses shall be site licenses for use at Kusile Power Station Site.

2.12.3.7 Fire Detection and Protection

Catered for in the design proposals.

2.12.4 Human Factors Engineering Requirements

N/A.

2.12.5 Documentation

The Contractor is responsible to plan for the supply of the documentation during the design, supply, installation, testing, commissioning and handover of the CCTV System and a document is thus any written or pictorial information describing, defining, specifying, or certifying activities, requirements, procedures and or results.

All documentation (entire architectural, equipment room layout, loop diagrams drawings, datasheets etc.) issued by the Employer for this contract is copyright protected and are not to be copied or distributed by the Contractor [8].

The Contractor shall submit all documentation on a formal transmittal form in triplicate to the Project Manager. All documents, reports and engineering documentation shall be compiled and presented in English language be in the required Microsoft Office Word, PowerPoint, Excel, PDF and or Project file extensions format.

The Contractor shall implement a legible, comprehensive, and complete documentation (control system), including their revision status and of the document status in relation to the "as designed" system status. Software licence, network architecture manuals and drawings, document control, loop diagrams, termination diagrams are included.

The drawing documentation format shall include:

Drawing number (Employer and makers number)

i. Revision.

ii. Approval status.

iii. Location of drawing at that stage.

iv. Drawing KKS number.

v. Drawing description.

vi. Sheet number.

vii. Transmittal number.

2.12.6 Packaging, Handling and Transporting Requirements

i. All the identified equipment that will be supplied as part of the scope shall be packaged such that it can be easily transported without being damaged.

ii. Dedicated areas shall be provided by Kusile Power Station for temporary storage.

iii. A detailed inventory of all equipment that is stored in the storage areas shall be provided.

2.13 Other Requirements

N/A.

2.14 Precedence of Requirements

Shall be dealt with contractually.

2.15 Verification

The Contractor shall demonstrate that the CCTV System hardware equipment has been tested satisfactory by producing the test certificates. The contractor shall demonstrate the functionality of the system prior to the installation of the system in the production environment through a FAT. Furthermore, it is the responsibility of the Contractor to ensure that the system is tested after installation to the satisfaction of the Employer's data quality requirements with commissioning and a SAT.
The Testing environment needs to be accommodated that may be used as training once the system is deployed in production by the Contractor. As well as the production environment needs to be created for production or security. The submissions shall include the various test phases as stated in section 2.5 of [3].

2.16 Notes

This project is of a strategic nature and covers aspects of compliance to requirements of the National Key Point. All the information and discussions will be treated in strict confidentiality and should not be shared without the consent of Eskom.

3 Management and start up.

3.1 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:
Project Kick-off Meeting	3 days Contract Award	Kusile Power Station	Employer, Contractor and Others
Execution Progress Meeting	Bi- Weekly	Kusile Power Station	Employer, Contractor and Others
Risk register and compensation events	Bi- Weekly	Kusile Power Station	Employer, Contractor

Meetings of a specialist nature may be convened as specified elsewhere in this Works Information or if not so specified by persons and at times and locations to suit the Parties, the nature and the progress of the *works*. Records of these meetings shall be submitted to the *Project Manager* by the person convening the meeting within five days of the meeting.

All meetings shall be recorded using minutes or a register prepared and circulated by the person who convened the meeting. Such minutes or register shall not be used for the purpose of confirming actions or instructions under the contract as these shall be done separately by the person identified in the *conditions of contract* to carry out such actions or instructions.

3.2 Documentation control

All contractual communication between the *Employer* and the *Contractor* shall be in the form of properly compiled letters or forms attached to e-mails and not as a message in the e-mail itself. All formal communication is via the *Project Manager.*

3.3 Health and safety risk management

The *Contractor* complies with the Occupational Health and Safety Act Number 85 of 1993 and its regulations, *Employer*'s SHEQ Policy, Standards, Procedures, Guidelines, Specifications and Regulations. The *Contractor* ensures safety awareness at all times through continuous training.

The *Contractor* must at all times be responsible for the supervision of his employees, agents and sub-*Contractor*s, and takes full responsibility and accountability in ensuring that they are competent, compliant and aware of the legal requirements and other applicable requirements, and executes the works accordingly.

The *Contractor* ensures that all statutory appointments, and appointments required by any *Employer*'s Policy, standard and Procedure, are recorded in writing and that all its appointees and/or agents fully understand their responsibilities and are trained and competent to execute their duties.

The *Employer's Project Manager*, or any person appointed by the *Employer's Project Manager*, may at any stage during the term of the contract:
Conduct health and safety audits by a competent person regarding all aspects of compliance with the SHEQ requirements, at any off-Site place of work, or the Site establishment of the *Contractor.*

Refuse any employee, sub-*Contractor* or agent of the *Contractor* access to the premises if such person has been found to commit an unsafe act or if any work is found not to be compliant or authorized.
Issue the *Contractor* with a STOP WORK ORDER should the *Employer's Project Manager* become aware of any unsafe working procedure or condition, or any non-compliance.

