

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**NEC3 Engineering & Construction Contract**

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

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

**for Duvha Water Treatment Plant Heating, Ventilation and Air
Conditioning Upgrade**

Contents:	No of pages
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Part C4 Site Information	[•]

CONTRACT No. [Insert at award stage]

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

Part C1: Agreements & Contract Data

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

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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:

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

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

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

Options A	The offered total of the Prices exclusive of VAT is	R [•]
Option A	The first forecast of the total Defined Cost plus the Fee exclusive of VAT is	R [•]
	Sub total	R [•]
	Value Added Tax @ 14% 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*.

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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.

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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

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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 <i>conditions of contract</i> are the core clauses and the clauses for main Option	
	dispute resolution Option	A: Priced contract with activity schedule
	and secondary Options	W1: Dispute resolution procedure
		X2: Changes in the law
		X5: Sectional Completion
		X7: Delay damages
		X16: Retention
		X17: Low performance damages
		X18: Limitation of liability
		Z: Additional conditions of contract
	of the NEC3 Engineering and Construction Contract, April 2013 (ECC3)	
10.1	The <i>Employer</i> 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 <i>Project Manager</i> is: (Name)	Ntebaleng Nkgodi
	Address	Duvha Power Station
	Tel	+27 13 690 0763
	Fax	+27 86 600 0028
	e-mail	MoreNV@eskom.co.za
10.1	The <i>Supervisor</i> is: (Name)	Dithole Kubyane
	Address	Duvha Power Station

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)Tel No. **+27 13 690 0649**

Fax No.

e-mail

11.2(13)	The <i>works</i> are	Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)	
11.2(14)	The following matters will be included in the Risk Register	PSR Training by the contractor supervisor	
11.2(15)	The <i>boundaries of the site</i> are	Duvha Power Station WTP HMI server room	
11.2(16)	The Site Information is in	Part 4: Site Information of the scope of work	
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 <i>law of the contract</i> is the law of	the Republic of South Africa	
13.1	The <i>language of this contract</i> is	English	
13.3	The <i>period for reply</i> is	one week	
2	The Contractor's main responsibilities	Upgrade of Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning (HVAC)	
3	Time		
11.2(3)	The <i>completion date</i> for the whole of the <i>works</i> is	?	
11.2(9)	The <i>key dates</i> and the <i>conditions</i> to be met are:	Condition to be met	key date
		1 Start date	Completion: Eight (8) months after the contract is awarded. Two months (2) is for PSR training by the contractor Six months (6) project execution
30.1	The <i>access dates</i> are:	Part of the Site	Date

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		1	WTP HMI – engineering room	After the contract is awarded
		2	WTP HMI – Control room	
31.1	The <i>Contractor</i> is to submit a first programme for acceptance within	One (1) weeks of the Contract Date.		
31.2	The <i>starting date</i> is	?		
32.2	The <i>Contractor</i> submits revised programmes at intervals no longer than	One (1) week (Schedule and cashflow)		
35.1	The <i>Employer</i> is not willing to take over the <i>works</i> before the Completion Date.	[No data needed if this statement is included]		
4	Testing and Defects			
42.2	The <i>defects date</i> is	52 weeks after Completion of the whole of the <i>works</i> .		
43.2	The <i>defect correction period</i> is	08 hours for emergencies or breakdowns and 4 working days for normal defects.		
	except that the <i>defect correction period</i> for	Four (4) days		
	and the <i>defect correction period</i> for	Four (4) days		
5	Payment			
50.1	The <i>assessment interval</i> is	25th day of each successive month.		
51.1	The <i>currency of this contract</i> is the	South African Rand.		
51.2	The period within which payments are made is	30 days		
51.4	The <i>interest rate</i> 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		

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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)	<p>The place where weather is to be recorded is:</p> <p>The <i>weather measurements</i> to be recorded for each calendar month are,</p> <p>The <i>weather measurements</i> are supplied by</p> <p>The <i>weather data</i> are the records of past <i>weather measurements</i> for each calendar month which were recorded at:</p> <p>and which are available from:</p>	<p>Duvha Power Station</p> <p>the cumulative rainfall (mm)</p> <p>the number of days with rainfall more than 10 mm</p> <p>the number of days with minimum air temperature less than 0 degrees Celsius</p> <p>the number of days with snow lying at 09:00 hours South African Time</p> <p>and these measurements:</p> <p>The South African weather Services</p> <p>Duvha Power Station</p> <p>the South African Weather Bureau and included in Annexure A to this Contract Data provided by the <i>Employer</i></p>
60.1(13)	Assumed values for the ten year return <i>weather data</i> for each <i>weather measurement</i> for each calendar month are:	<p>As stated in Annexure A to this Contract Data provided by the <i>Employer</i>.</p> <p>Note: If this arrangement is used, delete the rows above for 60.1(13) and delete this note.</p>
7	Title	<p>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.</p>
8	Risks and insurance	
80.1	These are additional <i>Employer's</i> risks	1. Availability of an AP (Appointed Person) /RP (Responsible Person) Safety risk
84.1	The <i>Employer</i> provides these insurances from the Insurance Table	<p>as stated for "Format A (Contractors All Risk insurance Policy) available on request from Eskom Insurance Management Services</p> <p>(See Annexure B for basic guidance)</p>
84.1	The <i>Contractor</i> provides these additional insurances:	?

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84.2	The insurance against loss of or damage to the <i>works</i> , Plant and Materials is to include cover for Plant and Materials provided by the <i>Employer</i> for an amount of	100 000.00
84.2	The minimum limit of indemnity for insurance in respect of loss of or damage to property (except the <i>works</i> , Plant, Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the <i>Contractor</i>) caused by activity in connection with this contract for any one event is	whatever the <i>Contractor</i> deems necessary in addition to that provided by the <i>Employer</i>.
84.2	The minimum limit of indemnity for insurance in respect of death of or bodily injury to employees of the <i>Contractor</i> arising out of and in the course of their employment in connection with this contract for any one event is	As prescribed by the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993 and the <i>Contractor's</i> common law liability for people falling outside the scope of the Act with a limit of Indemnity of not less than R500 000 (Five hundred thousand Rands).
9	Termination	<p>Clause 90.1 In writing either party should send a notification giving reasons for terminating the contractor's obligation and if the reasons comply with this contract, then a termination certificate should be issued to both parties.</p> <p>Clause 90.2 The contractor may terminate only for the reasons identified in the termination table and the employer may terminate for any reason. Refer to Clause 90.3, 90.4 and 90.5</p>
10	Data for main Option clause	
A	Priced contract with activity schedule	Option A to be used.
60.6	The <i>method of measurement</i> is	As stated in Part C2.1, Pricing Assumptions.
11	Data for Option W1	
W1.1	The <i>Adjudicator</i> is	<p>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).</p>
	Address	TBA
	Tel No.	[•]
	Fax No.	[•]
	e-mail	[•]
W1.2(3)	The <i>Adjudicator nominating body</i> is:	the Chairman of ICE-SA a joint Division of the South African Institution of Civil Engineering and the London Institution of Civil Engineers.

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(See www.ice-sa.org.za) or its successor body.				
W1.4(2)	The <i>tribunal</i> is:	arbitration.		
W1.4(5)	The <i>arbitration procedure</i> 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	the Chairman for the time being or his nominee of the Association of Arbitrators (Southern Africa) or its successor body.		
	- if the Parties cannot agree a choice or - if the arbitration procedure does not state who selects an arbitrator, is			
12	Data for secondary Option clauses			
X2	Changes in the law			
X5	Sectional Completion			
X5.1	The <i>completion date</i> for each <i>section</i> of the <i>works</i> is:	Section	Description	Completion date
		1	WTP HMI – engineering room	
		2	WTP HMI – Control room	
X7	Delay damages			
X7.1	Delay damages for Completion of the whole of the <i>works</i> are	R1500 per day to the maximum of 4 % aligned to the milestone contract value as per the baseline program.		
X16	Retention			
	The <i>retention percentage</i> is	10% of the total contract value		
X17	Low performance damages			
X17.1	The amounts for low performance damages are: Performance level <ul style="list-style-type: none">Two or more days late delivery of equipment after the agreed upon date as per the project schedule will amount to R2500 per day.			
X18.2	For any one event, the <i>Contractor's</i>	the amount of the deductibles relevant to the		

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	liability to the <i>Employer</i> for loss of or damage to the <i>Employer's</i> property is limited to:	<p>event described in the insurance policy format selected in the data for clause 84.1 above, which policy is available on http://www.eskom.co.za/Tenders/InsurancePolicies/Procedures/Pages/EIMS_Policies_From_1_April_2014_To_31_March_2015.aspx</p>
X18.3	The <i>Contractor's</i> liability for Defects due to his design which are not listed on the Defects Certificate is limited to	<p>The greater of</p> <ul style="list-style-type: none"> • the total of the Prices at the Contract Date and • the amounts excluded and unrecoverable from the <i>Employer's</i> assets policy for correcting the Defect (other than the resulting physical damage which is not excluded) plus R15M first amount payable in terms of the <i>Employer's</i> assets policy.
X18.4	The <i>Contractor's</i> total liability to the <i>Employer</i> for all matters arising under or in connection with this contract, other than excluded matters, is limited to:	<p>the total of the Prices other than for the additional excluded matters.</p> <p>The <i>Contractor's</i> total liability for the additional excluded matters is not limited.</p> <p>The additional excluded matters are amounts for which the <i>Contractor</i> is liable under this contract for</p> <ul style="list-style-type: none"> • 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 <i>works</i>, Plant and Materials), • death of or injury to a person and • infringement of an intellectual property right.
X18.5	The <i>end of liability date</i> is	<p>(i) 1(One) year after the <i>defects date</i> for latent Defects and</p> <p>(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.</p> <p>A latent Defect is a Defect which would not have been discovered on reasonable inspection by the <i>Employer</i> or the <i>Supervisor</i> before the <i>defects date</i>, without requiring any inspection not ordinarily carried out by the <i>Employer</i> or the <i>Supervisor</i> during that period. If the <i>Employer</i> or the <i>Supervisor</i> do undertake any inspection over and above the reasonable inspection, this does not place a greater responsibility on the <i>Employer</i> or the <i>Supervisor</i> to have discovered the Defect.</p>

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Z	The <i>Additional conditions of contract</i> are	Z1 to Z12 always apply.
Z1	Cession delegation and assignment	
Z1.1	The <i>Contractor</i> does not cede, delegate or assign any of its rights or obligations to any person without the written consent of the <i>Employer</i> .	
Z1.2	Notwithstanding the above, the <i>Employer</i> may on written notice to the <i>Contractor</i> 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 <i>Contractor</i> 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 <i>Employer</i> for the performance of this contract.	
Z2.2	Unless already notified to the <i>Employer</i> , the persons or organisations notify the <i>Project Manager</i> within two weeks of the Contract Date of the key person who has the authority to bind the <i>Contractor</i> on their behalf.	
Z2.3	The <i>Contractor</i> does not alter the composition of the joint venture, consortium or other unincorporated grouping of two or more persons without the consent of the <i>Employer</i> having been given to the <i>Contractor</i> in writing.	
Z3	Change of Broad Based Black Economic Empowerment (B-BBEE) status	
Z3.1	Where a change in the <i>Contractor's</i> legal status, ownership or any other change to his business composition or business dealings results in a change to the <i>Contractor's</i> B-BBEE status, the <i>Contractor</i> notifies the <i>Employer</i> within seven days of the change.	
Z3.2	The <i>Contractor</i> is required to submit an updated verification certificate and necessary supporting documentation confirming the change in his B-BBEE status to the <i>Project Manager</i> within thirty days of the notification or as otherwise instructed by the <i>Project Manager</i> .	
Z3.3	Where, as a result, the <i>Contractor's</i> B-BBEE status has decreased since the Contract Date the <i>Employer</i> may either re-negotiate this contract or alternatively, terminate the <i>Contractor's</i> obligation to Provide the Works.	
Z3.4	Failure by the <i>Contractor</i> to notify the <i>Employer</i> of a change in its B-BBEE status may constitute a reason for termination. If the <i>Employer</i> 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	Ethics	
Z4.1	Any offer, payment, consideration, or benefit of any kind made by the <i>Contractor</i> , which constitutes or could be construed either directly or indirectly as an illegal or corrupt practice, as an inducement or reward for the award or in execution of this contract constitutes grounds for terminating the <i>Contractor's</i> obligation to Provide the Works or taking any other action as appropriate against the <i>Contractor</i> (including civil or criminal action).	

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- Z4.2 The *Employer* may terminate the *Contractor's* obligation to Provide the Works if the *Contractor* (or any member of the *Contractor* where the *Contractor* constitutes a joint venture, consortium or other unincorporated grouping of two or more persons or organisations) is found guilty by a competent court, administrative or regulatory body of participating in illegal or corrupt practices.

Such practices include making of offers, payments, considerations, or benefits of any kind or otherwise, whether in connection with any procurement process or contract with the *Employer* or other people or organisations and including in circumstances where the *Contractor* or any such member is removed from the an approved vendor data base of the *Employer* as a consequence of such practice.

- Z4.3 Notwithstanding the provisions of core clause 90.2, the procedures on termination in terms of this clause are P1, P2 and P3 as stated in the core clause 92 and the amount due is A1 and A3 as stated in core clause 93.

Z5	Confidentiality
Z5.1	The <i>Contractor</i> 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 <i>Contractor</i> , enters the public domain or to information which was already in the possession of the <i>Contractor</i> at the time of disclosure (evidenced by written records in existence at that time). Should the <i>Contractor</i> disclose information to Others in terms of clause 25.1, the <i>Contractor</i> ensures that the provisions of this clause are complied with by the recipient.
Z5.2	If the <i>Contractor</i> is uncertain about whether any such information is confidential, it is to be regarded as such until notified otherwise by the <i>Project Manager</i> .
Z5.3	In the event that the <i>Contractor</i> is, at any time, required by law to disclose any such information which is required to be kept confidential, the <i>Contractor</i> , to the extent permitted by law prior to disclosure, notifies the <i>Employer</i> 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 <i>Contractor</i> 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.
Z5.4	The taking of images (whether photographs, video footage or otherwise) of the <i>works</i> or any portion thereof, in the course of Providing the Works and after Completion, requires the prior written consent of the <i>Project Manager</i> . All rights in and to all such images vests exclusively in the <i>Employer</i> .
Z5.5	The <i>Contractor</i> ensures that all his subcontractors abide by the undertakings in this clause.
Z6	Waiver and estoppel: Add to core clause 12.3:
Z6.1	Any extension, concession, waiver or relaxation of any action stated in this contract by the Parties, the <i>Project Manager</i> , the <i>Supervisor</i> , or the <i>Adjudicator</i> 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.
Z7	Health, safety and the environment: Add to core clause 27.4
Z7.1	The <i>Contractor</i> undertakes to take all reasonable precautions to maintain the health and safety of persons in and about the execution of the <i>works</i> . Without limitation the <i>Contractor</i> : <ul style="list-style-type: none"> • accepts that the <i>Employer</i> may appoint him as the "Principal Contractor" (as defined and

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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.

Z7.2 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.

Z8 Provision of a Tax Invoice and interest. Add to core clause 51

Z8.1 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.

Z8.2 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.

Z8.3 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.

Z9 Notifying compensation events

Z9.1 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".

Z10 Employer's limitation of liability

Z10.1 The *Employer's* liability to the *Contractor* for the *Contractor's* indirect or consequential loss is limited to R0.00 (zero Rand)

Z10.2 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.

Z11 Termination: Add to core clause 91.1, at the second main bullet point, fourth sub-bullet point, after the words "against it":

Z11.1 or had a business rescue order granted against it.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**Z12 Addition to secondary Option X7 Delay damages (if applicable in this contract)**

- Z12.1 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.
-
-

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

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

	<i>Weather measurement</i>				
Month	Cumulative rainfall (mm)	Number of days with rain more than 10mm	Number of days with min air temp < 0 deg.C	Number of days with snow lying at 08:00 CAT	[Other measurements if applicable]
January	119	11	0	0	N/A
February	127	9	0	0	N/A
March	132	9	0	0	N/A
April	84	7	0	0	N/A
May	56	4	0	0	N/A
June	33	3	0	0	N/A
July	36	3	0	0	N/A
August	48	4	0	0	N/A
September	74	6	0	0	N/A
October	109	10	0	0	N/A
November	117	11	0	0	N/A
December	119	12	0	0	N/A

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

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Annexure B: Insurance provided by the Employer

These notes are provided as guidance to tendering contractors and the Contractor about the insurance provided by the Employer. The Contractor must obtain its own advice. Details of the insurance itself are available from the internet web link given below.

1. For the purpose of works contracts, insurance provided by Eskom (the *Employer*) has been arranged on the basis of “project” or “contract” value, where the value is the total of the Prices at Completion of the whole of the works including VAT.

A “project” is a collection of contracts or work packages to be undertaken as part of a single identified capital expansion or refurbishment of a particular asset or facility.

A “contract” is a single contract not linked to or being part of a “project”.

2. For ECC3 there are three main “formats” of cover and deductible structure; Format A, Format B and Format Dx.

Format A is for a project or contract value less than or equal to R350M (three hundred and fifty million Rand) inclusive of VAT.

Format B is for a project or contract value greater than R350M (three hundred and fifty million Rand) inclusive of VAT.

In the case of contracts / packages within a project:

- For a contract / package of R50M which is part of a R400M project, Format B will apply
- For a contract / package of R250M which is part of a R6 billion project, Format B will apply;
- For a contract / package of R120M which is part of a R350M project Format A will apply;

For a contract which is not part of a project the same limits apply:

- For a contract of R50M, Format A will apply
- For a contract of R355M, Format B will apply.