The *Contractor* immediately reports all incidents as well as any threat to safety and health of which the *Contractor* becomes aware at the Site, to the *Employer's Project Manager*.

The *Contractor* agrees that the *Employer* is relieved of any and all of its responsibilities and liabilities in terms of the Occupational Health and Safety Act no 85 of 1993 in respect of any acts or omissions of the *Contractor*, and the *Contractor's* employees, agents or sub-*Contractor*s, to the extent permitted by the Occupational Health and Safety Act no 85 of 1993.

The *Contractor* provides a health and safety plan based on the *Employer's* Safety, Health and Environmental Specification.
All persons entering the Site must undergo the *Employer's* safety induction course.
The designer of the *Works* is mandated to comply with section 6 of the construction regulation 2014.

3.3.1 Safety of Worker

The *Contractor* is to ensure the safety of all persons working on the Site.
Any hot work, including welding, will be applied for in accordance with the permit to work system.
No hot work will be allowed on Site unless a hot work permit is granted in writing.
Precautions must be taken to prevent any objects, welding or grinding sparks from falling beyond the immediate working area.
Ear protection and all required PPE must be provided to all personnel by the *Contractor*.
The *Contractor* completes activity risk based assessments and provides the assessments to the *Project Manager* for acceptance before activities take place.

3.3.2 Fire Protection

The *Contractor* must ensure that his employees are trained in the use of firefighting apparatus.
The *Contractor* must take precautions to prevent any occurrence of fires or explosions while carrying out any work near flammable gas and liquid systems. Any tampering with the *Employer's* fire equipment is strictly forbidden. All exit doors, fire escape routes, walkways, stairways, stair landings and access to electrical distribution boards must be kept free of obstruction, and must not be used for work or storage at any time. Firefighting equipment must remain accessible at all times.

In case of a fire, the *Contractor* must immediately report the location and extent of the fire to the Electrical Operating Desk using the station's Emergency Number. The *Contractor* must take the necessary action to safeguard the area to prevent injury and spreading of the fire.

3.3.3 First aid

The *Contractor* provides First Aid services (level 2) to his employees and sub-*Contractor*s. In the case of severe or serious injury, to his employees and sub-*Contractor*s the *Employer's* Medical Centre and facilities will be made available and accessible to such persons.

3.3.4 Housekeeping

It is the *Contractors* responsibility to ensure that the Site is cleaned daily. All electrical cables and hoses are routed so as not to cross unprotected over floors and walkways. All equipment is packed neatly without interference to access. All excess scaffolding material is removed from Site after the scaffolding has been erected. The *Contractor* is responsible for the removal of any scrap material to the designated scrap area on a daily basis.

3.3.5 Barricading

Access to danger zones is restricted using handrail type guards at least 1.2 meters high and able to block access to the danger zone. Red tape is not allowed. Symbolic safety signs depicting 'Danger', name of

Contractor, Responsible Supervisor, Contact details of supervisor and 'No entry' are attached to the guards. This includes access during the taking of X-rays.

3.3.6 Radiographic Examinations

When radiographic tests are carried out in the plant by *Others*, the danger area is evacuated with the exception only of authorized radiographic workers, and thereafter barricaded. To ensure that employees and contract staff working in *Employer's* premises are not exposed to more radiation than is reasonable level, the *Contractor* complies with the Kusile Power Station procedure 'Requirements and Rules for Radiation Protection and Safety of Radiation Sources'.

3.3.7 Permit to Work System

The *Contractor* allocates personnel to be trained and authorised as Responsible Persons according to *Employer's* Plant Safety Regulations (36-681). The *Contractor* ensures that adequate number of appointed Responsible Persons and Authorised Supervisors prior to the outage date or commencement of work at the station. The *Contractor* ensures that Responsible Persons and Authorised Supervisors are available on Site at all times during the execution of the Work.
If the *Contractor* breaches this obligation, the *Employer's Project Manager* withholds monthly payments until the *Contractor* complies with this obligation.