Format Dx applies only to Distribution Division projects and contracts. If a Distribution Division project or contract exceeds the Format A limit, the Eskom Insurance Management Services [EIMS] need to be contacted for advice on how to formulate the insurance cover. Cover and deductibles for Distribution Division are per the relevant policy available on the internet web link given below.

Format A generally applies to Transmission Division projects and contracts. If a Transmission Division project or contract exceeds the Format A limit, the Eskom Insurance Management Services [EIMS] need to be contacted for advice on how to formulate the insurance cover.

3. Tendering contractors should note that cover provided by the *Employer* is only per the policies available on the internet web link listed below and may not be the cover required by the tendering contractor or as intended by each of the listed insurances in the left hand column of the Insurance Table in clause 84.2. In terms of clause 84.1 “the *Contractor* provides the insurances stated in the Insurance Table except any insurance which the *Employer* is to provide”. Hence the *Contractor* provides insurance which the *Employer* does not provide and in cases where the *Employer* does provide insurance the *Contractor* insures for the difference between what the Insurance Table requires and what the *Employer* provides.
4. When the Marine Insurance is required the *Contractor* needs to obtain a copy of the latest edition of Eskom’s Marine Policies Procedures found at internet website given below.
5. Further information and full details of all Eskom provided policies and procedures may be obtained from:

http://www.eskom.co.za/live/content.php?Item_ID=9248

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C1.2 Contract Data

Part two - Data provided by the *Contractor*

[Instructions to the contract compiler: (delete this notes before issue to tenderers with an enquiry)

Whenever a cell is shaded in the left hand column it denotes this data is optional. If not required select and delete the whole row, otherwise insert the required Data.]

Notes to a tendering contractor:

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

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

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

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

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		CV's (and further key persons data including CVs) are appended to Tender Schedule entitled _____.		
11.2(3)	The <i>completion date</i> 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 <i>Contractor's</i> design is in:			
31.1	The programme identified in the Contract Data is			
A	Priced contract with activity schedule			
11.2(20)	The <i>activity schedule</i> is in	(in figures) (in words), excluding VAT		
11.2(30)	The tendered total of the Prices is			
	Data for Schedules of Cost Components	Note "SCC" means Schedule of Cost Components starting on page 60, and "SSCC" means Shorter Schedule of Cost Components starting on page 63 of ECC3 (April 2013).		
A	Priced contract with activity schedule	Data for the Shorter Schedule of Cost Components		
	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	%		

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63 in SSCC	The categories of design employees whose travelling expenses to and from the Working Areas are included in Defined Cost are:			
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	%		
22 in SSCC	The rates of other Equipment are:	Equipment	Size or capacity	Rate

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C1.3 Forms of Securities

Pro formas for Bonds & Guarantees

For use with the NEC3 Engineering & Construction Contract (June 2005)

[Note to contract compiler:

Once it has been decided which securities are required for this contract delete from this file the ones not required, revise the notes below accordingly and delete this note.]

The *conditions of contract* stated in the Contract Data Part 1 include the following Secondary Options:

- Option X4: Parent company guarantee
- Option X13: Performance Bond
- Option X14: Advanced payment to the *Contractor*

Each of these secondary Options requires a bond or guarantee “in the form set out in the Works Information”. Pro forma documents for these bonds and guarantees are provided here for convenience but are to be treated as part of the Works Information.

Option X16: Retention (not used with Option F)

The *Contractor* may provide a Retention Money Guarantee in the form stated here. When the *Employer* receives and accepts a Retention Money Guarantee exactly in the form stated he will instruct the *Project Manager* not to assess any amount be retained in terms of secondary Option X16.

The *Contractor* shall guarantee his ASGI-SA Obligations by providing the *Employer* with an ASGI-SA Guarantee in the form provided here.

[Note to contract compiler: *If there are no ASGI-SA Obligations in this contract, delete the above statement*]

The organisation providing the bond / guarantee does so by copying the pro forma document onto his letterhead without any change to the text or format and completing the required details. The completed document is then given to the *Employer* within the time stated in the contract.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**Pro forma Parent Company Guarantee (for use with Option X4)***(to be reproduced exactly as shown below on the letterhead of the Contractor's Parent Company)*

**Eskom Holdings SOC Ltd
Megawatt Park
Maxwell Drive
Sandton
Johannesburg**

Date:

Dear Sirs,

Parent Company Guarantee for Contract No

With reference to the above numbered contract made or to be made between

Eskom Holdings SOC Ltd(the *Employer*) and**{Insert registered name and address of the *Contractor*}**(the *Contractor*), for**{Insert details of the *works* from the Contract Data}**(the *works*).

I/We the undersigned

on behalf of the *Contractor's*
parent company

of physical address

and duly authorised thereto do hereby unconditionally guarantee to the *Employer* that the *Contractor* shall Provide the Works in accordance with the above numbered Contract.

1. If for any reason the *Contractor* fails to Provide the Works, we hereby agree to cause to Provide the Works at no additional cost to the *Employer*.
2. If we fail to comply with the terms of this Deed of Guarantee, the *Employer* may itself procure such performance (whether or not the Agreement be formally determined). The *Employer* is to notify us and we shall indemnify the *Employer* for any additional cost or expense it incurs.
3. Our liability shall be as primary obligor and not merely as surety and shall not be impaired or discharged by reason of any arrangement or change in relationship made between the *Contractor* and the *Employer* and/or between us and *Contractor*; nor any alteration in the obligations undertaken by the *Contractor* or in the terms of the Agreement; nor any indulgence, failure, delay by you as to any matter; nor any dissolution or liquidation or such other analogous event of the *Contractor*.
4. The *Employer* shall not be obliged before taking steps to enforce the terms of this Deed of Guarantee to obtain judgement against the *Contractor* in any court or other tribunal, to make or file any claim in liquidation (or analogous proceedings) or to seek any remedy or proceed first against the *Contractor*.
5. This Deed of Guarantee shall be governed by and construed in accordance with the laws of the Republic of South Africa and we hereby submit to the non-exclusive jurisdiction of the High Court of South Africa.

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Signed at _____ on this _____ day of _____ 200_

Signature(s)

Name(s) (printed)

Position in parent company

Signature of Witness(s)

Name(s) (printed)

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

Pro forma Performance Bond – Demand Guarantee (for use with Option X13)

(to be reproduced exactly as shown below on the letterhead of the Contractor's Parent Company)

Eskom Holdings SOC Ltd
Megawatt Park
Maxwell Drive
Sandton
Johannesburg

Date:

Dear Sirs

Reference No. [●] [Drafting Note: Bank reference number to be inserted]

Performance Bond – Demand Guarantee: [Drafting Note: Name of Contractor to be inserted]

Project [] Contract Reference: [Drafting Note: Contractor contract reference number to be inserted]

1. In this Guarantee the following words and expressions shall have the following meanings:-
 - 1.1 “Bank” - means [●], [●] Branch, (Registration No. [●]); [Drafting Note: Name of Bank to be inserted]
 - 1.2 “Bank’s Address” - means [●]; [Drafting Note: Bank’s physical address to be inserted]
 - 1.3 “Contract” – means the written agreement relating to the Project, entered into between Eskom and the Contractor, on or about the [●] day of [●] 200[●] (Contract Reference No. [.]as amended, varied, restated, novated or substituted from time to time; [Drafting Note: Signature Date and Contract reference number to be inserted]
 - 1.4 “Contractor” – means [●] a company registered in accordance with the laws of [●] under Registration Number [●]. [Drafting Note: Name and details of Contractor to be inserted]
 - 1.5 “Eskom” - means Eskom Holdings SOC Ltd, a company registered in accordance with the laws of the Republic of South Africa under Registration Number 2002/015527/30].
 - 1.6 “Expiry Date” - means the date on which the Defects Certificate is issued in terms of the Contract.
 - 1.7 “Guaranteed Sum” - means the sum of R [●] ([●] Rand);
 - 1.8 “Project” - means [insert if applicable.].
2. At the instance of the Contractor, we the undersigned _____ and _____, in our respective capacities as _____ and _____ of the Bank, and duly authorized thereto, confirm that we hold the Guaranteed Sum at the disposal of Eskom, as security for the proper performance by the Contractor of all of its obligations in terms of and arising from the Contract and hereby undertake to pay to Eskom, on written demand from Eskom received prior to the Expiry Date, any sum or sums not exceeding in total the Guaranteed Sum.
3. A demand for payment under this guarantee shall be made in writing at the Bank's address and shall:
 - 3.1 be signed on behalf of Eskom by a Group Executive, Divisional Executive, Senior General Manager, General Manager or its delegate;
 - 3.2 state the amount claimed (“the Demand Amount”);
 - 3.3 state that the Demand Amount is payable to Eskom in the circumstances contemplated in

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the Contract.

4. Notwithstanding the reference herein to the Contract the liability of the Bank in terms hereof is as principal and not as surety and the Bank's obligation/s to make payment:
 - 4.1 is and shall be absolute provided demand is made in terms of this bond in all circumstances; and
 - 4.2 is not, and shall not be construed to be, accessory or collateral on any basis whatsoever.
5. The Bank's obligations in terms of this Guarantee:
 - 5.1 shall be restricted to the payment of money only and shall be limited to the maximum of the Guaranteed Sum; and
 - 5.2 shall not be discharged and compliance with any demand for payment received by the Bank in terms hereof shall not be delayed, by the fact that a dispute may exist between Eskom and the Contractor.
6. Eskom shall be entitled to arrange its affairs with the Contractor in any manner which it sees fit, without advising us and without affecting our liability under this Guarantee. This includes, without limitation, any extensions, indulgences, release or compromise granted to the Contractor or any variation under or to the Contract.
7. Should Eskom cede its rights against the Contractor to a third party where such cession is permitted under the Contract, then Eskom shall be entitled to cede to such third party the rights of Eskom under this Guarantee on written notification to the Bank of such cession.
8. This Guarantee:
 - 8.1 shall expire on the Expiry Date until which time it is irrevocable;
 - 8.2 is, save as provided for in 7 above, personal to Eskom and is neither negotiable nor transferable;
 - 8.3 shall be returned to the Bank upon the earlier of payment of the full Guaranteed Sum or expiry hereof;
 - 8.4 shall be regarded as a liquid document for the purpose of obtaining a court order; and
 - 8.5 shall be governed by and construed in accordance with the law of the Republic of South Africa and shall be subject to the jurisdiction of the Courts of the Republic of South Africa.
 - 8.6 Any claim which arises or demand for payment received after expiry date will be invalid and unenforceable.
9. The Bank chooses domicilium citandi et executandi for all purposes in connection with this Guarantee at the Bank's Address.

Signed at _____

Date _____

For and behalf of the Bank

Bank Signatory: _____

Bank Signatory: _____

Witness: _____

Witness: _____

Bank's seal or stamp

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**PART 2: PRICING DATA****ECC3 Option A**

Document reference	Title	No of pages
C2.1	Pricing assumptions: Option A	
C2.2	The <i>activity schedule</i>	

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

C2.1 Pricing assumptions: Option A

How work is priced and assessed for payment

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

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

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

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

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

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

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

Function of the Activity Schedule

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

Link to the programme

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

Preparing the *activity schedule*

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

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

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

- Has taken account of the guidance given in the ECC3 Guidance Notes pages 19 and 20;

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

An activity schedule could have the following format:

Item No.	Programme Reference	Activity description	Price

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C2.2 the *activity schedule*

The Prices List

Item	Description	Quantity	Price	Total price
1	SITE ESTABLISHMENT	1		
2	Safety	1		
	PRELIMINARY AND GENERAL (TRANSPORTATION, ACCOMMODATION, ETC.)	1		
	TEMPORARY SCAFFOLDING, HOISTING, RIGGING AND TEMPORARY SUPPORTS	1		
	QUALITY ASSURANCE	1		
	TESTING AND COMMISSIONING OF THE ENTIRE SYSTEM	1		
	OPERATING AND MAINTENANCE MANUALS	1		
2.1	HVAC MECHANICAL WORKS	1		
2.1.1	Detailed Design of the Mechanical Works (hydraulic analysis for duct work, airflow and sound attenuation)	1		
2.1.2	Package Cooling Unit	2		
2.1.3	Return Air Fan	2		
2.1.4	Duct work, sound attenuators and structural supports (as per the Employer 's proposed layout sketches and the detailed design)	1		
3	HVAC Related Electrical Works Schedule	1		
3.1	Detailed Design of HVAC related electrical works	1		
3.2	Plant and material selection; installation and as built drawings; Testing, balancing and commissioning Documentation; Operating Instruction and Maintenance Manuals; and Inspection Record Cards/Checklists.	1		
3.3	Supply and install 400/380V AC HVAC Electrical Distribution Panels with circuit breakers, contactors, isolators, indication lamps, pushbuttons, door interlocking handles, ammeters, selector switch, auto/manual etc.	1		
3.4	Supply, install and terminate power cables on the new 400/380V AC HVAC Electrical Distribution Panels.	1		
3.5	Allocate the spare circuits on the selected boards to supply the new 400/380V HVAC Electrical Distribution Panels.	1		
3.6	Terminate the power cables on the allocated spare circuits on the selected boards to supply the new 400/380V AC HVAC Electrical Distribution Panels. Modify existing circuit if necessary.	1		
3.7	Electrical cable / wiring, Cable ladders and trays, power and control cabling and racking, joint kits, earthing, hangers and mounting arms, risers and droppers measured as elbows etc. and isolators ending within to HVAC equipment and its controls.	1		

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

4	Division of HVAC Related Controls and Fire Detection Works Schedule	1		
4.1	Detailed Design of HVAC standalone equipment controls including plant and material selection; installation and as built drawings; Testing, balancing and commissioning Documentation; Operating	1		
4.2	Fire signal within 2.0m of HVAC equipment and electrical boards	1		
4.3	Provision and connection of fire relay in HVAC equipment and electrical boards	1		
4.4	Testing and commissioning of HVAC related fire detection works	1		
5	Civil and building Works	1		
5.1	Detailed design; Design two plinths, roof shelter and fencing and access gate around HVAC distribution board and control panel	1		
5.2	Plant and material selection	1		
5.3	Construction of plinths	1		
5.4	Supply and erection of roof shelter and fencing with access gate around HVAC distribution board and control panel	1		
6	Testing and commissioning HVAC related works	1		
7	Training (operating, engineering and maintenance)	1		
8	Hand-over	1		
9	Electrical Connection (Optional)	1		
10	Quality Control	1		
11	Supply and deliver material	1		
12	Offloading	1		
13	Decommissioning of existing system	1		
14	Installation	1		
TOTAL PRICE EXCL.VAT				

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PART 3: SCOPE OF WORK

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

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C3.1: EMPLOYER'S WORKS INFORMATION

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1. In this Guarantee the following words and expressions shall have the following meanings:-	25
2. At the instance of the Contractor, we the undersigned _____ and _____, in our respective capacities as _____ and _____ of the Bank, and duly authorized thereto, confirm that we hold the Guaranteed Sum at the disposal of Eskom, as security for the proper performance by the Contractor of all of its obligations in terms of and arising from the Contract and hereby undertake to pay to Eskom, on written demand from Eskom received prior to the Expiry Date, any sum or sums not exceeding in total the Guaranteed Sum.	25
3. A demand for payment under this guarantee shall be made in writing at the Bank's address and shall:	25

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

4. Notwithstanding the reference herein to the Contract the liability of the Bank in terms hereof is as principal and not as surety and the Bank's obligation/s to make payment:.....	26
5. The Bank's obligations in terms of this Guarantee:.....	26
6. Eskom shall be entitled to arrange its affairs with the Contractor in any manner which it sees fit, without advising us and without affecting our liability under this Guarantee. This includes, without limitation, any extensions, indulgences, release or compromise granted to the Contractor or any variation under or to the Contract.	26
7. Should Eskom cede its rights against the Contractor to a third party where such cession is permitted under the Contract, then Eskom shall be entitled to cede to such third party the rights of Eskom under this Guarantee on written notification to the Bank of such cession.....	26
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Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

1 Description of the works

1.1 Executive overview

Duvha Power Station is a coal fired power station built between 1978 and 1984, and is situated near Witbank. The station has six power generating units, each with an output of 600MW. The total plant capacity is 3600MW. The station has initiated a project to upgrade the Water Treatment Plant Human Machine Interface (WTP HMI), to achieve reliable and quality water (potable and demineralized) production. The WTP HMI upgraded equipment are positioned in dedicated server and automation rooms. The equipment generates heat during operation. Equipment heat load must be removed through air conditioning, to prolong the equipment lifespan, and achieve dust control through pressurization and filtration.

1.2 Employer's objectives and purpose of the works

The purpose of this document is to describe the minimum requirements engineering, drawings, procurement, manufacture, quality control & assurance, supply, delivery, installation, commissioning, testing, training, and maintenance and handing over of HVAC Works.

1.3 Interpretation and terminology

Definitions

Definition	Description
Acceptance	The Employer accept the condition or design but does not take responsibility from the Contractor
Approval	Written agreement or authorization by Employer. All requests for approval must be submitted in writing and any proposed deviation from specified requirements must be fully justified and agreed by Employer.
Architect Engineer	Architect Engineer - When Eskom acts as the Architect Engineer on a project/package/plant/system/asset, the reviewer(s) are to review the design documentation issued by the Design Authority to ensure that: the design satisfies the stakeholder requirements (i.e. validation of design deliverables against stakeholder requirements); the design is integrated by identifying all interfaces with other packages/plant systems/assets and ensuring that these interfaces are catered for; foreseen technical risks are identified and addressed/challenged with the Design Authority; general technical oversight is provided over the design.
Design Authority	Design Authority - When Eskom acts as the Design Authority on a project/package/plant/system/asset, the reviewer(s) are to review the design documentation to ensure that: the design satisfies the design requirements; all relevant COE design standards, procedures and guidelines have been adhered to; the design is suitable and correct (calculations, philosophy, functionality, etc.); best COE practices were applied; the design is integrated by identifying all interfaces with other packages/plant systems/assets and ensuring that these interfaces are catered for.
Contractor	Refers to the corporation appointed to perform the engineering, procurement, and construction works required for the project.
Design freeze	Is a binding decision that defines the whole product, its parts or parameters and allows the continuation of the design based on that decision (no further changes can be made to the design, it is cut-off for the engineers)
Employer	Refers to Eskom Holdings State Owned Company
Eskom Plant Engineering	Refers to the Eskom Engineering team who will perform the reviews and provide technical assistance for the work performed by the appointed

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

Definition	Description
	Contractor.
Heating, Ventilating, and Air Conditioning (HVAC)	Relates to systems that perform processes designed to regulate the air conditions within buildings for the comfort and safety of occupants. HVAC systems condition and move air to desired areas of an indoor environment to create and maintain desirable temperature, humidity, ventilation and air purity.
Interface	Interface in this document means either to hard wired or software interaction between the Contractors and/or other Works
Maintenance	Maintenance can be defined as the function of keeping components or equipment in, or restoring them to a serviceable condition so that they comply with design and statutory requirements and employer standards. Maintenance includes the cleaning, removal of contaminants and waste, correct adjustment and setting, tightening, testing, fixing, refill, lubrication, rust prevention, touch up, refrigeration charge, servicing, inspection, replacement, re-installation, troubleshooting, calibration, condition determination, repair, modification, overhaul and rebuilding of equipment. Maintenance can be either preventative or corrective of nature.
Maintenance Management	Maintenance Management can be described as the management (planning, organising, leading and control) actions needed to ensure effective maintenance execution to provide the most efficient and optimum availability (capable of being used) and reliability (consistent quality) of the equipment installed.
Owners Engineer	Owners Engineer - When Eskom acts as the Owners Engineer on a project/package/plant/system/asset, the reviewer(s) are to review the design documentation issued by the Design Authority to ensure that: the design satisfies the stakeholder requirements (i.e. validation of design deliverables against stakeholder requirements). General technical oversight is provided over the design.
Specification	The document/s forming part of the contract in which the methods of executing the various items of work to be done is described, as well as the nature and quality of the materials to be supplied and it includes technical schedules and drawings attached thereto as well as all samples and patterns
The Client	The end user will be Eskom who will be represented by client throughout the duration of the Project.

The following abbreviations are used in this Works Information:

Abbreviation	Meaning given to the abbreviation
AFC	Approved for construction
OBL	Outside battery limits
AC	Alternating Current
BMS	Building Management System
CA	Corrective Action
C&I	Control and Instrumentation
DX	Direct Expansion
ISO	International Organisation for Standardisation
HMI	Human Machine Interface
HVAC	Heating Ventilation and Air Conditioning
LOSS	Limits of Service and Supply

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

LPS	Low Pressure Services
MTTF	Mean Time To Failure
MTTR	Mean Time To Repair
OEM	Original Equipment Manufacture
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Procedure
RCM	Reliable Centre Maintenance
SANS	South African National Standards
VDSS	Vendor Document Supplier Submittals
WTP	Water Treatment Plant

2 Management and start up.

2.1 Management meetings

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

Title and purpose	Approximate time & interval	Location	Attendance by:
Risk register and compensation events	Weekly on Mondays at 13h00	Projects/ WTP Boardroom	Employer, <i>Contractor</i> , Supervisor
Overall contract progress and feedback	Monthly on Thursdays at 13h00	Projects/ WTP Boardroom	Employer, <i>Contractor</i> , Supervisor
Monthly Safety meeting, weekly during implementation	Monthly on Mondays at 14h00	Projects/ WTP Boardroom	Employer, <i>Contractor</i> , Supervisor, Safety Officers
Quality and NCR/Defect/Concessions meeting	Monthly on Mondays at 15h00	Projects/ WTP Boardroom	Employer, <i>Contractor</i> , Supervisor, Quality managers and Officers
Weekly contract progress and feedback	Weekly on Mondays at 08h00	Projects/ WTP Boardroom	Employer, <i>Contractor</i> , Supervisor, Quality managers
Daily contract progress and feedback	Daily at 09h00	Projects/ WTP Boardroom	Employer, <i>Contractor</i> , Supervisor, Quality managers

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

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

- (4) All meetings shall be recorded using minutes or a register prepared and circulated by the person who convened the meeting.
- (5) 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.
- (6) 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.
- (7)
- (8) All meetings shall be recorded using minutes or a register prepared and circulated by the person who convened the meeting. Such minutes or register shall not be used for the purpose of confirming actions or instructions under the contract as these shall be done separately by the person identified in the conditions of contract to carry out such actions or instructions.

2.2 Documentation control

- (1) The Contractor's site manager must submit a daily log, which needs to be signed by the Employer's Supervisor / Project Manager daily.
- (2) The project manager will arrange for necessary documentations to allow component removal from Duvha P/S.

2.3 Health and safety risk management

- (1) Refer to Safety, health and environmental procedure Appendix F.

2.4 Environmental constraints and management

- (2) Refer to Safety, health and environmental procedure Appendix F.

2.5 Quality assurance requirements

- (1) The Contractor complies with the Employer's Quality Requirements as specified in Eskom Generation Standard QM 58
- (2) Appendix C to this Standard indicates the specific application thereof.
- (3) All quality control documentation (QCP) is submitted to the Project Manager on delivery.

2.6 Programming constraints

- (1) The Contractor submits a programme within 1 week of the contract date..
- (2) The program shall be in Microsoft Excel or Projects format (preferably 2003 version or lower)
- (3) The programme indicates
 - i. The hour duration of each activity
 - ii. The working calendar (number of hours per day, days per week)
 - iii. The exact quantity of people per day.
 - iv. All phases and interfaces.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**2.7 Invoicing and payment**

- (1) Within one week of receiving a payment certificate from the Project Manager in terms of core clause 51.1,
- (2) 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:
 - i. Name and address of the Contractor and the Project Manager;
 - ii. The contract number and title;
 - iii. Contractor's VAT registration number;
 - iv. The Employer's VAT registration number 4740101508;
 - v. Description of service provided for each item invoiced based on the Price List;
 - vi. Total amount invoiced excluding VAT, the VAT and the invoiced amount including VAT;
 - vii. (add other as required)
 - viii. Add procedures for invoice submission and payment (e. g. electronic payment instructions)

2.8 Insurance provided by the *Employer*

- (1) Refer to the Contract Data Section 8 – Risks and Insurance.

2.9 Contract change management

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

2.10 Provision of bonds and guarantees

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

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

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

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**2.12 Training workshops and technology transfer****HVAC TRAINING**

After completion of the contract, the Contractor is required to provide training and transfer system knowledge to the building owner/manager by submitting documented Design Intent, As-built drawings, Operational and Maintenance Manual, Commissioning Records, Commissioning Report and by providing training on all the systems to the building management staff to ensure that they have all the information and understanding needed to operate and maintain the features and systems in the building.

The Contractor is to provide on-site training and training material to the Engineers, Operators and Maintenance personnel prior to taking-over of the works. The contractor will, prior to handing over of the works, satisfy the Employer or authorized representative that maintenance and operational personnel are competent and adequately trained to maintain and operate the equipment supplied.

The training is to cover the following, however not limited to:

- (1) Information provided in the design intent report (including energy/environmental features)
- (2) Review of controls set up, programming, alarms and troubleshooting
- (3) Review of O&M manuals
- (4) Building operation (start up, normal operation, unoccupied operation, seasonal changeover, shutdown)
- (5) Measures that can be taken to optimise energy efficiency
- (6) Occupational health and safety (OH&S) issues
- (7) Maintenance requirements and sourcing replacements
- (8) Obtaining and addressing occupant satisfaction feedback
- (9) Steps for Conducting On-site Training shall include:
- (10) Preparation
- (11) Introduction
- (12) Explanation
- (13) Demonstration
- (14) Practice Under Supervision
- (15) Conclusion

The operating and maintenance manual must be available during the training of site staff. Site staff must also be made familiar with the contents of that manual.

HVAC COMMISSIONING**Pre-commissioning documents**

- (1) The following documents are supplied to the Employer by the Contractor prior to commissioning:
 - i. Dimensioned shop drawings showing the general arrangement of all plant and equipment including isometrics and P&ID's or PFD's where required. Sufficient views must be given to ensure clarity and the drawing shall have at least a plan and two different elevations or sections giving overall dimensions.
 - ii. Documents including equipment data sheets and specification for selected equipment, electrical cabling and other associated equipment.
 - iii. Manufacturer's product data highlighting Minimum Efficiency Reporting Value (MERV) for filtration media.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

- iv. Detailed electrical wiring diagrams including schematic and control circuits.
- v. Detailed sequencing manner for installation procedure of Works.
- vi. Detailed programme for the works in sufficient detail as to represent the units of work to enable the representative to assess the progress of the works.
- vii. Technical literature for all items of equipment that forms part of the complete installation, including, evaporators, condensing units, refrigerant circuits, ventilation fans, electrical and control circuits etc.
- viii. Corrosion protection systems, including data sheets for coating of equipment.
- ix. List of recommended spares and technical specifications for the spares, part numbers and the stock levels required.
- x. Detailed building works for complete works
- xi. Detailed maintenance, reliability, control and operating philosophies
- xii. Testing, balancing and commissioning procedures
- xiii. Plant and material acceptance testing
- xiv. Plant codification lists for each section of the Works
- xv. Operating and maintenance manual

Inspection prior to testing and commissioning

Prior to tests taking place on the completed or a section of the installation the Contractor check the following points:

- (1) That the components comprising the installation or sections of an installation are installed as described in the specification and drawings.
- (2) That the components have been installed correctly.
- (3) That the manufacturer's test data for plant and components, if necessary for testing and commissioning, has been provided and is available for reference.

Cleaning and flushing of ductwork and pipe work systems

All pipe work and ductwork systems included in this contract are thoroughly cleaned internally to remove any foreign matter. The following operations shall be carried out:

- (4) The cleaning of completed pipe work and ductwork to remove dirt etc. accumulated in pipe work and ductwork during installation by flushing out the installation.
- (5) The external cleaning of all pipe work and ductwork carried out to remove surplus jointing material, paper labels, dirt and grease.
- (6) Flushing of pipework
- (7) Blow through of ductwork.

Testing

The site testing of the various installations take place prior to the application of thermal insulation. High and low pressure ductwork is tested for air tightness, using the system fan or fans, by observation and air flow measurement. The sum total of measured air quantities at all outlets (supply system) and inlets (extract system) are compared with the air quantity measured in the adjacent main duct. Any discrepancy greater than plus or minus 5% for low velocity and 1% for high velocity indicate that unacceptable leakage exists and should be remedied.

All leakage tests are witnessed by the Employer and are independent of any performance tests on the whole system, which is as detailed elsewhere in this specification.

Installations or sections thereof, which is embedded in the structure or concealed in permanently sealed ducts or voids, etc., is, in addition to the above specified tests, individually tested as they are laid and before being concealed.

On completion of the installation the Contractor carry out sound tests to measure the sound pressure level in each octave band in each space, under the supervision of the Employer and with all plant running. The Contractor uses a sound analyser with one octave band range 63 to 8000 Hz to establish the sound spectrum on each space. In carrying out these analyses the Contractor pays particular regard to the following points:

- (1) All items of mechanical services plant or equipment must be running normally.
- (2) Areas adjacent to these areas being tested are unoccupied.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

- (3) There should be no interference from the Contractor's machines or equipment or from any other abnormal noise source.
- (4) The microphone is between 1 and 2 meters from floor level.
- (5) Microphone is not to be held in air velocities greater than 1, 2 m/sec and in any case never nearer than 1,2m from a noise source such as grilles, diffusers etc.
- (6) An average of three readings is to be taken for each area for each octave band.
- (7) Sample readings of background noise dBA should be taken with equipment not in operation before and after noise reading in any one area.

Commissioning

The Contractor does comprehensive pre-commissioning, commissioning as well as quality monitoring on all the HVAC systems in exact accordance with CIBSE Commissioning Codes C (Automatic Controls), A (Air Distribution), R (Refrigeration Systems), B (Boilers), W (Water Distribution Systems) and or ASHRAE Commissioning Guideline.

The Commissioning Report must:

- (1) Demonstrate that the services were commissioned in compliance with CIBSE Commissioning Codes or ASHRAE Commissioning Guideline for all mechanical services;
- (2) Include commissioning dates, records of all functional/commissioning testing undertaken, a list of any future seasonal testing, and a written list of outstanding commissioning issues;
- (3) Include the outcomes and changes made to the building as a result of the commissioning process, accounting for all of the recommendations; and
- (4) Reference appended extracts of commissioning records for major plant and equipment.

The commissioning includes the setting of all controls, dampers etc., and the balancing of the systems to meet the required design air volumes. The Contractor is required to include in the commissioning manuals readings obtained at all grilles, at the air handling units and other fans, at points on the ductwork prior to branch connections and pressure and velocity readings on the supply, return and extract ducts. Ducts are tested and balanced according to SANS 10173 latest revision

The commissioning procedure to be adopted is prepared by the Commissioning Authority. During commissioning the Contractor set the installation to work and competent personnel demonstrates and explain the operation and maintenance procedures for the installation and for each item of plant to the Employer. During commissioning if any item is found to be unsatisfactory the fault is rectified and/or new components fitted and commissioned by the Contractor at their own expense. The Contractor then rebalances and commission the system or part thereof affected at their own expense.

After successful completion of the commissioning and proof period of the installation and any maintenance materials as listed in the Specification and those normally supplied by equipment manufacturer are handed over, the defects liability period commences. Items of equipment which are of a specialist nature e.g automatic controls etc. are commissioned by the manufacturer's representative who instruct the Employer on the function and proper operation of the equipment.

The contract is deemed to be complete when the following have been completed in accordance with the relevant specifications:

- (5) The Plant is erected, and commissioned.
- (6) Signed erection and safety clearance certificates.
- (7) The final drawings have been submitted.
- (8) All documentation has been submitted including testing reports and the associated certificates received. All Quality Control Plan (QCP) documentation received. Final Draft of the Technical, Operating, Maintenance manuals delivered.
- (9) The Plant and all documentation/drawings are coded and labelled.
- (10) All special tools have been supplied.

The complete system is to be subjected to performance tests under full working conditions. This is done in the last month of the defect period. The Contractor shall supply the necessary field testing instruments (thermometers and flow meters) and detailed description of field testing arrangement to prove a capacity/performance measurement accuracy of $\pm 5\%$ for performance acceptance testing.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**Engineering and the *Contractor's* design****3.1 Employer's design****Scope of Works**

The *Works* entail the detailed design, procurement, manufacture, quality control, supply, delivery, offloading, construction, installation, commissioning, testing, training and handing-over of all materials and equipment necessary for the completion of:

HVAC

- New 2 x 100% package cooling units (heat pump or similar)
- New return air fan
- Provide hydraulic analysis report for duct work and air flow
- Provide temporary scaffolding, hoisting, equipment rigging and temporary supports
- New local control panels
- Power and distribution cabling (i.e. from HVAC Electrical Switchgear panel to equipment)
- Structural supports and steel work for HVAC equipment
- Quality assurance
- Operating and Maintenance Manuals
- Test and commission the system
- Interface with the fire detection system

Purpose

The purpose of the works includes the following:

- a) To ensure that Eskom Power Station's infrastructure function correctly and safely to comply with original design and statutory requirements/standards.
- b) Provide adequate cooling, ventilation to ensure long term integrity of all process control electronic equipment is maintained during its operation and maximizes plant efficiency.
- c) To provide & maintain good indoor air quality and dust control.
- d) To provide a safe environment for occupants and keep escape routes safe.
- e) To maintain internal temperatures to the limits as specified by mechanical ventilation and air conditioning.
- f) To prevent the build-up of fumes, odours and other gases during the operation and maintenance life of the station.
- g) To interface closely with the Fire Protection systems to ensure integrity of fire compartments and fire zones.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)

3.2 EMPLOYER'S DESIGN

The contractor is required to *Employer's* functional requirements are based on the following:

Outdoor design conditions

- a) Summer: 32°C DB, 20°C WB
- b) Winter: 2°C DB
- c) Altitude: 1600 m

HVAC Indoor Conditions

The indoor conditions need to be kept as indicated on table 1 below to prolong the equipment lifespan.

Table1

Buildings /areas with HVAC Systems	HVAC Requirements (Cooling/Heating/Ventilation)	Indoor temperature	Humidification	Filtration	Noise / Attenuation (dBA)	Fresh air as % of supply	Smoke Extraction (Yes / No)	Smoke Detection Interface – by others (Yes / No)	Operation (hr/day)
Server room	Cooling	22 °C DB + 2 °C summer	20%-75% monitored	2 Stages, 85% dust spot efficiency (ASHRAE)	45dB A	20%-100%	Yes	Yes	24hrs/day
Automation room	Cooling	22 °C DB + 2 °C Summer	20%-75% monitored	2 Stages, 85% dust spot efficiency (ASHRAE)	45dB A	20%-100%	Yes	Yes	24hrs/day

Performance requirements

The air conditioning system meets the following performance requirements:

- (1) The floor standing indoor units are positioned inside the server and construct plinth automation rooms. The outdoor condenser units are located external to the abovementioned rooms in the vicinity of the Water Treatment Plant (WTP) building.