3.4 Environmental constraints and management

a) The contractor and or supplier shall have a documented and implemented environmental management system e.g. environmental policy, operational procedures relating to their activities, Environmental Aspects and Impacts Register.
b) The contractor and or supplier shall prepare an environmental management plan relating to their activities that will be carried out. The environmental management plan shall be based on, amongst others, Eskom Kusile Power Station's OEMP and any other applicable environmental legislation. The environmental management plan must include all the aspects and impacts relating to the activity and address the principle of continual improvement.
c) The contractor and or supplier employees shall attend induction on environmental management prior to commencement of work at Kusile Power Station.
d) The contractor and or supplier shall comply with all Eskom Kusile Power Station environmental requirements such as policies, standards and procedures.
e) The contractor shall appoint trained and competent personnel in writing, who will have the responsibilities of implementing all environmental requirements on a specific contract.
f) Non-conformance and All spills/emergency incidents shall be reported to Eskom Contract Manager and Environmental Officer(s) immediately on occurrence, such reports must include but not limited to the following information:
    a. The date and time of the incident
    b. The cause of the non-conformance/incident;
    c. The proposed actions to correct and prevent recurrence.
g) Eskom Kusile Power Station shall issue non-conformances where there are deviations from Eskom Kusile Power Station Procedures and any other environmental requirements, and the Contractor or Supplier shall be responsible to provide an action plan and close out of such non-conformances timeously.
h) Environmental Incident Investigations shall be done jointly where responsible managers and the environmental team from Eskom and the Eskom subsidiary or contractor are present.
i) Environmental Incident investigation shall be done in accordance to Eskom Environmental Incident Management Procedure (240-133087117).
j) The contractor or supplier shall be responsible to ensure duty of care during execution of work at Kusile Power Station and shall be liable for the costs for the costs of remedying pollution, *environmental degradation and consequent adverse health effects as indicated on the NEMA principles below:*

National Environmental Management Act 107 of 1998 (NEMA) principles:
• Duty of care and remediation of environmental damage

Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorized by law or cannot reasonably be avoided or stopped, to minimize and rectify such pollution or degradation of the environment.

• Polluter Pays Principle

The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

k) The *Contractor* and or supplier shall allocate funds for the implementation of environmental requirements.
l) All contractors shall abide to Eskom Zero Liquid Effluent Discharge through the process of reuse and recycling.
m) All waste generated during the execution of the scope of work shall be managed in accordance with Kusile Power Station Waste Management Work Instruction (240-105776552) and in compliance with applicable environmental legislation and bylaws.
n) All contractors should be aware of Eskom SHEQ Policy.
o) All contractors must take into account environmental consideration when carrying out Risk Assessments.
p) All equipment used on site must be in good working condition and no fuel and/or oil leaks on any plant will be tolerated.

Records to be kept onsite for Environmental Management

The following minimum records shall be kept on sites:

a) Contractor site specific Environmental Management Plan and Environmental aspect and impact register. Environmental aspect must be identified, and how they should be mitigated and also be communicated to employees. Proof of communication must be available

b) Environmental Incident registers and investigation reports.
Incident must be reported immediately or within 24 hours of occurrence, investigation must take place within 7 days and concluded with 30 days, lesson learned must be shared with employees. Record of environmental incidents must be made available.

c) Non-conformance register.
When non-conformances are closed, they should be investigated and close-out within the agreed timeframes.

d) Complaints register. Where complaints are raised they should be reported to Kusile Environmental management Department, be investigated and closed out.

e) Waste disposal register

f) Hazardous Substances registers and SDS where applicable.
Where hazardous substances are used, a register should be maintained and all SDS should be available and communicated to employees.

g) Records of audit reports and audit findings close-out, where applicable.

h) Records of audit and how findings where closed should be maintained.

i) Records of environmental inspections conducted.
Monthly environmental inspection should be conducted and records of inspections should be maintained.

j) Licences for Landfill sites/Waste Treatment plant for all waste streams generated and disposed by the contractor.

k) Registration certificate for a waste service provider appointed by the contractor
l) Safe disposal certificates or weighbridge certificates for all waste disposed.

Tender Submission Documentation

The following documentation shall be submitted with all tender submissions:
a) Environmental Policy
b) Aspect and impact register or an environmental management plan (relevant to the scope of work)
c) Environmental Management System Certificate (if certified) if not, an environmental management system manual or procedures
d) Waste Management Plan
e) Proof of training of persons performing activities that could have significant impact on the environment.

3.5 Quality Assurance Requirements

3.5.1 Quality Management

The quality requirements are as per ISO 9001:2008 and *Employer* Quality Standard, QM 58. This quality management philosophy is developed from the basis that manufacturers produce quality products, supervisor oversees the process, checks quality but liability for quality remains with the *Contractor*. The *Contractor* submits a QMS as a returnable schedule and uses it for all phases of the Project. The QMS complies with the requirements of ISO 9001:2008 standard. The *Contractor* provides evidence of a fully implemented QMS as and when requested by the *Project manager*.

The *Project Manager* may at his sole discretion carry out an audit on the *Contractor*, the *Contractor*'s suppliers and Sub-*Contractor*s
Quality control plans will be produced by the *Contractor* or manufacturer which will indicate the level of product quality control to be applied. The CQP must be aligned to, and reference ISO 10005:2005 QMS, guidelines for quality plans and in compliance with the guideline in 240-105658000. The CQP will make reference to the *Contractor's* QMS Procedures to be used in this Contract. This plan will be reviewed by the *Project Manager*. The project team monitors that these plans are being implemented and that it is yielding the expected results through process and product verifications.