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- (2) The temperature in the Battery & UPS Rooms is designed at 22 ± 2 °C and 50% RH in summer and winter
- (3) The minimum filtration efficiency complies with MERV-9 as defined in ASHRAE 52.2-2007.
- (4) The velocity across the filters is less than 2.5 m/s.
- (5) The total unit cooling and heating capacity should include for the HVAC and pedestals for the HMI cabinet equipment load, building load, HVAC Plinth fresh air load at design parameters and the unit inefficiencies.
- (6) The system is equipped with a flow monitoring device to indicate when the filters are blocked or the fan unit has failed.
- (7) The design life of the HVAC system is 15 years


The Contractor makes provisions for a dirty/blocked filter alarm to be interfaced with the Outside Plant and Water Treatment Plant DCS. The final coordination of the Interface is to be determined at site after Contract award and without commercial implications to the project.

The system is supplied complete with the following:


- a) R410A or equivalent refrigerant gas
- b) Advanced control board
- c) ON/OFF scroll compressor
- d) EC plug fans
- e) Condensing fan speed control (HP control)
- f) Areolating rubber feet
- g) Dehumidification control
- h) Compressor anti-short cycle
- i) Air flow switch
- j) Dirty filter alarm
- k) Evaporate leaving temperature control
- l) Low ambient protection
- m) G3 & F9 filters
- n) Phase sequence relay
- o) Free-cooling

The Contractor completes the equipment data sheets as indicated below:

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SINGLE PACKAGE COOLING UNIT – DATA SHEET		Data sheet no	1	
Power station	Duvha Power Station	Revision no	0	
System	WTP HMI Automation Room & Server Room	Revised by	A.D. Kubyane	
		Revision date	03/10/ 2016	
1. Data Supplied by Employer				
1.1. Reference drawing		TBA		
1.2. Altitude		1600 masl		
1.3. Approx. Cooling Capacity (kW)		22		
1.4. Approx. Air flow rate (m³/s)		1.05		
1.5. Number of units		2		
1.6. Physical dimensions – L (mm) x W(mm) x H (mm)		1630mm x 1068mm x 1065mm		
1.7. Weight (kg)		343kg		
1.8. Input Power (kW)		11kW		
1.9. Input Current (A)		20.1A		
2. Data Supplied by the Contractor				
2.1. Manufacturer				
2.2. Country of origin				
2.3. Make				
2.4. Model number				
2.5. Physical dimensions – L (mm) x W(mm) x H (mm)				
2.6. Weight (kg)				
2.7. Nominal cooling capacity (kW)				
2.8. COP				
2.9. Air flow rate (m³/s)				
2.10. Sound power (Cooling / heating) – (dBA / dBA)				
2.11. Sound pressure (Cooling / heating) – (dBA / dBA)				
2.12. Refrigerant type				
2.13. Refrigerant charge (kg)				
2.14. Power supply (V – Ph – Hz)				
2.15. Compressor Motor Output (kW)				
2.16. Heat exchanger type				
2.17. Condenser Fan				
2.17.1. Air Flow Rate (m³/s)				
2.17.2. Motor output (kW)				
2.18. Refrigerant piping				
2.18.1. Liquid piping NB (mm)				
2.18.2. Gas piping NB (mm)				
2.19. Maximum number of Indoor Units Connectable				
Notes:				

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AXIAL FAN – DATA SHEET		Data sheet no	2	
Power station	Duvha Power Station	Revision no	0	
System	WTP HMI Automation Room & Server Room	Revised by	A.D. Kubyane	
		Revision date	03/10/ 2016	
1. Data Supplied by Employer				
1.1. Reference drawing		TBA		
1.2. Altitude		1600masl		
1.3. Number of units		1		
1.5. Approx. Air flow rate (m³/s)		0.85m³/s		
1.6. Fan Motor Power (kW)		0.55kW		
1.6. Indoor room conditions (°C DB)		Max 40 °C		
2. Data Supplied by the Contractor				
2.1. Manufacturer				
2.2. Country of origin				
2.3. Make				
2.4. Model number				
2.5. Type of Impeller				
2.6. Class				
2.7. Arrangement				
2.8. Air flow rate (m³/s)				
2.9. Speed (rpm)				
2.10. Blade pitch (angle)				
2.11. Type of Drive (Belt / Direct)				
2.12. Enclosure / Protection				
2.13. Electrical supply (Voltage – Phase – Frequency)				
2.14. Finish				
2.15. Total pressure (Pa)				
2.16. Fan Motor Power (kW)				
2.17. Operating Temperature (°C)				
2.18. Average noise level (dBA)				
Accessories:				

3.3 Parts of the works which the Contractor is to design

The *Contractor* is responsible for the supply and design of the below mentioned *Works*. The design must be submitted to the *Project Manager* in advanced in order for the *Employer* to review and accept. A method statement, clearly defining the execution of the *Works*, must be submitted to the *Project Manager* for approval as part of the design package:

HVAC

The Conditions of Contract and the Particular Conditions state that the *Contractor* is responsible for the detailed design, supply, delivery, installation, testing, commissioning, training, upholding during the trial operation period and the defects liability period of all HVAC equipment related to Duvha Power Station in this tender. These specifications are to be read in conjunction with the rest of this Contract in its entirety, including tender drawings & general standard technical specifications.

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During the period of the Works, the *Contractor* will become aware of technical matters which require attention. The *Contractor* is responsible for communicating these to the *Project Manager*, who will manage the matters in accordance with the applicable contractual conditions. The conditions and/or general standard specifications in this document are to be regarded as the absolute minimum requirement. More stringent similar conditions and/or specifications stated in the detail works information must take preference to those in the general standard technical specifications.

Tender prices for articles and equipment described by means of trade names or catalogue references must refer to the type and manufacture specified. If it is desired to use substitutes, the onus is on the *Contractor* to prove that such substitutes are similar and equivalent to the articles specified and meet with the acceptance of the *Employer*. The decision as to whether to use the specified or alternative articles rests solely with the *Employer*.

Once the installation has commenced with the appropriate acceptance for using any type and make of article or equipment, the same type and make of article or equipment are used throughout the project for that specific application unless otherwise specified.

Site inspection before detailed design

Before tendering, it is recommended that the *Contractors* should visit the site and acquaint themselves with all the local conditions, the accessibility of the site, the full extent and nature of the operations, the supply of and conditions affecting labour, carriage, carting, unloading, storage and safe custody of materials, workshop accommodation, the scaffolding, tackle and tools necessary for the execution of the contract generally. Claims on the grounds of lack of knowledge in such respects or otherwise will not be entertained at all.

The *Contractor* is responsible for the detailed design of the HVAC works based on the Employer's requirements and that such detail designs be submitted to the *Employer* for acceptance prior to purchase and manufacture of any system and *equipment*.

The design data specified in this *works* information and those dimensions shown on the tender drawings are intended for tendering purposes only. The *Contractor* is required to take the actual measurements onsite before proceeding with design & manufacture of the HVAC works as dimension accuracy remains the responsibility of the *Contractor*.

Detailed design required from the Contractor

The *Employer's* concept design at section 4.1 above in conjunction with the rest of this contract in its entirety, including tender drawings & general standard technical *specifications* are to be used to provide the detailed design for the complete HVAC works. The detail design requirements for complete Works is to include the following as minimum, but not limited to the following:

- (1) Detailed design of complete package cooling system and with its recirculation.
- (2) Sound attenuator selection on equipment.
- (3) Detailed design of refrigerant piping
- (4) Detailed design of the control system and Interfacing with fire detection system for complete HVAC works
- (5) Detailed design of the electrical power system and associated interfaces, for complete HVAC works
- (6) Steel structures required for access to equipment.
- (7) Builder 's and civil requirements for complete HVAC works
- (8) Detailed design for provision of painting and corrosion protection for complete HVAC works

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

General

The *Contractor* must follow procedures for the submission and acceptance of his designs as per 4.9 as a minimum. Where otherwise specified, the *Contractor* must accept the more onerous option with regards to delivery times and must include all items requested as per 4.9 and applicable section below where applicable.

The *Employer* rejects the design by the *Contractor* should the designs not be up to standard according to the *Employers* requirements. The *Contractor* is expected to address all comments before resubmitting the designs to the *Project Manager* for an additional review cycle.

The *Contractor* may be required to present the design to an *Employer's* design review committee for final approval.

HVAC

The following documents are supplied to the *Employer* by the *Contractor* as a minimum:

- a) Detailed design including equipment data sheets and specification for selected HVAC equipment, addition of circuits to existing switchgear panel, electrical cabling, controls and instrumentation, and other associated equipment
- b) Dimensioned detail drawings showing the general arrangement of all system and equipment including isometrics and P&ID's or PFD's where required. Sufficient views to ensure clarity on the drawing with at least a plan and two different elevations or sections giving overall dimensions.
- c) Dimensioned detail drawings showing proposed method of fixing of all the system and equipment
- d) Steel structures required to support equipment
- e) Detailed electrical wiring diagrams including schematics and control circuits.
- f) Detailed sequencing manner for installation procedure of *Works*
- g) Detailed programme for the *works* in sufficient detail as to represent the units of work to enable the representative to assess the progress of the *Works*
- h) Technical literature for all items of equipment that forms part of the HVAC installation including, evaporators, condensing units, refrigerant circuits, ventilation fans, door grilles, remote controllers, electrical and control circuits etc.
- i) Proposed corrosion protection systems, including data sheets for coating proposed of equipment
- j) List of Recommended Spares and Technical specifications for the spares, part numbers and the stock levels required
- k) Detailed building & Civil *works* for HVAC and potable water supply *Works*
- l) Detailed maintenance, reliability, control and operating philosophies
- m) Supply of end of manufacturing reports for complete HVAC and potable water supply *Works*
- n) System Codification Lists for each Section of the *Works*

The *Contractor* submits all documents according to the accepted VDSS as appended to this *Works* information. The *Employer* reviews the submission and responds at least 10 days or less after the review

3.5 Other requirements of the *Contractor's* design

The *Contractor* submits a request to the *Project Manager* to assign a resource from the *Employer's* team to assist in the codification of plant.

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General

The *Contractor* provides all system, equipment, materials and services and executes all work necessary to fulfil all requirements specified in this Works Information.

The *works* complies with professional practices and standards for fossil fuel power systems, and are designed for the environmental conditions prevailing at Duvha Power Station.

The *Contractor* liaises with the *Employer* and the *Others* to ensure the successful completion of contract requirements. This is a site activity and is coordinated by the *Project Manager*.

The *Contract* includes the provision of the following:

- a) AKZ labels (*Employer* provides the AKZ codes)
- b) Contract management including site management (and *Subcontractors*)
- c) Contract programming
- d) Provision of draftsman (drawing) services
- e) Cost control and progress reporting
- f) Quantity surveying documentation
- g) Quality assurance
- h) Quality control
- i) Acceptance testing and handing over to the *Employer*
- j) Documentation

The *Contractor* is required to guarantee the complete installation, in accordance with the conditions of this document.

Life expectancy

The HVAC system is to be designed to ensure safe and satisfactory operation for a life expectancy of at least 15 years for DX system under the conditions prevailing at Duvha Power Station.

The *Contractor* provides the following support services after defects correction period at *Employer's* request as and when required during the life of the plant:

- a) full service
- b) spares and
- c) training support

Power Supply interruptions

The Contractor ensures that the supplied equipment are capable of safely shutting down the system without damage in the event of partial or total loss of electrical power, and must be designed to accept a sudden restoration of electric power, without damage and without operator intervention.

Design Philosophy

The philosophy supplied by the *Employer* ensures the optimal performance and maintenance of the system and must be achieved by the *Contractor's* design. In order to achieve the philosophy requirements, the operating range within which the system must perform are defined in the Works Information to which the *Contractor* must comply.

The *Employer* will review the detailed design to ensure compliance with the philosophy. The *Contractor's* function is to ensure:

- a) Adherence to requirements as stipulated in these works information and supporting documents

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attached as part of the works information.

These objectives are to be realised not only in the short term but also to meet the requirements of the system life expectancy and mentioned above.

The HVAC system is to be designed to cost effectively improve the safety, reliability, production, operation, minimise maintenance, training and life cycle costs, by means of appropriate:

- a) standardisation of components and system with inter-changeability of equipment as a focus point;
- b) reduction of interfaces
- c) advanced control concepts
- d) correct man-machine interfaces
- e) compatibility and alignment of the *Contractor's* designs with *Others*; and
- f) Effortless diagnostics.

The *Employer's* Schematics for the Project is to be used as a baseline for a comprehensive detailed design for the *works*.

HVAC System Interface

The *Contractor* is responsible for all system interfaces which forms part of the *works*. The Employer will provide the relevant information defining the system interfaces. The *Contractor* caters for all identified interfaces.

The following major interfaces must be catered for in the design and the execution of the works:

- a) Interface with *Others* including but not limited to the existing LV switchgear.
- b) The *Contractor* uses the floor plan layouts to determine whether the HVAC equipment fit into the respective rooms. It is the *Contractor's* responsibility to ensure that the equipment offered fits into the allocated space.

Transportation

- a) The *Contractor* is required to transport all the Plant and Material to the temporary storage and then to the disposal area located on site.
- b) The *Contractor* is also required upon completion of packaging to transport the System and Material to the permanent storage area.

Technical Risk Assessments

The following technical risk assessments are to be carried out by the *contractor*:

- a) The Contractor must carry out formal Hazardous Locations (HAZLOC) Studies on all systems in their design.

General and sundry items

- a) Provide as-built documentation, control & operating philosophy, operating and
- b) maintenance manuals. "As built" drawings to be provided in Micro Station and PDF version on CD. 3-off final hard-copies of the Installation, Operation and Maintenance Manual prior to the issue of the Taking-Over Certificate.
- c) Provide operating Instructions and Signage, including AKZ coding and tagging.
- d) Inspections, tests, etc. of equipment, and quality control and assurance throughout the

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complete Works by the contractor. Arrangements are made for Employer to inspect equipment before they are dispatched to site. The contractor must make arrangements that these inspections are carried out within the boundaries of South Africa.

- e) Provision of all Test Certificates.
- f) Checking, starting up, testing and commissioning of the complete Works. Balancing of the refrigerant flows for the entire system. Pressure testing of the complete refrigerant piping system and Balancing of the complete ducting system.
- g) Operational Acceptance Testing of the complete works and Trial Operation Period of at least 30 days prior to the issue of the Taking-Over Certificate.
- h) On-site training and training material to the Employers, Operators and Maintenance personnel prior to taking-over of the works. The training must preferable be offered during the 30 day Trial Period for a minimum of ten (10) personnel. The contractor must, prior to handing over of the works, satisfy Eskom or authorized representative that maintenance and operational personnel are competent and adequately trained to maintain and operate the equipment supplied.
- i) Maintaining the Works during the Defects Liability Period of 12-Months from the date of taking – over of the works and Maintenance inspection in accordance with Scope of Work

3.6 Design of Equipment

The *Contractor* is responsible for the detailed design of the HVAC *Works* based on the *Employer's* outline concept design and that such detail designs be submitted to the *Employer* for acceptance prior to purchase and manufacture of any system and equipment.

The design data specified in this works information and those dimensions shown on the tender drawings are intended for tendering purposes only. The *Contractor* is required to take the actual measurements onsite before proceeding with design & manufacture of the HVAC Works as dimension accuracy remains the responsibility of the contractor.

The minimum general equipment design criterion that is to be met is as follows:

- a) The equipment is to be designed to facilitate efficient manufacture, inspection, transportation, installation, maintenance, cleaning and repairs.
- b) The equipment is to be designed to ensure safe and satisfactory operation for a life expectancy of at least 15 years for the HVAC equipment under the conditions prevailing at Duvha Power Station site. The life expectancy of the pipe work and associated fittings must suffice for the remaining life of the station
- c) The equipment is to be designed to prevent undue stresses being produced by expansion and contraction due to temperature change and other local natural and manmade conditions.
- d) The equipment is to be designed to keep maintenance costs to a minimum.
- e) The equipment is to be designed to comply with all the legal requirements in respect of safety and the prevention of environmental pollution.
- f) The equipment is to be designed to satisfy any specific requirements contained in the relevant statutory codes and standards.
- g) The equipment is to be designed for operation of 365 day per annum, 24hrs per day.
- h) The equipment is to be designed such that all material from which the equipment are manufactured from is compatible with the intended duty and service conditions. All equipment is suitable treated and protected from corrosion.
- i) After the design freeze, at the time of the award of the contract, the information stated in the data sheets are to be fully complied with through the installation, unless otherwise agreed upon by both Eskom & contractor in writing.
- j) All electrical equipment, forming part of the specified equipment are sealed against penetration by hose cleaning operations, and be also accessible for repair and maintenance.

The details of equipment and installation requirements are as follows as minimum, however not limited to:

DX Air Conditioning units

The unit to be provided with the following as a minimum:

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- An ON/OFF facility with the ability to select full air conditioning and Fan operation only.
- A fan speed selector with a HIGH/MEDIUM/LOW setting.

The controls are to be clearly marked and easy to operate.

The unit is to be provided with an adjustable temperature controller with an adjusting range of 20-25°C. The sensitivity of this temperature controller are to be such that it controls in a differential band of 2°C (adjustable 1 to 4°C, factory set at 2°C), 1°C on either side of the set points. The temperature controller is to be clearly marked in which way to adjust the room temperature. The temperature controller is to switch on the heater or compressor automatically in accordance with the load.

Install the control facilities within a suitable draw box recessed into the wall/partition, with the control cable reticulated within an enclosed conduit.

Operating range

Fan delivery does not decrease more than 10% when filter dirty and the operation point are stable part of the curve.

Unit operate continuously without damage or malfunction for the following range of conditions at local altitude:

- a) Condensing Unit: Entering Air Temperature : 0°C - 52°C

A “low ambient” condensing control is to be incorporated in the unit if specified as such in the schedule.

Safety protection is to be provided for the fan motors as follows, unless otherwise specified:

- a) Single phase motors: Thermal overload protection.
b) Three phase motors: Combined thermal overload and phase failure protection.

Fan motors are non-overloading at any operating point of their performance curves. Both indoor and outdoor units are to be fully protected and to fail safe. Minimum safety protection, caused by possible external abnormal conditions to be provided for the following, and require manual or automatic reset after fault occurrence:

- a) High discharge pressure.
b) Low Suction pressure/anti-freeze protection.
c) Crankcase heater.
d) Thermal overload protection for all motors.
e) Current overload protection on compressor.
f) Re-starting time delay for compressor.
g) Auto re-starts on power supply interruption.

Reliability and availability

All components and casings to be designed for a service life of 15 years for local conditions based on a 24 hour daily operation.

All components which may come in contact with water (rain, condensate, sweating of compressor, etc.) are to be protected against corrosion in order to obtain the desired service life.

Technical restraints

The unit coils are provided with the following minimum requirements:

- a) The AHU coil to be aluminium fins mechanically bonded to seamless copper tubes. The fin

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- spacing to be greater than 2mm. Ensure no "water carry over" during any operation condition.
- a) The outdoor coil must be hail-proof.
 - b) Coil and refrigerant piping to be protected from freezing in ambient temperatures down to -5°C.

Heating to be provided by a reverse cycle "heat pump feature" if specified as such in the schedule. Compressors may be either semi-hermetic, suitable for field servicing or hermetically sealed. The unit electric heater must have the following minimum requirements:

- a) Manual reset thermal cut-out device set between 60 – 80 °C with reset button, labelled and operable without removing any terminal box cover.
- b) Elements to have an adequate resistance to earth, with due regard to the possible condensation of moisture during the cooling cycle.

The refrigerant piping system is provided with the following minimum requirements:

- a) Refrigerant pipe sizing calculations are to be submitted where the length exceeds 15 metres.
- b) The necessary traps to be installed in the refrigerant lines to ensure oil return for applications where the outdoor unit is installed higher than indoor unit.
- c) Flare connections to be used at the indoor and outdoor unit.
- d) Three way valves with service port are to be installed at the outdoor unit for connection of standard refrigerant pressure gauges.
- e) Fit a filter in the liquid line with a sight glass and moisture indication thereafter.
- f) Provide facilities for charging the units with refrigerant and measuring the refrigerant pressures of the unit using standard refrigerant gauges.
- g) Units which are not pre-charged are to be evacuated to a vacuum of not less than 4mm Hg before charging.
- h) The insulation for the refrigerant piping to be of the "ultra-violet resistant" type. Insulation exposed to outside weather to be finished off with ultra-violet resistant plastic tape or paint.

Drainage of condensate from the units to be collected by the following means:

- a) A pan of sufficient size to catch all condensate which may emanate from the unit.
- b) Drainage via gravity feed from this pan to a suitable connection; or booster pump assisted drainage where indicated on the relevant drawings or in the accompanying schedule.
- c) The drain pan to be fabricated from galvanised sheet steel and painted internally to prevent condensation on the external surface.
- d) Drain piping to be fixed and routed to the nearest suitable drain point to ensure positive drainage.
- e) Drain piping to be resistant or protected against weather elements or people traffic.

The electrics and controls must have the following minimum requirements:

- a) All electrically powered elements within the unit to have an adequate resistance to earth, with due regard to the possible condensation of moisture and comply with statutory requirements.
- b) Interconnecting wiring from the outdoor unit to the indoor unit is to be via conduits or suitable special cable.
- c) Power supply from the local isolator is to be protected against the elements by means of conduit or suitable cable.
- d) Confirm adequacy of the power supply at equipment submission stage.
- e) A manual override facility is to be provided on the indoor unit if a remote wireless

Temperature/control unit is offered.

Installation restraints

Install units in accordance with manufacturer's recommendations and be capable of being fitted into the spaces indicated.

The unit not to drum, vibrate or leak under any operating conditions. Noise level in the conditioned space through the operation of the unit at any operation point is not to exceed NC 40 with an 8dBA room attenuation factor in each octave band.

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All penetrations through building structures are to be sealed against ingress of water and air.

All piping/conduits/wiring/supports are to be neatly and securely fixed to the building structure. Method of fixing is to be submitted to *Employer* prior to installation.

Measurement to confirm equipment compliance with specification

Contractor is to submit with the tender certified performance tests of capacity and power consumption at either local conditions by the SANS or a similar organisation.

Performance to be based on the actual mounting details and location where installed.

Performance testing of each unit to be done in a certified "on line" test facility. The minimum tests are to include compressor running amps, entering and leaving temperatures, a leak test, the heater amperage, all controls for function and calibration of thermostat. All results to be properly recorded against the serial number of the unit and signed off by the responsible person for quality.

Fans**Operating range**

The operation point is to be in the stable part of the curve.

Safety protection is to be provided for the motors as follows, unless otherwise specified:

- a) Single phase motors: Thermal overload protection.
- b) Three phase motors: Combined thermal overload and phase failure protection.

Reliability and availability

The allowable maximum downtime for fans are to be so installed that replacement are not to take longer than 2 hours when executed by qualified building maintenance staff. *Contractor* is to submit service-, maintenance, troubleshooting- and testing instructions in order to obtain acceptance. Documentation is indexed in accordance with the equipment part of the Operating & Maintenance Manuals.

Technical restraints

The Fan is to be complete with standard flanges. Bearings are to be of the permanently lubricated type. Air flow arrow indicators to be installed for each fan unit. Fan is direct driven or belt drive as required by equipment schedules, suitable for mounting at any angle and mounted on vibration areolation mountings. Motor rating is not to be less than the maximum power required by the fan at any operating point between zero and break off capacity.

Fan casing are to be insulated with high density acoustic insulation to limit break out noise to the occupied space. The fan motors are to be provided with manually adjustable speed controller to deliver the specified air quantity where required.

Installation restraints

Install fan assembly in accordance with manufacturer's recommendations.

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Contractor is to supply the necessary field testing instruments and detailed description of field testing arrangement to prove a capacity/performance measurement accuracy of $\pm 5\%$ for the Fan Acceptance Testing.

Certified test results are to be plotted on the official published and certified equipment performance graph/table to confirm that claimed performance is achieved.

The various tests as required by the Quality Management System are demonstrated and accessible to the Employer at all times for monitoring.

Low pressure air distribution system**Operating range**

Maximum allowable variation between actual air flow and specified air flow is not to exceed 5%. Leakage is not to exceed 4% under operating conditions.

Ducting system is to attenuate the total sound power fed into the system by the fan to provide the specified noise levels in the spaces supplied by the ducting system either directly or indirectly (duct break out and noise or air outlet noise).

All isolating, fire, smoke and balancing dampers are to have external easy accessible position indicators, with locking and sealing means when required, and means of resetting after tripping. Inspection doors are to be provided to inspect damper and/or equipment operation for which external indication is impossible or impractical.

Reliability and availability

Duct system control and safety equipment such as automatic dampers, booster fans, etc., requiring service and possible removal/replacement are to be installed in such a way that the downtime of the duct system does not exceed 1 hour when either service/repair or removal and re installation are required.

Duct system control and safety equipment requiring service, maintenance, trouble shooting and periodic replacement etc., are to be documented in accordance with the equipment part of the Operating & Maintenance Manuals.

Technical restraints

The ducting system is to comply in all respects with:

- a) SANS 1238 1979 "Standard Specification for Air Conditioning Ductwork
- b) SANS 0173 1980 "Code of Practice for the Installation, Testing and Balancing of Air Conditioning Ductwork".
- c) Low Velocity Duct Construction Standards-SMACNA.
- d) SANS 10400 Section TT 43.2.

Additional sound attenuating elbows, attenuators, internal acoustic material are to be installed if a sound analysis - in accordance with Chapter 32 Sound and Vibration Control of ASHRAE 1984 System's Volume - for the actual sound power generation of the selected fan, selected fittings and duct construction details indicate that this are required to maintain the specified noise level in the space.

Flexible ducting complete with insulation are to be constructed of non-combustible material as required in terms of the building regulations provided that:

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Approved combustible flexible connections are to be used where the length of such connection does not exceed 1.5m and such connection does not pass through any wall or floor which is required to have a specified fire resistance.

Approved combustible flexible joints of not more than 250mm in length may be used in any system room where such system room are protected by a smoke detection system.

Installation restraints

Ducting systems are to be isolated from actual or potential vibration generating equipment and building components to eliminate transmission of vibrations.

Pressure testing

Duct work is to be pressure tested as follows:

- a) The duct pressure is to be at least 2 times maximum operating pressure, or 150 Pa, whichever is the greater.
- b) Smoke is introduced into the duct section under test.
- c) All leaks letting out visible smoke are to be closed up with approved duct sealing compound.
- d) A further pressure test are to be performed at the above specified duct pressure and leaks sealed until a maximum allowable leakage rate of 4% are reached, suitably de-rated for the volume handled by the duct section being tested.
- e) Pressure testing are to be performed with the spigots installed, temporarily capped, but before the application of the external insulation.

Measurement to confirm equipment compliance with specification

The testing and balancing of the ducting system are to be executed under the control and supervision of an *Employer*. The method instrumentation, procedure, recording are to be documented in a Testing, Balancing, Adjusting Procedure Book.

Minimum requirement for procedure are to be submitted for acceptance in accordance with contract conditions, SANS Code of Practice 0173 1980 and/or Procedural Standards National Environmental Balancing Bureau and/or C.I.B.S. Code of Practice.

On completion of testing and balancing of the ducting system a signed report are to be submitted by the *Contractor* listing all the results to prove that the system are balanced as specified. *Contractor* is to submit proven and necessary calibration certificates that measurements have a 5% accuracy.

Refrigerant piping system

The refrigerant piping system is to be designed and engineered in detail in accordance with the design criteria laid down in:

- a) Trane Reciprocating Refrigeration Manual 1977, and/or
- b) Carrier Systems Design Manual Piping Design Chapter 3, Refrigerant Piping.

The refrigerant accessories are to be fully catalogued products and the documentation to include performance curves or selection tables, for the expected range of operational conditions. Submit certified detailed selection shown on these performance tables or curves. Submit full documentation and calculations

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for acceptance of equipment submission, showing all detailed pressure loss and velocity calculations for the entire refrigerant piping system and accessories under full load and minimum load conditions, including the temperature/pressure curves and balance points for evaporator, compressor and condenser. Where reduction in pipe size are necessary to provide sufficient gas velocity to entrain oil upwards in vertical risers at part load, and at full load the pressure drop exceeds specified design limits, a double riser incorporating an oil trap are necessary.

The system is to be designed:

- a) To minimise loss of lubricating oil from compressor at all times.
- b) To ensure lubricating oil return to compressor, at the same rate at which it leaves under all load conditions
- c) To prevent lubricating oil being trapped in system.
- d) To prevent liquid refrigerant from entering the compressor during operation and shutdown.
- e) For minimum pressure drop and noise generation. The suction, discharge and liquid lines are to be sized so that the pressure drops do not cause a change in saturation temperature of refrigerant greater than 1,1 degrees C in each respective line.
- f) For handling the specified capacities from 100% down to minimum load at specified suction and discharge/condensing temperature.

Refrigerant piping accessories and connections are to be selected to ensure no leakage from refrigerant piping system during its operational life. Refrigerant piping system is to be complete with all necessary isolating valves to enable repairs and maintenance to be carried out on any one section of the system.

The refrigerant accessories are to be so connected and installed into the refrigerant piping system that either a sub component replacement or total removal or reinstallation of the accessory does not take longer than 2 hours by qualified refrigeration mechanics.

Piping system, including accessories, thermal insulation, hangers, supports and vibration isolators are selected and installed to give a minimum working life of 15 years under normal building service conditions. The entire refrigerant system is to be subjected to a leak pressure test with a suitable gas, e.g. clean dry air or nitrogen. It is permissible to add system refrigerant to enable leakages to be more easily detected. Prior to carrying out this test, the *Contractor* verifies by examination of the various parts of the components of the system that the test pressure to which they were subjected at the manufacturer's works, are adequate for the required duties.

Incorporate a safety valve or rupture disc in the piping system. Rupture discs are to have a specified and certified bursting pressure at a specified temperature and marked accordingly on the disc. The system is to comply with the Safety Code for Refrigerant Piping ASA B31.35–1962, with the requirements of ASME, with Occupational Health and Safety Act as amended, and with local authority's by laws. Piping to be stored and handled on site to prevent dirt from entering piping system. Open ends are to be plugged.

Tubing is to be protected against oxidation during silver soldering by use of dry nitrogen flowing through tubing. Solder to be silver solder. Where required for connection to gauges and control devices, tubing not larger than nominal 10mm may be type K soft (annealed) with flared tube fittings suitable for high pressure. Accessories connected to copper tubing are to have solder type ends or flanged ends and soldered flange adaptors.

Piping is to be installed so as to allow for expansion and contraction. Suction and discharge lines are to be installed so that the first point of support is 6 pipe diameters in each of three directions from the unit. System vibration areolation are in accordance with Sound and Vibration Control requirements. Thermal insulation of suction line is to be in accordance with insulation requirements. Piping is to be installed parallel or perpendicular to building construction, while maintaining the required gradients.

Refrigerant piping between indoor and outdoor units are to be supported along its entire length by a galvanised perforated cable tray of sufficient size to allow pipe work to be neatly laid out and insulated. The cable trays are to be supported clear of fixing surface by galvanized brackets allowing air space between cable tray and mounting surface.

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Where piping and insulation are exposed to damage or located externally to the building, a galvanized sheet metal cover having a minimum thickness of 0.8mm are neatly formed and secured to the cable tray brackets. Joints are to be lapped by a minimum of 30mm and to have a minimum clearance of 10mm over insulation.

All necessary pressure gauges are to be installed in refrigerant lines to check pressures and temperatures for load monitoring function of various accessories and possible blockages of strainers. Isolate accessories requiring regular inspection, cleaning and removal by shut off valves to enable this without pump down of the entire refrigeration system.

Accessories

4.5.9.1.1. Liquid receivers

Liquid receivers are offered with the following minimum requirements:

- a) Each receiver is to have sufficient capacity to hold all refrigerant in the system to which it are connected, except that in systems having two or more separate refrigerant circuits, cross connected by pump out piping.
- b) The receiver is to have sufficient capacity to hold all refrigerant in the largest circuit. Receiver capacity is to be based on not over 85% of its internal volume being occupied by liquid. Receiver is to be complete with liquid level indication.

4.5.9.1.2. Liquid suction interchanger

Liquid Suction Interchanger must have the following minimum requirements:

- a) Heat exchangers for field assembled systems are to be the standard products of a reputable manufacturer. Field fabrication of heat exchangers is not permitted.
- b) Heat exchangers for field assembled systems are to be of the shell and tube, shell and coil or double tube type. Tubes are to be seamless copper, plain or with integrally formed fins. Shells are to be welded steel, conforming to the requirements of the latest edition of the Mines and Works Act or the Occupational Health and safety Act and Regulations (85 of 1993), covering pressure vessels. Gas passages are to be arranged so as to prevent trapping of oil.

Liquid gas heat exchangers for Refrigerant 12 are to have sufficient surface to ensure heating the gas to not less than 18.5 degrees C at the outlet. Liquid pressure drop are not to exceed 21 kPa and gas pressure drop not to exceed 3.5 kPa.

The vessels and equipment are to comply with the pressure equipment regulation as per SANS 347 standard

4.5.9.1.3. Refrigerant driers

Refrigerant Driers have the following minimum requirements:

- a) Refrigerant driers for field assembled systems are to be of the angle type with removable cartridges that can be renewed without disturbing pipe connections. Driers are to have brass or steel bodies and solder joint connections. Bonnets are to be flanged and bolted. Cartridges are to be charged with dry silica gel or activated alumina, held securely in place without restraining normal expansion, and provided with suitable means for distributing the refrigerant evenly through the charge. Unless otherwise indicated driers are to be installed in liquid lines close to the receiver outlets and be provided with valves on the inlet and outlet connections. Valved by-passes are also to be provided unless the driers are of a type guaranteed by the manufacturer to operate indefinitely without dusting of the desiccant or appreciable increase in pressure drop. Install a liquid sight glass and moisture indicator of the colour change type in the liquid line, close to each drier.
- b) Select each drier so that the pressure drop through the drier does not exceed 14 kPa when operating at full connected evaporator capacity.
- c) Drier cartridges are not to be installed until after pressure and vacuum tests have been completed but immediately prior to charging

4.5.9.1.4. Thermostatic expansion valves

Thermostatic Expansion Valves have the following minimum requirements:

- a) In field assembled systems, each evaporator circuit are to be provided with a thermal expansion valve of the gas charged type.
- b) Valves are to have external equalizer connections, external superheat adjustments with seal

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caps and solder joints or flanged pipe connections.