High quality standards are also assured by conforming to the following:

a) The use of sound design and engineering principles,

b) The design process uses a good performance and functional specification,

c) It is ensured that the installation conforms to the Works Information.

d) Design Review Procedure is followed

e) Engineering Change Procedure

f) QA/QC on project (manufacturing, installation)

The *Contractor* submits the following documents within ten (10) working days of the Contract Date to the *Project Manager* for review and acceptance prior to the commencement of work:

a) The *Contractor's* QMS compliance with the requirements of ISO 9001:2008

b) *Contractor's* quality manual

c) *Contractor's* quality procedures

d) *Contractor's* quality forms and work instructions

e) *Contractor's* quality system documents referenced in this Works Information

The *Contractor* supplies the *Project Manager* with a QCP or ITP for review and acceptance.

The *Contractor* supplies the *Project Manager* with a detailed contractor organogram showing the quality personnel to be used in the Contract. The *Contractor* provides CVs of the quality management employees who will be responsible for quality.
The *Contractor's* Quality Management employee's responsibilities include but are not limited to the following:

a) Implementation of the QMS

b) Administration of QA/QC systems

c) Verification of approval status of Sub-*Contractor*'s QCP and procedures

d) On-and -offsite inspections

e) Co-ordination, inspection and verification of the *Employer's* intervention points

f) Review of *Contractor* testing and inspection documents (procedures, test results)

- Reporting on quality performance

The requirement to submit these documents does not constitute a compensation event.

3.5.2 Quality Responsibility

a) The *Contractor* is accountable for the quality of the output and liable for any failures.

b) The *Contractor* is responsible for defining the level of intervention of QA/QC or inspections. These are in line with the *Employers* requirements.

c) The *Contractor* is responsible for defining the level of intervention of QA/QC or inspections to be imposed on his Sub-*Contractor*'s, suppliers and sub-suppliers and must ensure that these are in line with the *Employer*'s requirements.

d) The intervention requirements take into consideration the criticality of the Plant and Material.

e) The intervention points include all witness, hold, verification and review points required by the *Employer*. The *Contractor's* failure to allow the intervention points will constitute a non-conformance.

3.5.3 Non Conformances and Defects

Where NCR's and Defect notifications are issued, the *Contractor* acknowledges receipt within 48 hours and proposes corrective and preventive actions to the *Project Manager* as per the contract response period. The corrective and preventive actions will include the implementation and completion dates. Progress on all NCR's and Defect notifications issued to the *Contractor* must be reported to the *Project Manager* on monthly basis.

The *Contractor's* Quality Manager keeps a register of all NCR's and Defect notifications issued. Deviations from the Contract are treated as a non-conformance. Records of NCRs and Defect notifications are kept and form part of the data book records.
During the contract execution phase, the *Contractor* will be monitored by the *Project Manager* for performance on quality related aspects. The monitoring will be in the form of audits and assessments.

3.6 Programming constraints

3.6.1 Inclusions in the programme

General
This contract shall follow ECC contract, Clause 3-Time.
The Contractor submits a Level 4 Microsoft project or Primavera P6 programme for the project manager acceptance.

- Discipline Speciality Program (Level 4)

This is the execution Schedule, also called a Project Working Level Schedule. Level 4 is the detailed working level schedule, where each schedule is an expansion of part of a Level 3 schedule and is established within the integrated project schedule.

This programme typically represents day-to-day tasks which are work unit based and become summarised in the Level 3 activities showing the following:

- The starting date, access dates, key dates, and planned completion date.
- The order and timing of all tasks which the contractor plans to do in order to provide the works
- Critical path
- Float
- Time risk allowances, which shall include weather allowance.
- Health and safety requirement

3.6.2 Computerised Planning and Reporting
The programme shall be submitted in MS Project/ Primavera P6 format and the basis of schedule to support the schedule, showing inclusion and exclusions.

3.6.3 Project Calendar
The project calendar includes working days (Monday to Friday) and excludes non-working days which are weekends (Saturday to Sundays) and Public Holidays. If and when the Contractor deems any period in a calendar year as a non-working day, e.g. pay weekends, etc. such shall be declared up front and agreed with the Project Manager in the first programme for acceptance by the Project manager. Failure to declare these days shall render any later declaration as null and void and the Contractor shall provide the services to comply with the accepted first programme.

3.6.4 Additional Programme Requirements

The programme layout takes into account the Key Dates provided in the Contract and the Work Breakdown Structure (WBS).

The following levels of programme are to be used for this project for dynamic integrated project control:

- Management level programme (Level 1)
- Project level programme (Level 2)
- Control level programme (Level 3)
- Discipline speciality programme (Level 4)

3.6.5 Submission of Revised Programmes
The Contractor submits one electronic copy in MS Project (MPP) of the revised programme to the Project Manager for acceptance. The contractor shows on each revised programme.