- c) Valves are to move from fully open to fully close with not more than 3 degrees C superheat change. Superheat setting is to be 6 °C at full load. Each valve is to be provided with an external strainer, regardless of any internal strainer that may be incorporated in the construction. Strainers are to be as specified under "Refrigerant Strainers".

4.5.9.1.5. Oil separators

Oil Separators have the following minimum requirements:

- a) Each reciprocating compressor having suction and/or liquid mains more than 15 m long is to be equipped with a discharge line oil separator.
- b) Separators are to be made of welded steel and have an effective impingement type separating element, an oil sump and a float operated return trap connected to them to return oil to the compressor automatically.

4.5.9.1.6. Refrigerant Stop and Shut-off Valves

Refrigerant Stop and Shut-off Valves have the following minimum requirements:

- a) Refrigerant stop valves generally are to be of the back seating key operated, sealed cap type. Valves which are opened and closed in regular operation are to have packless type hand wheels.

4.5.9.1.7. Refrigerant strainers

Refrigerant strainers have the following minimum requirements:

- a) Refrigerant strainers are to be of the angle type, cleanable without disturbing pipe connections. 40 mm N.B. strainers and smaller are to have brass bodies and solder joint connections. 50mm N.B. strainers and larger are to have brass or rust proofed steel or iron bodies and flanged connections. Connections are to be flanged and bolted.
- b) Screens are to be bronze metal with perforations not larger than 0.25 mm for liquid lines and 0.5mm for gas lines. The free area of each screen is not to be less than 5 times the area of the strainer inlet pipe.

Charging valves are to be located in the liquid line between the receiver shut-off valve and expansion valve.

Provide external gauge connections at inlet and outlet of condenser, evaporator coil and compressor to enable evaluation of system pressures at commissioning and for normal maintenance inspections.

All gauges are to be connected to the refrigerant piping system through isolating shut off valves.

Liquid indicators are to be of sight glass - double port with seal cap type - of full size in the main liquid line before the thermostatic expansion valve.

The solenoid valves are to have manual override to enable the system to continue to operate in case of solenoid coil failure.

4.5.9.1.8. Vibration isolators

Vibration Isolators (Flexible Connectors) have the following minimum requirements:

- a) Suction and discharge lines from the compressor are to be fitted with flexible connectors of the bronze braided hose type, having sweat-ends, to fit over copper tubing having the same size as the line in which they are installed.
- b) Locate flexible connector as close as possible to the compressor and parallel to the compressor shaft. It must not be subjected to compression or extensions.
- c) For refrigeration installation utilising a remote air cooled or evaporative condenser, hot gas mufflers are used to remove pulsations from the hot gas discharge and thereby reduce noise and vibration from the piping system. The hot gas muffler must be installed to prevent accumulation of oil.

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Complete system to be pressure tested with dry nitrogen and leak test carried out. Test pressure to be maintained for 24 hours with no loss in pressure. Complete system to be evacuated and proved to be free of moisture. The system is able to stand for a minimum of 12 hours with no change in Vacuum. System to be liquid charged on high side following purging of connections to the estimated total charge. Minor adjustment to charge is to be carried out during the 12 hour test run.

The following method is recommended for pressure leak testing:

- a) Use a mixture of nitrogen & trace refrigerant in conjunction with one of the following suitable leak detection methods: Acceptable leak test methods include, Liquid submersion testing, soap bubble leak detection, fluorescent leak detection & electronic leak testing or any acceptable standard.
- b) Pressurise the complete system with dry nitrogen & leak test using any acceptable method.
- c) Having ensured there are no leaks using A or B above, the system must be pressurised to a safe test pressure. Observe over a period of time, relative to the size of the system that no pressure drop occurs, having due regard to temperature variation throughout the system.
- d) After determining that there are no refrigerant leaks when the system is pressurised, the system must be evacuated to remove moisture & air. Evacuation must be deep evacuation method, or triple evacuation using dry nitrogen only as the moisture absorber. To be witnessed by *Employer's* representative.
- e) DEEP VACUUM METHOD: Pull a deep vacuum to a pressure of less than 13 Pa absolute (100 microns of mercury). After isolation the vacuum pump, allow the system to stand for 60 minutes to ensure the vacuum are maintained at or below 16 Pa absolute (120 microns of mercury), OR
- f) TRIPLE EVACUATION METHOD: Use a vacuum pump to pull a vacuum to a pressure of at least 260 Pa absolute (2,000 microns of mercury). Break the vacuum with dry nitrogen & allow the system to stand. Re-evacuate the system & repeat the procedure twice more, breaking the vacuum each time with dry nitrogen.
- g) The final evacuation should be held for twelve hours with no loss of vacuum. After the system has been evacuated the vacuum pump should be isolated from the system and as guide, with constant ambient conditions the vacuum should not rise more than 13 Pa absolute (100 microns of mercury) in one hour. A greater rate of rise may indicate a leak. Absolute vacuums should be measured using accurate measuring equipment selected for the specific application.

Expansion valves and solenoids are to be stripped before welding refrigerant pipes so as to avoid overheating and associated damage to seals, or they are to be kept at constant temperature by means of damp rags.

Should the refrigerant piping run longer than normal, the amount of refrigerant oil is to be increased in the pipe system as per the manufacture's specification.

3.7 Electrical works**Background**

The HMI server and equipment rooms are currently being air conditioned at a capacity of 255 L/s and 4kW. The new cabinets and servers require an estimated cooling capacity 1050L/s and 22kW. The capacity of the existing is insufficient to achieve temperature control in the HMI server and equipment rooms, and shall be upgraded.

The rooms shall be air conditioned with a dedicated air conditioning system, comprising of 2 x 100% package cooling units, air distribution ductwork including fittings and a return air fan for economic cycle purposes. One package unit shall be on standby while the other package shall be operational. The package cooling units shall be positioned at the north side of the Water Treatment Plant building

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New HVAC power requirements

The power requirements for the package cooling units are 11kW, 20.1A for working package unit, 11kW, 20.1A for standby package unit and 0.55kW, 1.45A for a return air fan). The total power requirement for the running unit including the return air fan is estimated at 11.55kW, 23.1A.

Electrical point of supply

The HVAC cooling units shall be installed approximately 200 meters away from the South Water Plant Substation, hence the appropriate point of supply is from this Substation. Spare circuits of 63A with a fuse rating (100A) and spare circuit 40A with a fuse rating (100A) were identified on both the 380V Water Treatment Plant Board 1A and 380V Water Treatment Plant Board 1B respectively. The stated spare circuits on the 380V WTP Boards shall be utilised and modified to power the 400/380V AC HVAC Electrical Distribution Panel.

Requirements for the AC Switchgear

The design for the 400/380V AC HVAC Electrical Distribution Panel shall be in accordance with 240-56227516. The panel shall consist of two incomers, a bus coupler, two feeders for cooling units and two direct online motor control circuits. The panel shall be installed in an open area, thus the Contractor shall ensure that the IP rating for the panel is sufficient for all weather conditions.

Electrical Contractor responsibilities

The Electrical Contractor shall be responsible for the detailed design; manufacturing, construction, factory testing, transportation, offloading, installation, site testing and commissioning of the 400/380V AC HVAC Electrical Distribution Panel. The *Contractor* shall provide and terminate the power cable (s) from the existing 380V WTP Boards on the available spares circuits to supply the HVAC cooling units. The *Contractor* shall also provide and terminate the power cable (s) from the new 400/380V AC HVAC Electrical Distribution Panel to supply the HVAC field equipment. The Contractor shall ensure the electrical works is properly earthed and protected against any lightning strikes. The Contractor shall provide all the necessary documentation for the complete HVAC related electrical works. The *Contractor* shall submit the detail design to the Employer for review and acceptance.

The responsibility matrix between the Electrical Contractor and HVAC Contractor is as depicted in following Table:

Table 1: HVAC Related Electrical Works Schedule

Description of work	Responsible Discipline		
	Employer	Electrical Contractor	HVAC Contractor
1. Detailed Design of HVAC related electrical works		X	
2. Plant and material selection; installation and as built drawings; Testing, balancing and commissioning Documentation; Operating Instruction and Maintenance Manuals; and Inspection Record Cards/Checklists.		X	
2.1. Supply and install 400/380V AC HVAC Electrical Distribution Panels with circuit breakers, contactors, isolators, indication lamps, pushbuttons, door interlocking handles, ammeters, selector switch, auto/manual etc.		X	
2.2. Supply, install and terminate power cables on the new 400/380V AC HVAC Electrical Distribution Panels.		X	

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Description of work	Responsible Discipline		
	Employer	Electrical Contractor	HVAC Contractor
2.3. Allocate the spare circuits on the selected boards to supply the new 400/380V HVAC Electrical Distribution Panels. Modify existing circuit if necessary.	X		
2.4. Terminate the power cables on the allocated spare circuits on the selected boards to supply the new 400/380V AC HVAC Electrical Distribution Panels.	X		
2.5. Electrical cable / wiring, Cable ladders and trays, power and control cabling and racking, joint kits, earthing, hangers and mounting arms, risers and droppers measured as elbows etc. and isolators ending within to HVAC equipment and its controls.		X	
2.6. Testing and commissioning HVAC related electrical works	X	X	X

Cable, Racking and Routing

For the cabling and cable racking *Works*, the *Contractor* shall:

- Design, manufacture/procurement, transport, supply, install, test and commission the new cables.
- Ensure interfacing with all the other system requirements of the plant/installation.
- Ensure that the *works* are implemented as prescribed in the corresponding standards
- Test all cables and provided certificate.
- Develop, finalise and implement the optimised cable routing.
- Produce exact cable routing designs of all the cables.
- Cater for cable servitudes and cable racking.
- Implement all cable routing designs as approved.
- Implement all cable terminations.
- Produce all documentation and drawings

Earthing and Lightning protection

For the earthing and lightning protection *Works*, the *Contractor* shall:

- Perform earth resistance and earth continuity tests of the existing earthing system to determine the status of the earthing point used.
- Construct new earthing tied into the existing earth mat
- Propose and implement lightning protection interventions.
- Perform detailed designs, manufacture/procure, transport, supply, install, test and commission the earthing and lightning protection system and its components, in line with the relevant standards.
- Provide all equipment and components required.
- Ensure that interfacing with all the other system requirements of the plant/installation.

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- Produce all documentation and drawings.

Applicable Electrical Standards

The design of the electrical systems shall be applicable to the following Standards as a minimum:

- The design for the 400/380V AC HVAC Electrical Distribution Panel shall be in accordance with 240-56227516: LV Switchgear and Control Gear Assemblies and Associated Equipment for Voltage up to and Including 1000V AC and 1500V Standard.
- Cabling, cable racks and cable routing shall be design in accordance with 240-56227443:Requirements
- Earthing and lightning protection design shall be in accordance with 240-56356396: Earthing and Lightning Protection Standard.

Refer to section to section 5 for a detailed list of Applicable Standards

3.8 C&I Works

Control and Instrumentation System Design

The Contractor's HVAC discipline is responsible for the detailed design; plant and material selection; installation and as built drawings; testing, and commissioning documentation; operating instruction and maintenance manuals; and inspection record cards/checklists of the complete HVAC standalone equipment controls which are capable of interfacing with Building Management System (BMS).

The HVAC controllers are to be designed to utilise standard sensors, transducers and actuators for the industry which has been field tested for the last two years.

The HVAC controllers is to have a capability to communicate with the standard equipment supplied such as fans to enable monitoring of performance of the components and allow for subsystems to be tested, logged and commanded at the central operator's terminal.

Field controllers are to operate independently of the BMS and each redundant plant is to have dedicated sensors and actuators. The communication bus is to be BACnet, LonMark or Modbus.

Each HVAC system is to be provided with centralized controller capable (HVAC controller) interfacing to with Building Management System (BMS).

The HVAC related controls and fire detection Works responsibility matrix between Contractor's Electronic/Fire discipline and HVAC discipline is as detailed by table below.

Table 2: Division of HVAC Related Controls and Fire Detection Works Schedule

Description of work	Responsible Discipline		
	Contractor's Electronic/Fire discipline	Contractor's Electrical discipline	Contractor's HVAC discipline
1. Detailed Design of HVAC standalone equipment controls including plant and material selection; installation and as built drawings; Testing, balancing and commissioning Documentation; Operating Instruction and Maintenance Manuals; and Inspection Record Cards/Checklists.			X
2. Fire signal within 2.0m of HVAC equipment and electrical boards	X		
3. Provision and connection of fire relay in HVAC equipment and electrical boards		X	X

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Description of work	Responsible Discipline		
	Contractor's Electronic/Fire discipline	Contractor's Electrical discipline	Contractor's HVAC discipline
4. Testing and commissioning of HVAC related fire detection works	X	X	X

Stand-alone control system

The stand-alone control system is to be of the direct digital control type and be configured with the following functions. The stand-alone micro-processor based plug-in modules typically control peripheral devices, elements and components in a subsystem and must:

- Provide means to change set-points, integrating and derivative time, and proportional bands through portable plug-in operator terminal.
- Transmit relevant data to other stand-alone controllers installed if required to do so. The control system is to be Employed and arranged in such a way that staged start-up at sub-system level is provided for staged commissioning.
- All the programming units or equipments must be formally handed over to the *Employer* after commissioning, for future tuning of the controllers

Operating range

Sensitivity, speed of response and throttling range of the individual items of the control system is adjustable so that the controllers maintain steady conditions without hunting or drifting within the specified control values.

Safety and alarm

In case of any control system malfunctioning or function interruption, an alarm signal is given by field adjustable, programmable, audible and visual alarms and the control device must remain in its last controlled position prior to the failure.

Points in alarm are accessed on the stand-alone controller by using menu on screen. The list of signals is as follows:

a) Controls

- Dx. package unit automatic/manual selection switch
- Room return air temperature thermostat controlling 3 way valve at close control
- Heater stop/start per step
- Return air fan motors start/stop
- Fire dampers re – opening

b) Indications

- Fan running/stop/tripped indications
- Duty selection position
- Change over to standby plant activated/not activated
- Individual Dx. Package cooling unit air flow failed/normal
- Filters clean/dirty
- Fire dampers open/close signals

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- High and low air conditioned zone temperatures.
- Dx. Package cooling unit trip
- Fans trip
- No airflow (priority alarm for operator 's investigation)

Reliability and availability

The equipment are so constructed and components installed, connected and documented so that with required spares available and diagnosis methods used, the maximum breakdown interference for any card or board replacement will be limited to one hour. The *Contractor* demonstrates at tendering stage how the "Mean Time To Return" the system to its operational status is achieved with the aid of trouble shooting flow charts to diagnose and repair the sub system.

During pre-handover (commissioning and testing) "Downtime" of the control system and/or during actual "Downtime" during the period that the Comprehensive Service and Maintenance Contract is in force, the *Contractor* must operate the entire system for as long a period as may be required to provide satisfactory performance at all times in the occupied spaces served by that system for up to 24 hours a day continuously.

The *Contractor* provides the operator(s) and equipment required for testing and operating the system. The *Employer* may assign operating personnel as observers but such observation time must not be counted as instruction time. The *Contractor's* operator(s) are fully conversant with the system operation and experienced in running similar installations.

The Mean Time between failure of the overall system or parts of the system is offered at a minimum of 7.5 years. Not more than 5% of the system components fail in any one year. At tender stage the *Contractor* submits the interpretation of the point list, major qualifications and brief summary of the proposed system offered.

The *Contractor* submits at equipment submission stage full details of the proposed:

- a) Fault detection and identification methods
- b) Fault correction methods
- c) Spare parts availability
- d) Documentation
- e) Operators and Maintenance training.

During construction, prior to handover full Operating, Trouble Diagnosis, Service and Maintenance Manuals, together with training aids and procedures are submitted.

The *Contractor* submits full details how and what integrity checks are continuously performed concurrent with normal operation and the subsequent actions are fully described and the influence of these procedures on achieving the claimed "Mean Time to Return" to normal operation.

Technical restraints

The equipment requirements is such that the control system hardware is readily accessible, modular, plug-in connected, to allow for easy fault diagnosis and ease of maintenance on a remove and replace basis to limit downtime to minimum. Adequate space is provided around all items for easy removal of parts. The system has self-diagnostic characteristics to determine fault conditions.

The stand-alone controller level and interface is designed as follows:

- a) The system is designed to utilise only standard sensors, controllers transducers, servo

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actuators, for the industry which have been field tested for at least 2 years. The control system does not only incorporate its own sensors and controllers where applicable, but also use the standard instrumentation, sensors and control equipment supplied as "standard" on equipment such as air cooled condensing units, in order that the performance of all the components of a subsystem can be test logged and commanded at the central operator's terminal.

- b) All actuators, operating valves, dampers, etc., controlling the capacity of components and/or subsystems are equipped with manual operators to maintain control during power failure or interruption. It is impossible to use the manual operator when the power is switched on. If the actuator is switched back to automatic control the manual operator knob must automatically disengage.
- c) All interface between sensors, components, relay boards, capacity controllers, etc., is via plug in terminal factory pre tested connector strips in the MCC's or interface panels.
- d) The accuracy of the sensors, controllers, outstations and management level is of such a standard that the discrepancy (measuring error) between actual and measured value never exceed 2% of the operating rang.
- e) All the field instruments positioned in the battery room are Exn rated

Installation restraints

Every care is taken to protect material, either fixed or unfixed, from damage, ingress of dust, water and moisture. The entire installation is in "as new" condition at handover. All panels are totally enclosed, dust, damp and vermin proof.

The system is designed for location in mechanical system rooms with maximum indoor temperature of 40°C. The system is designed to provide continuity and correct operation during abnormal conditions caused by over voltages, electromagnetic induction, spiking input/output and any other "normal" interference found in commercial buildings through switching of fluorescent lights, operation of other control equipment, operation of welding machines, somewhere in the building, etc.

The installation in its entirety must comply with regard to electrical safety, supply interference and suppression requirements, with SANS regulations.

Measurement to confirm equipment compliance with specification

After successful demonstration of control operation of each sub system including accuracy of sensors, a total system demonstration is performed. This demonstration, having satisfactorily met previously approved submittals, must with the Employer's written acceptance, allow commissioning of the system for on line operation.

The *Employer* takes over the control system upon successful completion of the following by the *Contractor*:

- a) Training of the system's operator and demonstration that the operator is fully conversant with the system trouble diagnosis and corrective actions.
- b) The proper functioning of the entire stand-alone control system is documented in a formal handover/test report written and signed by the control system's responsible *Employer* representative and accepted and countersigned by *Contractor*.
- c) The control system tenderer must submit the pro forma test/handover report at tendering stage.
- d) No handover of system will take place without submission to and acceptance by the *Employer* of this formal handover report.

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The *Contractor's* is responsible for the detailed design; plant and material selection; installation and as built drawings; testing, and commissioning documentation; operating instruction and maintenance manuals; and inspection record cards/checklists of the complete HVAC related building works. The HVAC building related work requirements are as detailed by attached HVAC floor layout plans.

4.8.1.1. Structural Scope

The design process shall follow the Structural Design and Engineering Standard (240-56364545), the steps below outline the deliverables required by the contractor:

1. The Contractor picks a suitable plinth location near the building as shown in appendix 10.7. The selected location must not interfere with any existing services (i.e The plinth must not be in front of the existing air conditioners).
2. Two plinths are designed to support the HVAC equipment and HVAC distribution board.
3. The Fencing and access gate around the HVAC distribution board and control panel
4. HVAC distribution board and control panel is sheltered to protect the electrical equipment

Design requirements

1. The Plinths are designed to support the total mass of the HVAC equipment/Electrical panel, and to accommodate all of the forces that are exerted onto them
2. Drainage is considered in the sizing of the plinth and determining the height above final Terrence level.
3. Contractor positions the plinth in a location that has sufficient space for the maintenance of the equipment to be supported and also for the existing pipes next to the building.
4. All designs shall comply with the Eskom Standard 240-56364545 "Structural Design & Engineering Standard and relevant SANS standards
5. The Contractor submits all designs to the *Project Manager* for review and acceptance.
6. The contractor submits the final layout of the plinth with fence to the station for approval and acceptance

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Documentation control and configuration management Information Requirements

All documents and records management are performed according to Technical Document and Record Management Work Instruction (240-76992014) and the Employer ensures that the *Contractor* is provided with latest revisions. Any uncertainty regarding the work instruction should be clarified with the Employer and clarification updates should be reflected in updated versions of the works instruction. The Contractor complies with all minimum document metadata as specified in Technical Documentation Classification and Designation Standard (240-54179170).

Transmittal letters are provided with each document submittal. The transmittal letter must include the *Contractor's* drawing number, revision number, and title for each drawing attached. Each drawing title must be unique and must be descriptive of the specific drawing content.

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

- Documentation Management Review and Handover Procedure for Gx Coal Projects (240-66920003).
- Project Documentation Deliverable Requirement Specification (240-65459834).
- Technical Document and Record Management Work Instruction (240-76992014)

Configuration Management

The *Contractor* supplies a comprehensive configuration management program according to ISO 10007 (2nd Edition) 'Guideline for Configuration Management' to ensure that plant structures, components and computer software conform to approved design requirements. The *Contractor* develops a project specific Configuration Management Plan document which is aligned to ISO 10007. In addition, the Works as-built physically and functional characteristics must be accurately reflected in selected documents and databases, including those for design, procurement, construction, operation, testing and training. The configuration program must be applicable for use throughout all phases of the project life cycle, including management of spare parts, replacement parts and product upgrades, and forms part of deliverables for hand-over to the *Employer* for use during the operation and maintenance phases of the plant.

Change Management

Design change management is performed in accordance to the latest revision of the Eskom Project Change Management Procedure (240-53114026) and the Employer ensures that the *Contractor* is provided with latest revisions of this procedure. Any uncertainty regarding this procedure should be clarified with the *Employer* and clarification updates are reflected in updated versions of this procedure.

AKZ Classification System

Plant Codification

The AKZ Keypart is used by the *Contractor* for classifying and designating both Plant and their associated documents. The rules for applying the AKZ codes are contained in the AKZ Standards that is provided by the *Employer*.

The *Contractor* codes all Plant within scope of supply according to the AKZ classification system to component level. The *Employer* provides the Plant Breakdown Structure with plant, systems and equipment coded up to the level of design. The relevant AKZ codes allocated appear on all Plant related documentation, drawings, lists and correspondence.

The *Contractor* is responsible for plant codification of all new systems, equipment and components that form part of the design. In order to codify the plant and its documentation, the *Contractor* makes use of the relevant codification standard provided by the *Employer*. Unless otherwise stated, the codification is limited to the lowest component level of coding and applies to all systems included in the *works*.

The *Contractor* is responsible for ensuring the accuracy, completeness and consistency of the designations in all documents. This applies both to designations within documents (Plant designations) and of documents (document designations). The *Contractor* submits these for the *Employer's* acceptance.

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The *Contractor* provides the *Employer* with outline drawings or diagrams showing the *Contractor's* reference coding for materials as per schedule of submittals.

Plant Labelling

The *Contractor* manufactures and installs labels according to the Duvha AKZ Plant Location Coding ENS0002 that will be provided. Detailed nameplate or label lists with the service legends, including the AKZ code are prepared by the *Contractor*, submitted to the *Employer* for review and comment before commencing with the manufacturing of the labels.

Document Submittal Program

The Vendor Document Submittal Schedule (VDSS) provides a list of the documents to be provided and their due dates.

The *Contractor's* engineering program allows a minimum of 5 working days for mailing, processing, and review of drawings and data by *Employer*.

If *Contractor* makes further changes to the equipment and materials shown on submittals that have been reviewed by the *Employer*, the changes are clearly marked on the submittal by the *Contractor* and the submittal process is repeated. If changes are made by *Contractor* after delivery to the Plant, as-built drawings indicating the changes are prepared by the *Contractor* and submitted to the *Employer* for review. Any resubmittal of information clearly identifies the revisions by footnote or by a form of back-circle, with revision block update, as appropriate.

Minimum Requirements

The Drawings to be provided must be in accordance with the Engineering Drawing Standard – Common Requirement (240-86973501)

Procedure for Submission of Documents

The *Contractor* completes the design change [report/request] within 10 working days or such other time period that the *Project Manager* and *Contractor* agree is reasonable in the circumstances, of the *Project Manager's* instruction changing the Works Information.

- In completing the change report, the *Contractor* takes into account the impact of the *Project Manager's* instruction on the works, in accordance with the Works Information and the Contract;
- Provides the *Project Manager* with the impact on the *Contractor's* detailed design, programme,
- costs, Completion Date, Key Dates, execution and methodologies

The above information from the *Contractor* is sent to *Others* on the Project in order to integrate the system and ensure that the *Employer's* objectives in relation to the Project are achieved. Likewise, the *Contractor* may during the Contract receive such information, via the *Project Manager*, from *Others*. The *Contractor* assesses this information to:

- Assess the impact of changes on the *works*, in accordance with the Works Information
- and the Contract;
- Provide the *Project Manager* with the impact on the *Contractor's* detailed design, programme,
- costs, Completion Date, Key Dates, execution and methodologies

Within 5 working days or such *Other* time period that the *Project Manager* and *Contractor* agree is reasonable in the circumstances of the *Contractor* submitting (or receiving this information), the *Contractor* attends a meeting with the *Employer* and *Others* on the Project to align the *Employer*, *Contractor* and *Others' works* and ensure compatibility and integration of the Project.

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The *Contractor* submits its revised programme within 5 working days or such *Other* time period that the *Project Manager* and *Contractor* agree is reasonable in the circumstances, taking into account all information received from the *Employer* and *Others*.

The *Contractor's* obligation to submit quotations within the times periods stipulated in clauses 62.3 is not negated by the procedures set out in this paragraph. If, however, the *Contractor's* quotation does not include the information required by this paragraph or take into account the impact of this information, the *Employer* rejects the quotation in accordance with clause 62.4.

Where the *Contractor* is unable to comply with the Contract or Works Information, the contractor promptly notifies the *Project Manager* of:

- Details of the non-compliance;
- Impact of non-compliance on *Others*;
- Remedial steps to be taken.

The *Project Manager* meets with the *Contractor* and *Others* to assess the non-compliance. The *Project Manager* assesses all the information provided to him by the *Contractor* and *Others* including the impact on *Others*. The *Project Manager* issues an instruction to the *Contractor* and *Others* on how to deal with the non-compliance. The *Contractor* bears the liability for effect of the Instruction including the remedial work and the work undertaken by the *Employer* and *Others* to deal with the non-compliance.

For all instances where the *Contractor* is required to submit a quotation, the contractor must provide the necessary supporting information (detailed in paragraph 2.12 below) in order for the *Project Manager* to assess the Actual Cost. If the *Contractor* fails to provide such information with the quotation, the *Project Manager* rejects this quotation. Notwithstanding the lack of a compliant quotation, the *Project Manager* is entitled to issue an instruction for the *Contractor* to start the work.

If there are any delays under the Contract, the *Contractor* must as part of the quotation show how it intends to mitigate its losses. This includes allocating resources, including key people to *Other* contracts, limiting accommodation, travel and catering expenses. The *Contractor* shows that in incurring these expenses the *Contractor* prepared for the possibility of delay and made all reasonable attempts to mitigate the losses prior to incurring these expenses.

The following process will be followed during submission of documents:

- The Contractor submits the documents/drawings to the Project Manager.
- The Employer's Document Controller registers the documents.
- The Employer's Document Controller will supply the documents/drawings to all relevant parties
- within the Employer's project team.
- The Employer's project team reviews the documents/drawings and will submit all comments or
- inputs to the Project Manager and the Project Manager submits to the Contractor for consideration.
- 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 Design Review session.
- The Employer and the Contractor conduct a Design Review.
- If any fundamental errors were found in the designs or further actions are required, the
- Contractor record all concerns raised and revise the designs.
- The Contractor organises a Design Review session once all designs were revised according to

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

Installation, Operation, and Maintenance Manuals

The Contractor must provide proof, final installation, operation and maintenance manuals for the unloading, storage, installation, operation, and maintenance of the plant materials.

Design Review Documentation

The *Contractor* conducts design reviews as per the *Contractors* official design review procedure. *Contractor* further takes note of the *Employers* Design Review Procedure (240-53113685) and participates in all design reviews as specified by the *Employer*. The *Employer* "Accepts" or "Rejects". The *Contractor* makes the necessary revisions on the documentation and ensures acceptance is obtained from *Employer*. The *Contractor* includes the design reviews in Table 3 below as part of the schedule.

The following design reviews as shown in Table 3, will be conducted, by the *Employer*, as per the design review procedure.

Table 3 : Contractor Design Reviews

Contract Award Review
Design Freeze Reviews (Detail Design)
System Integrated Design Review (Detail Design)
Pre-Commissioning Review
Acceptance Testing Review

Design Freeze reviews can be conducted as End-of-Phase Design Reviews or as a series of Interim Design Reviews with the aim to design freeze a system or subsystem/asset in order to enable subsequent designs to progress. The number of design freeze reviews is discussed with the *Employer* during the contract negotiations.

Documentation for design review is presented to the *Employer* at least ten working days prior to the start of the formal technical clarification discussion.

Where required the *Contractor* meets with the *Employers* for a technical meeting, before the final design review meeting. This meeting may be weekly and will facilitate discussion around interfacing between different designs.

Applicable standards and codes

Table 4: List of Applicable Standards and Codes

Number	Title
SANS 10400	The Application of the National Building Regulations
SANS 10108	The Classification of Hazardous Locations and the Selection of Equipment for Use in Such Locations

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Number	Title
SANS 10103	The measurement and rating of environmental noise with respect to annoyance and to speech communication
SANS 61800	Adjustable speed electrical power drive systems
SANS 10140-3	Identification color marking Part 3: Contents of pipelines
SANS 10142-1	The wiring of premises Part 1: Low-voltage installations
SANS 10147	Refrigerating systems including plants associated with air-conditioning systems
SANS 10173	The installation, testing, and balancing of air-conditioning duct work
SANS 193	Fire dampers
SANS 1238	Air-conditioning ductwork
SANS 1287-1	Ventilation brattices and ducting Part 1: Flexible ducting
SANS 1287-2	Ventilation brattices and ducting Part 2: Brattices, unsupported
SANS 1424	Filters for use in air-conditioning and general ventilation
SANS 1551-1	Check valves (flanged and wafer types) Part 1: PN series
SANS 1551-2	Check valves (flanged and wafer types) Part 2: Class series
SANS 1849	Butterfly valves for general purposes
ASHRAE 15	Safety Codes for mechanical refrigeration
ASHRAE 62	American Society of Heating Refrigeration and Air Conditioning Engineers. Ventilation for acceptable indoor air quality
ASHRAE 55	Thermal environmental condition for human occupancy
ASHRAE 52/76	Standard test method for filters
ASHRAE G1	Guideline for commissioning of air conditioning system
240-56355754	Field Instrumentation Installation Standard
240-56355815	Field Instrument Installation Standard - Junction Boxes and Cable Termination
240-56227443	Requirements for Control and Power Cables for Power Stations Standard
240-56356396	Earthing and Lightning Protection Standard
240-40643427	Coding and Labelling Standard
240-56227516	LV Switchgear and Control Gear Assemblies and Associated Equipment for Voltage up to and Including 1000V AC and 1500V Standard
240-56177186	Design Guide for Power Station Battery Rooms
240-56176097	Electrical Cable Schedule Template
240-56227927	Electrical Load List Template
240-56356421	Electrical LV Switchgear Schedule Template
240-56356465	Electrical LV List of Switchboards Template
240-77302094	Cable Termination Schedules
NFPA 70	National Electrical Code

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**3.10 As-built drawings, operating manuals and maintenance schedules**

- (1) 'As Built' documentation, as listed in Appendix 1 – list of documents required from the contractor is supplied by the Contractor to the Project Manager upon completions of works.
- (2) 3 hard copies and 2 soft copies of As Built documentation is provided by the Contractor as part of the works
- (3) Acceptance of the 'As Built' documentation is a pre-requisite for the Sectional Completion of the Plant Area concerned.
- (4) The documents are reviewed by the Project Manager for correctness and conformance to the accepted design.

CONTRACTOR Requirements for the “AS BUILT” Documentation

- (1) The CONTRACTOR signs of on the completeness of the As Built documentation package

EMPLOYERS Requirement for the Document

- (1) The contractor to supply Duvha with a complete data package.

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4 Procurement

4.1 People

2.14.1 Minimum requirements of people employed on the Site

Only qualified and experienced people to be employed.

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

- (1) The contractor must have at least 2 of Supervisory and Artisan staff authorized in Plant Safety Regulations and/or High Voltage Regulations. In order for any person to do work at the Power Station, this person should be authorized to take out a permit to work.

The courses for this will be presented free of charge to contractors and bookings must be done via the Project Manager.

- i. N.B Access to the switchgear/equipment rooms the Contractor to comply to the following prior to access being granted:
 - a. The Contractor's Supervisor to attend PSR Modules and pass the required test so that they can take up work permits as a responsible person (RP). The course will be offered by the Employer at no cost and Course dates will be announced after Contract Award.
 - b. Contractor to ensure that all personnel working in the room wear special overalls due to the nature of equipment in the rooms.

Overall specification – Arch Flash Proof Overall Class 2, Material: Protera (ATPV 12CA/cm2) Colour: Blue. Suggested Supplier: Quality Safety 1990 Pty Tel 016 365 5770.

BBBEE and preferencing scheme

The Employer formal Black Economic Empowerment (BEE) programme was first initiated in 1995 with the publication of its policy regarding procurement from Black Suppliers (ESKADAAT6). ESKADAAT6 has set the standard for BEE programmes within Eskom and across South Africa as a whole.

Eskom's policy is to maximise purchases from Black or Black Empowering Enterprises (BEE's) whether Black Woman-owned, small or Large Black or Black empowering suppliers. The purpose is to promote entrepreneurship in black communities and give black business access to the mainstream of business opportunity.

Eskom will concentrate its development efforts on black suppliers in the manufacturing, construction and mining /extraction sector of the economy and provide support.

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

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

[Insert the agreed ASGI-SA Compliance Schedule here]

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

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

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**Subcontracting****Preferred subcontractors**

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

Subcontract documentation, and assessment of subcontract tenders

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

Visual Automation Interface Scope

The contractor of The station Historian Visual Automation 4 (VA 4) is SAM. It is recommended that the contractor may consult SAM to obtain assistance for establishing a link between the WTP and VA.

Limitations on subcontracting

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

Attendance on subcontractors

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

4.2 Plant and Materials**2.14.2 Quality**

Refer to Duvha quality manual - See Appendix 5

Plant & Materials provided “free issue” by the *Employer*

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

Contractor's procurement of Plant and Materials

- (1) The *Contractor* shall make use of SABS approved plant and material.
- (2) Test certificates shall be given to the *Project Manager* of the project.