- The actual progress achieved on each operation and the timing of the remaining works
- The effects of the implemented compensation event
- How the contractor plans to deal with any delay and to correct the notified defects
- Any other changes that the contractor proposes to make to the acceptance programme.

3.6.6 Bi-Weekly Progress reporting
A bi-weekly status report is submitted by the Contractor to the Project Manager. The Contractor submits updated programme bi-weekly or as instructed by the Project Manager.

. Contents of a weekly report will include the following items:

- The updated MS Project/ Primavera P6
- Programme summary narrative (Basis of schedule)
- Progress and performance summaries
- Key Milestone status

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

Contractor to submit an Organogram for the company indicating all roles and responsibilities relevant to the implementation of the work stated in this document. The *Contractor* is required to make all appointments as per the technical, Quality and Health and Safety and Environmental requirements. The *Contracto*r shall provide all SHEQ and compliance documentation which include but not limited to the following:

- SHEQ policy
- SHE Plan
- Environmental Plan
- Environmental Policy
- Risk Management Plan
- Baseline Risk assessment
- All accreditation and qualifications
- Technical and professional organizations affiliations.
- SHEQ appointments
- SHEQ accreditations

3.8 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:

- Name and address of the *Contractor* and the *Service 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;
- The invoice is to be submitted to invoiceseskomlocal@eskom.co.za once confirmed with the payment certificate.

3.9 Contract change management

Contract change management shall be done as per the NEC ECC compensation event process.

3.10 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.

4 Engineering and the *Contractor*'s design

4.1 *Employer*'s design

See section 2.5 of this document.

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

Covered in detail in section 2 of this document.

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

4.3.1 Documentation Requirements

The *Contractor* ensures that the Technical Documents and Records Management Work Instruction, 240-76992014 is adhered to for all documentation requirements. The *Contractor* is responsible for the compilation and the supply of all documentation during the various project stages. The *Contractor* makes provision in their programme for the submission of design documentation. For consistency, it is important that all documents used within the project follow the same layout, style and formatting as described in the Technical Documents and Records Management Work Instruction, 240-76992014. Documents such as QCP's, Method Statements etc. that impact the project works to be approved by the *Employer* at least 3 working days prior to commencement of the works.
Each revision of a document or drawing shall be accompanied with a list of comments made by the *Employer* on previous revisions, if applicable. The responses/corrective actions taken by the *Contractor* to be recorded in a revision table contained in each drawing/document.
Documents and drawings to indicate the *Employer'*s unique identification number as allocated by the Employer. The *Contractor* may also have his own internal document or drawing number on the document or drawing.
The *Contractor* compiles a complete data book for all works performed during manufacturing, construction and commissioning. The data package to contain the following attributes as a minimum, where applicable:

- Design drawings used to execute the works
- Approved construction/installation method statement
- Approved QCP/ITPs
- Material certificates/data sheets for all components
- Test reports
- Calibration certificates
- Certificates of Completion (CoCs) or Professional Engineering Certificates (PECs)
- Operating and maintenance manuals
- Spares catalogue
- Storage, packing and transportation instructions

4.3.2 The Contractor shall ensure that documents have the following minimum attributes on the cover page:

- Document title
- Document unique identification number (Eskom number)
- Contractor document number, if applicable
- Document status
- Revision number
- Document type
- Document revision table/history
- Page number on the footer
- Document author/authoriser
- Document originator

The following additional attributes are important for technical documents:
- Package/System name/sub-system name

- Unit number
- Contractor name
- Contract number
- Plant identification codes

4.3.3 Format and Layout of Documents

For consistency, it is important that all documents used within a specific domain follow the same layout, style and formatting standard.

4.3.4 Layout and Typography

Every document should comply with the following font specifications:

- Font Colour: Black
- Main Headings Font Type: Arial, Bold, Capital Letters
- Main Heading Font Size: 12pt
- Sub Headings Font Type: Arial, Bold, Title Case
- Sub Headings Font Size: 11pt
- Body Font Type: Arial, Sentence Case i.e., only the first letter of the first word is a capital letter.
- Body Text Font size: 11pt
- Line Spacing: 1.5 line spacing
- Margins: Standard
- Alignment: Full justification to be used
- Paragraphing: One line skip between paragraphs
- Pagination: Centred page numbers (about 0.5 inches from bottom)
- Indentations: Standard tab for all paragraphs (about 0.4 to 0.5 inches)

4.3.5 Document Headers

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

4.3.6 Naming of files

The Contractor complies with the Eskom standard for naming documentation files. The standard is as follows:

For documents that have an approval date and signature; (YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtention)

For documents that do not necessarily require the ‘Approved Date’ and ‘Revision & Versioning’, use the date of update;
(YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtention).

4.3.7 Documentation Submissions

The Contractor's program to allow a minimum of 21 days for mailing, processing, and review of drawings and data by the Employer. All documents and records must be submitted and managed according to the Project/Plant Specific Technical Document and Records Management Procedure, 240-76992014
as well as the Generation (Gx) Projects Documentation Deliverable Requirements Specification,240-65459834. The Employer shall ensure that the Contractor is provided with the latest revisions of the mentioned documents.

a. Information Requirements

The *Employer* requires information and data from the *Contractor* for management and execution of the Contract as well as the operation, maintenance and support of the *works*. The *Contractor* to supply all information required in terms of the Contract including, whether or not specified in the Contract, all information necessary for:

1. Design reviews and the interface management of the *works*,
2. Quality assurance and control,
3. Operations, maintenance, training etc.

The scope of supply of information from the *Contractor*, to include the below document list, if applicable:

- **Typical Document Requirement List**

Document Group	Description of document type (includes information data sets)
General	Equipment arrangement drawings Piping & Instrument Diagrams (P&ID's) Engineering and procurement schedule Equipment list Isometric drawings Equipment specifications & data sheets Drawings and data for all equipment and material Installation, Operation, and Maintenance (IOM) Manuals Spare parts list Factory Acceptance Test (FAT) report
Quality Assurance	Quality assurance manual Quality control plans Quality control reports Weld summary index Material traceability certificates Manufacturing test reports Manufacturing Non-Conformance Reports (NCR's)
Civils & Structures	Building arrangement and floor layouts Structural drawings Architectural drawings Structural analysis and design report Foundation drawings Structural support drawings Access Platform/Walkway Drawings Professional Engineering Certificates from Professionally Registered Engineers

- **Typical Document Requirement List**

Document Group	Description of document type (includes information data sets)
Construction	Transportability study/report (including heavy haul study) Site management plan (QA, Safety, Environmental etc.) Construction schedule Site storage requirements for major equipment Construction test records Maintenance records for all equipment while stored on site Constructability report
Commissioning	Commissioning schedule Commissioning procedures Performance test procedure Performance test reports Field test reports and certificates
Operations	Operating procedures Plant operational documentation Plant tech specs Operating scenarios (for C&I control purposes)
Logistic Support	Maintenance concept Plant maintenance documentation ISI plan/program Spare parts assessment Plant RAM analysis Equipment access and removal paths assessment Fault finding diagrams
Training	Training plan Training manuals and instructions
Safety & Protection	Fire hazard analysis Waste management plan
Design Analyses	Reliability model and analysis Transient / Transition Analysis Flow dynamics analysis Thermo-hydraulic analysis Pipe Stress Analysis Maintainability analysis FMECA / FMEA analysis HAZOP analysis 3D model interference checks
Electrical	Motor list Electrical load list Circuit list Raceway list Single line diagram Protection schematic diagram Electrical load flow and fault studies report Cable block diagrams Cable schedule Cabling routing and cable racking layout diagrams Cable termination diagrams EMC and earthing standards report Earthing layout drawings Lighting layout drawings

• **Typical Document Requirement List**	
Document Group	**Description of document type (includes information data sets)**
C&I	Alarm and set-point schedule Instrument schedule Instrument data sheets Mechanical hook-up drawings Electrical hook-up drawings Cable Schedule Termination Schedules Junction Box GA and Internal Layout Junction Box and Instrument location drawings Instrument Stand GA Maintenance Manuals and procedures Operating and Control Philosophies Functional Logic diagrams Field device calibration certificates Level measurement installation report
CBMS	Alarm and set-point schedule Instrument schedule Instrument data sheets Equipment layout drawings Routing layout drawings Cable schedules Termination schedules Junction Box GA and Internal Layout Instrument Stand GA Maintenance Manuals and procedures Operating and Control Philosophies Field device calibration certificates Network architecture Fire risk assessments

b. **Drawings**

The creation, issuing and control of all Engineering Drawings shall be in accordance to the latest revision of the Engineering Drawing Standard , 240-86973501 - to be supplied as part of the enquiry documents. Drawings issued to the *Employer* will be a minimum of one hardcopy and an electronic copy. The *Contractor* is required to submit drawings electronically in both native CADD format and PDF format. Drawings issued to the *Employer* may not be “Right Protected” or encrypted.

c. **Documentation Reviews**

The *Contactor* shall conduct design reviews in accordance to the *Employers* Design Review Procedure, 240-53113685 and participate in all design reviews as specified by the *Employer*. The *Employer* shall review and consolidate review comments for submitted documentation by the *Contactor*. The *Contactor* shall also make the necessary revisions or rectify noted issues highlighted on the documentation by the *Employer*. The *Consultant* must include the documentation reviews as part of the Design and Construction schedules and allocate appropriate timelines/durations for these activities.

d. Submission of the *Contractor’s* Design

- The *Contractor* submits all design documentation to the *Employer* for review. The documentation submitted to include all design elements i.e. drawings, calculations, reports etc.
- The *Employer* conducts a review of the design documentation. The *Employer* reserves the right to review any design in detail, where deemed necessary. The *Employer* accepts no accountability and liability due to the review of any designs.

- The *Contractor* is the Design Authority as defined in the Design Review Procedure, 240-53113685 for the *works*. The *Contractor* is responsible for following this design procedure and conducts all the design reviews as specified in this procedure.
- The following process will be followed for submission of documents:
  - The *Contractor* submits the documents/drawings to the *Project Manager*.
  - The *Project Manager* distributes the documents/drawings to all relevant parties within the *Employer's* project team to review
  - The *Employer's* project team reviews the documents/drawings and submit all comments or inputs to the *Project Manager*. The *Project Manager* submits the review comments to the *Contractor* for consideration.
  - If the *Employer* finds major deficiencies in the submitted documents/drawings, the *Contractor* revises the documents/drawings and resubmits to the *Project Manager*.
  - The *Employer* reviews the documents/drawings and if no major deficiencies are found, the *Contractor* organises a review session.
  - The *Employer* and the *Contractor* conduct a review.
  - If any fundamental errors are found in the review or further actions are required, the *Contractor* records all concerns raised and revises the documents/drawings accordingly.
  - The *Contractor* organises a review session once all documents/drawings have been revised
  - If no fundamental errors are found in the documents/drawings during the review session, the *Contractor* compiles the review minutes/report and submits to the *Employer*.
  - The *Employer's* project team reviews the *Contractor's* report/minutes. If the report/minutes are not acceptable, the *Contractor* revises the report/minutes and resubmits to the *Employer*.
  - The *Employer* accepts the *Contractor*'s documents/drawings once the report/minutes are accepted by the *Employer's* project team.

e. Acceptance of the *Contractor's* Design

The *Contractor* is to implement the following activities for design acceptance:

a. The *Employer* accepts the *Contractor*'s design upon completion of reviews by the project team

b. The *Contractor* stamps, dates and signs his design drawings, to signify approval of his designs.

c. The *Contractor* informs the *Employer* in writing of any deviation in the *Contractor*'s drawings, from scope requirements.

4.4 As-built drawings, operating manuals and maintenance schedules

4.4.1 As-built Drawings

a. The *Contractor* provides "As Built" drawings/documentation for all his designs. The designs to embody all modifications made during construction/installation. "As Built" documentation to be provided for the entire project scope i.e. civil, mechanical, electrical and C&I works etc.

4.4.2 Operating Manuals and Maintenance schedules

The *Contractor* shall prepare and submit operating and maintenance manuals for all supplied equipment under this contract. The manuals to provide a detailed/complete record of information relating to the proper and safe operation and maintenance of the supplied items. The *Contractor* to submit the documentation to the *Employer* for review and acceptance. The *Contractor* to submit theoperating and maintenance manuals prio**r** conducting any testing or commissioning activities. The manuals shall provide comprehensive information on the following but not limited to:

a. Equipment technical data
b. Detailed drawings of supplied equipment
c. Operating philosophy of supplied equipment
d. Prescribed maintenance schedule or routine maintenance procedures/instructions per manufacturer requirements at the recommended service intervals
e. Commissioning procedures

5 Procurement

5.1 People

5.1.1 Minimum requirements of people employed on the Site

Eskom Holdings Limited's requirements regarding employment of unskilled or semi-skilled workers are as follows:

Kusile Power Station requires that during recruitment of unskilled or semi-skilled labour, the *Contracto*r or its subsidiaries should make every effort to employ minimum target as per SDL&I requirements. The *Contractor* shall under no circumstances be allowed to recruit labourer(s) at Kusile Power Station main security gate. The *Contractor's* employees shall undergo security screening/clearance obtainable from SAPS or MIE or any accredited institution.

5.2 Subcontracting

5.2.1 Limitations on subcontracting

The *Contracto*r may sub-contract specialised work and shall not subcontract more than a 25% of the value of the contract to any other entity that does not have an equal or higher B-BBEE status level of a contributor than the supplier concerned unless the contract is subcontracted to an EME that has the capability and ability to execute the subcontract work.

5.3 Plant and Materials

5.3.1 Quality

a) The Contractor is responsible for defining the level of QA/QC (intervention Points) or inspection to be imposed on his Subcontractors and suppliers of material in the Quality Control Plans (QCPs).
b) The Contractor submits monthly, the following QA returns:

- A register of Defects with those older than 30 days being flagged, and an explanation attached.
- Register of accepted Defects
- A register of Non-Conformance Report
- Monthly Project Quality Report
- Monthly updated Site and pre-site programmes
- Inspection dates
- Site Acceptance Tests
- Inspections completed / outstanding

6 Construction

6.1 Temporary works, Site services & construction constraints

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

All persons entering the Kusile Power Station site pass through the control points at the main access gate and are required to have temporary permits that are issued to *Contractor's* staff on request. All persons submit ID documents with the application for temporary permits. If it is necessary to bring equipment onto site a list is submitted which is verified by security staff prior to equipment entering the security area.

If any *Contractor*'s staff are transferred from Kusile Power Station or leave site, the person's permit is handed over to the Supervisor. The *Contractor* ensures that personnel leaving site are transported out of the security area and that the permit is returned.

No firearms, weapons, alcohol, illegal substances and cameras are permitted on site. Any person suspected of being under the influence of alcohol is tested and if proved positive, is refused entry to the security area.

No "private work" is carried out for or on behalf of any Eskom employee.

Under no circumstances shall the *Contractor* recruit outside Kusile Power Station's security gate. An applicable local office for recruitment shall be used.

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

The generator area and the other units are barricaded and out of bounds and only authorised persons are permitted. Areas outside the site are out of bounds to the *Contractor*'s staff.

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

The *Contractor* keeps records of his people on Site, including those of his Subcontractors which the Project Manager or Supervisor have access to at any time. These records may be needed when assessing compensation events.

6.1.4 Cooperating with and obtaining acceptance of Others

The *Contractor* may be required to give or obtain access from Others during execution of the *Works*.

6.1.5 Publicity and progress photographs

The *Contracto*r shall not take any photographs on site without the *Employer*'s written permission.

6.1.6 *Contractor*'s Equipment

Contractor's equipment shall be clearly marked, as tools and material need to be declared at the gate before entering the site, and the same declaration shall be used to remove equipment from site.

6.1.7 Site services and facilities

The *Employer* shall provide power supply connection point in the form of 220V AC power, water, waste disposal skips. The *Contractor* shall provide everything else necessary for Providing the *Works*.

6.1.8 Facilities provided by the *Contractor*

The Contractor shall provide for his own Site accommodation, construction camps, storage, vehicles, office equipment and all other requirements deemed necessary for him to do site establishment. Upon completion of the contract, the *Contractor* shall do site de-establishment and restore the allocated area to its original state.

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

Scanning of underground services and utilities shall precede all excavation works. The Contractor shall obtain all relevant drawings, indicating the position of potential underground services in the project area. Care shall be taken by the Contractor to properly demarcate and protect all existing services. Should any service be damaged by the Contractor, it is the responsibility of the Contractor to report such damage to the Employer immediately. If any service or structure is damaged by the Contractor, that should have been located or protected by the Contractor, the Contractor shall be liable for the repair works.

6.1.10 Control of noise, dust, water and waste

Where there is work to be performed in the buildings occupied by personnel and noise and dust may be induced, it is the responsibility of the *Contractor* to inform the Project Manager for awareness and preparation to mitigate.
Covered in detail in section 2 of this document.

6.2 Completion, testing, commissioning and correction of Defects

6.2.1 Work to be done by the Completion Date

All work is to be done by the Completion Date.

On or before the Completion Date the *Contractor* shall have done everything required to Provide the Works at the Completion Date. The *Project Manager* cannot certify Completion until all the work has been done and is also free of Defects which would have, in his/her opinion, prevented the *Employer* from using the *works* and Others from doing their work.

6.2.2 Commissioning

Covered in detail in section 2 of this document.

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

Covered in detail in section 2 of this document.

6.2.4 Take over procedures

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

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

The Employer will provide access for correction of any defects identified during the agreed defects correction period.

6.2.6 Performance tests after Completion

Covered in detail in section 2 of this document.

6.2.7 Training and technology transfer

Covered in detail in section 2 of this document.

6.2.8 Operational maintenance after Completion

Covered in detail in section 2 of this document.

PART 4: SITE INFORMATION

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PART 4: SITE INFORMATION

1. General description

Site	:	Kusile Power Station
Regional Authority	:	Emalahleni Local Municipality, Mpumalanga Province
Nearest Towns	:	Emalahleni – 42km north east of power station Bronkhorstspruit – 41km south of power station Delmas – 45km north of power station There are informal settlements within a 10 km radius of the power station.
Infrastructure	:	Kusile Power Station is situated approximately 3km from the N4 highway and is connected to it by means of a tarred road. There is also a secondary tarred road connecting the site with the R545 and D686.
Latitude & longitude	:	
Landowner	:	Portions of Horingkraans Farm
River catchment	:	Wilge River
Regional Climate		Kusile Power Station is situated in the Mpumalanga Province on the Highveld in the western part of Mpumalanga province on the escarpment, at an average height of 1551 m above sea level. The winters are generally dry and cold with regular frost and temperatures varying between -7ºC and 23ºC. The summers are mild with most of the rainfall occurring during this season. Temperatures vary between 12º & 32º C.
Wind direction		Data from the Emalahleni weather station shows that Kusile Power Station is sited in such a way that for most of the year (291 days) the wind direction is from the power station in a direction that is North West.
Rainfall		Based on information recorded at the Emalahleni weather station, the average annual rainfall for the Emalahleni area is approximately 691 mm. (Weather Bureau, Pretoria).