Spares and consumables

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- (1) The *Contractor* shall provide any spares and consumables as they are required for this fault finding and solutions to the defective plant items
- (2) The *Contractor* must supply a recommendation for spares holding based on the project requirements and the *Employer's* goals.

4.3 Tests and inspections before delivery

- (1) The *Contractor* does not bring to the working area those plant and material which the works information states are to be tested or inspected before delivery until the supervisor has notified the contractor that they have passed the test.

5. Construction

Temporary works, Site services & construction constraints

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

Refer to Access Control document - see Appendix 6

Restrictions to access on Site, roads, walkways and barricades

- (1) Pedestrian crossing are made on the road they should be used when crossing the road.
- (2) Inside the plant walkways are clear, they should be used when walking inside the plant to keep safe on any object that might fall.
- (3) Barricades are provided where there are open trenches and around the sumps and manholes.
- (4) The contractor shall occupy only such ground as is necessary to carry out the works.
- (5) All fences and other structure that have been damaged or interfered with by the contractor shall be restored to be a condition at least equivalent to their original condition

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

- (1) The LAR is for the person in charge of the plant to maintain control over activities taking place on his plant that are not covered by the Plant Safety Regulation and Operating Regulations for High Voltage Systems.
- (2) Activities that are allowed to be carried out under the LAR must not require a permit and must satisfy the following criteria:
 - (3) They must not involve danger to the person carrying out the activity;
 - (4) No plant isolations must be required;
 - (5) The activity must be performed by a skilled person and there must be no risk of a production loss;
 - (6) The duration of the activity must be less than 24 hours
 - (7) The Supervisor accompanies the Contractor during the first instances of working under a LAR on a specific plant area.
 - (8) It is very important that the person who plans to do an activity on a plant under the LAR informs the person in charge of the plant (ASS on the panel or Operating Supervisor) of what will be done.
 - (9) This means verbally telling the person in charge of the plant what will be done and not just signing the LAR book. The LAR book is also signed.
 - (10) It is also important that as soon as the activity is completed the person, who was doing the activity, notify (verbally) the person in charge of the plant that conditions are back to normal and that the LAR has been signed off. Just signing the LAR book is not sufficient.
- (11) For more information please refer to Plant Safety Regulation C11.

Health and safety facilities on Site

- (1) Refer to Health and Safety Specification document see attached Appendix 7

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

- (1) Refer to Environmental Policy See Appendix 7

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**Title to materials from demolition and excavation**

- a) The Contractor has no title to an object of value or historical or other interest within the site
- b) The Contractor shall notify the Project Manager when such an object is found and the Project Manager will instruct the Contractor how to deal with it.
- c) The Contractor does not move the object without instruction.
- d) The Contractor has title to material from excavation and demolishing only as stated in the works information.

Cooperating with and obtaining acceptance of others

The Contractor shall co-operate with others in obtaining and providing information which they need in connection with the works.

The Contractor shall share the working area with others in executing the works.

Publicity and progress photographs

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

Contractor's Equipment

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

Equipment provided by the Employer

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

Site services and facilities**a) Potable Water Supply**

- Potable water is available at the existing points.

b) Electrical Power Supply

- Power is available at the existing points.

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- The Contractor provides his own portable 380V electrical distribution boards, and supply cables to and from the boards, for all his power supply requirements to execute the works.
- Contractors' Electrical Distribution Boards complies with OHSA as referred to in the Electrical Installation Regulations and the Electrical Machinery Regulations.
- Each board brought onto site must have a Certificate of Compliance issued by an accredited person.
- The Contractors' electrical distribution boards are installed at the works on a time negotiated with the project manager, prior to the possession date.
- The Employer connects distribution boards to a 380V three-phase AC power supply, only after the Contractor has submitted the valid Certificate of Compliance.
- All Contractors' Electrical Distribution Boards are earthed to the steel structure of the plant.

c) Toilet Facilities

- The Employer provides the Contractor access to existing toilet facilities. The Contractor is to provide this facility should the existing facilities not be within reasonable distance from the working area.

d) Catering Facilities

- The Contractor are not allowed to use the Employer's dining facilities, unless a specific agreement has been made between the Contractor and Eskom Catering and Accommodation Services (ECAS).
- The Contractor may buy take away meals from the fast foods outlet on Site.

e) Medical Facilities

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

Facilities provided by the Contractor

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

Survey control and setting out of the works

- a) The Contractor shall properly deal with and disposal of water to ensure that the works are kept sufficiently dry for their proper execution.
- b) The contractor shall provide, operate and maintain in sufficient quantity such pumping equipment, well points, pipes and other equipment as may be necessary.
- c) The Contractor shall also provide temporally works as may be necessary to minimise damage, inconvenience or interference.

Survey control and setting out of the works

- a) The Contractor shall properly deal with and disposal of water to ensure that the works are kept sufficiently dry for their proper execution.
- b) The contractor shall provide, operate and maintain in sufficient quantity such pumping equipment, well points, pipes and other equipment as may be necessary.
- c) The Contractor shall also provide temporally works as may be necessary to minimise damage, inconvenience or interference.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**Excavations and associated water control**

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

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

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

Control of noise, dust, water and waste

- a) The Contractor shall take all responsible measure to minimise any dust nuisance, pollution of stream and inconvenience to or interference with public as a result of the execution of the works.
- b) Remove all rubble and dispose to appropriate facility as according Duvha waste management procedure (EVP0005)

Sequences of construction or installation

All work must be inspected and approved as per QCP holding points by the system engineer and project manager. The contractor's supervisor is still entirely responsible for ensuring that the work is carried out as per the complete QCP

Giving notice of work to be covered up

All work must be inspected and approved by the system engineer and project manager before it may be covered up.

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

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Item of work	To be completed by
Performance testing of the <i>works</i> in use as specified in paragraph 1.1 of this Works Information.	Contractor in the presence of <i>Project Manager</i> and engineer

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

The *Employer* may use any part of the *works* before completion has been certified. If he does so, he takes over the part of the *works* when he begins to use it except if the use is:

- For a reason stated in the works information
- To suite The Contractors method of working

The *Project Manager* certifies the date upon which the *Employer* takes over any part of the *works* and its extension within one week of the date.

5.2 Materials facilities and samples for tests and inspections

The Contractor and the *Employer* provide material, facilities and samples for test and inspection as stated in the Works Information.

5.3 Commissioning

The *Contractor* supplies personnel to assist the *Employer* with commissioning of the *works*.

The plant is commissioned by running the system fully manual and testing each piece of Plant and Material for full functionality.

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

The Contractor shall carry out sufficient checks to satisfy himself that the materials used and the workmanship comply consistently with the specified requirements and the results of those checks shall, if so ordered, be made available to the Engineer.

The Engineer may carry out such check as he deems necessary at any point or any depth or any layer, as the result of the Engineer's check shall be made available to the contractor.

2.14.3 5.5 Take over procedures

Take over will be on or before the Completion Date the *Contractor* shall have done everything required to provide the *works* and the Engineer has done all the necessary inspection and the approval of the *works* done

2.14.4 5.6 Access given by the *Employer* for correction of Defects

The Supervisor issues the Defect certificate at the later defect date and the end of the last defect correction period. The *Employer's* right in respect of the defect which the supervisor has not found and notified are not affected by the issue of the defect certificate

The Contractor contacts the *Project Manager* to gain access to the site to correct defects.

2.14.5 5.7 Performance tests after Completion

The Contactor shall conduct performance test after installation in the presence of the *Project Manager* and the Engineer according to the QCP, the end user and functional requirements.

2.14.6 5.8 Training and technology transfer

The *Contractor* shall provide any associated transfer of technology and knowledge to the *Employer*.

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**3 5.9 Plant and Materials standards and workmanship**

All materials to be new and to comply to all the requirements as laid down in the applicable SANS or other standards.

5.10 Investigation, survey and Site clearance

The Contractor shall make arrangement with the *Project Manager* should he want to perform investigations or survey.

5.11 Electrical & mechanical engineering works**Wiring and cabling installation**

- (1) All cables shall be sized according to the design of the system. This must take into account all electrical and mechanical characteristics, such as voltage drops, current carrying capacity, impedance and mechanical protection. This is often dependant on the type and make of the equipment, as well as the specific environments in which they are installed. This shall be the responsibility of the contractor.
- (2) Cables with "standard" fire resistance shall be used for general use. These cables shall have a rating of PH30 when tested according to BS EN 50200 [23]. The competent fire system engineer needs to specify the required cables to be provided to the risk areas.
- (3) Cables with "enhanced" fire resistance shall be used where certain systems are required to operate for longer than normally required. These cables shall have a rating of PH120 when tested according to BS EN 50200 [23].
- (4) Mixture of cable types is not permitted. Cables shall only be supplied from one manufacturer for the entire system to avoid known impedance problems caused by mixing different manufacturers cables.
- (5) Fibre optic cable is recommended for the communications medium between fire panels because it is immune to electromagnetic interference, can pass through hazardous areas without the risk of spark and provides high speed network connectivity.
- (6) Alternatives to hardwiring of systems may be considered, but only if necessary. These shall comply with the EN 54 standard.
- (7) Cables only enter panels from the bottom, never from the top.
- (8) Where the wiring enters control panels, etc., the wires of each conduit / cable are neatly and carefully bunched together and secured by means of plastic cable straps.
- (9) Saddles are positioned at intervals no greater than 1000 mm. All cables are armoured when not running inside conduit.
- (10) All cables are colour coded or numbered consistently and continuously throughout the work.
- (11) Painting of conductors is not acceptable under any circumstances.
- (12) Cable spacing is maintained by cable ties accepted by the *Project Manager*, every 300 mm in horizontal and vertical runs of trays.
- (13) Single cables run from a tray follow the building or structure members and are supported every 300 mm. Where necessary additional steel angles or channels are installed to support the cables.
- (14) Cables are installed with radii of bends not less than the minimum recommended by the cable manufacturer or eight times the outer diameter, whichever is the larger.
- (15) Trailing cables may be installed with radii of bends not less than eight times the outer diameter of the cables.
- (16) When cables are installed in positions exposed to areas with pedestrian traffic, vehicle traffic or maintenance activities, and could be subject to damage, they are provided with mechanical protection in the zone from floor or ground level to three metres above the floor.
- (17) All cables are installed in locations remote from sources of heat. Where, out of necessity, cables are installed in the vicinity of radiated heat source, they are adequately protected by a heat resistant barrier and are of a heat resistant type approved by the *Project Manager*.
- (18) All debris and foreign matter is removed from the cable trays and trenches prior to installation of the cables, and on completion of the work, the Contractor thoroughly checks all cable trays and trenches and again removes all accumulated dirt and debris. On completion of the cable installation, the Contractor ensures that all covers are in place on the trenches and trays where applicable.

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- (19) During installation of the cables, extreme care is exercised to avoid kinking or bending which may damage the cable insulation or sheath. Cables that are accidentally damaged during installation are repaired or replaced to the satisfaction of the *Project Manager*. In no case is a cable, on which the outer sheath has been punctured, installed.
- (20) Signal and control cables are not laid until the cables are safe from damage that may be caused by construction operations.
- (21) All conductors on vertical runs of cable tray are supported independently of the terminal connections.
- (22) Cables are installed in the trays in logical order such that they will lie flat on the tray with no crossovers.
- (23) Cables entering or leaving a tray are routed to prevent possible mechanical damage due to abrasion.
- (24) The Contractor is responsible for storage of all cables and suitably protects it from weather and damage during storage and handling.
- (25)
- (26) Wiring is multi-core and conforms to SABS 1411 (1996) and SABS 1574 (1992)
- (27) Use can be made from the existing cabling. Any additional cabling required is included in the prices.
- (28) The number of cables in any one conduit does not exceed the number permitted by the SABS Code of Practice 0142.
- (29) Where the wiring enters control panels, etc., the wires of each conduit / cable are neatly and carefully bunched together and secured by means of plastic cable straps.
- (30) All cables are colour coded or numbered consistently and continuously throughout the work.
- (31) Painting of conductors is not acceptable under any circumstances.
- (32) Cable spacing is maintained by cable ties accepted by the *Project Manager*, every 300 mm in horizontal and vertical runs of trays.
- (33) Single cables run from a tray follow the building or structure members and are supported every 300 mm. Where necessary additional steel angles or channels are installed to support the cables.
- (34) When cables are installed in positions exposed to areas with pedestrian traffic, vehicle traffic or maintenance activities, and could be subject to damage, they are provided with mechanical protection in the zone from floor or ground level to three metres above the floor.
- (35) And again removes all accumulated dirt and debris. On completion of the cable installation, the Contractor ensures that all covers are in place on the trenches and trays where applicable.
- (36) During installation of the cables, extreme care is exercised to avoid kinking or bending which may damage the cable insulation or sheath. Cables that are accidentally damaged during installation are repaired or replaced to the satisfaction of the *Project Manager*. In no case is a cable, on which the outer sheath has been punctured, installed.
- (37) Signal and control cables are not laid until the cables are safe from damage that may be caused by construction operations.
- (38) All conductors on vertical runs of cable tray are supported independently of the terminal connections.
- (39) Cables are installed in the trays in logical order such that they will lie flat on the tray with no crossovers.
- (40) Cables entering or leaving a tray are routed to prevent possible mechanical damage due to abrasion.
- (41) The Contractor is responsible for storage of all cables and suitably protects it from weather and damage during storage and handling.

Cable Routing

- (1) Low voltage cables (less than 50 V) in conduits are separated from circuits of higher voltages. These are not run in the same conduit.
- (2) Signal cables parallel to any power cables are routed at least 1000 mm from such power cables in the plant and cross the power cables at right angles where necessary.

Cable Termination

- (1) Cable ends are properly crimped with pin lugs and securely connected in terminal blocks.
- (2) Solder less crimping lugs are used.
- (3) The terminals used in junction boxes are of non-brittle plastic,

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- (4) Only compression glands to suit the cable and boxes are used. Termination of armoured cable in all power and control equipment is made in IP21 armoured cable glands.

Panel Wiring

- (1) Crimping connector size is determined by the wire size.
- (2) Every wire is identified by numbered at each end.
- (3) All panel wiring is neatly laid in trucking to a maximum capacity of 80% of trimming capacity.
- (4) All exposed wiring is neatly looped in accordance with accepted practice.
- (5) Terminals are of the Clip-on polyamide feed through type or equivalent approved by the *Project Manager*.
- (6) Each terminal has a space for numbering.
- (7) Connection is made to terminal strips on one side only, leaving the other side clear for field connections.
- (8) Not more than one wire is connected to one side of any terminal.
- (9) Wiring passing through a terminal carries a terminal number on both ends.

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6 List of drawings

6.1 Drawings issued by the *Employer*

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

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

Drawing number	Revision	Title

7 Appendices

7.1 Appendix A Environmental Management Policy

7.2 Appendix B ENV0005- Procedure for waste management



Microsoft Word
Document

7.3 Appendix C Supplier Contract Quality Requirement



QM-58 Supplier
Contract Quality Requi

7.4 Appendix D Access Control Visitors Appointment



Access Control
Visitors Appointment

7.5 Appendix E AKZ Plant labelling standard



Microsoft Word
97-2003 Document

7.6 Appendix F SHE Requirements



32-726 (0) SHE
Requirements for the

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**PART 4: SITE INFORMATION**

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

Duvha Water Treatment Plant Human Machine Interface (WTP HMI) – Heating, Ventilation and Air Conditioning Upgrade (HVAC)**PART 4: SITE INFORMATION****C4.1: Information about the *site* at time of tender which may affect the work in this contract****Safety Risk Management**

- 1) The Contractor complies with the requirements of the Duvha Power Station Safety, Health & Environmental Specifications SAS 0012 rev 8.
- 2) **The documents are completed by the Contractor and submitted to the Employer before taking possession of the works.**
- 3) These documents are valid for the duration of the works.
- 4) The Contractor and all his personnel attend a Health and Safety Induction Course prior to starting with the works.
- 5) The induction course is presented by the Safety Risk Department at Duvha Power Station.
- 6) The Contractor makes arrangements with Project manager who will arrange with Safety Risk Management, for a slot and the date scheduled for the course.
- 7) The Contractor submits all the documents as indicated in the Safety, Health & Environmental Specifications relevant to the work to Safety Risk Management before the induction course.
- 8) The Contractor completes all appointments required and ensures that the appointee and appointees fully understand their responsibilities and are competent and trained to execute their duties.
- 9) The appointees/appointee ensures that all duties are carried out and records are kept by the Contractor for review/audit by the Employer or Inspector of Machinery.
- 10) Duvha Safety Risk Management has the right and authority to visit and inspect the Contractor's work place or Site establishment.
- 11) The Contractor supplies and ensures that his employees wear the necessary PPE according the risk assessments performed on the specific tasks to be carried out.
- 12) The Contractor ensures that everyone entering Duvha Power Station under his supervision are medically, physically and psychologically fit to enter Duvha Power Station.
- 13) The medical examination, at the Contractors cost, is carried out by a Registered Professional Occupational Health Practitioner and the examination shall include the following tests:
 - a. Eye Test, Blood Pressure,
 - b. Heart Function,
 - c. Hearing Test and
 - d. Lung Function.
- 14) A thorough examination is done and previous physical injuries, as well as occupational diseases/complications are covered.
- 15) If at any point in time during the execution of the works, the Contractor has a radiation-related

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incident/exposure, the onus is on the Contractor to immediately notify the Employer, the Medical Station, the Risk Manager and the Safety Risk Management Department.

- 16) The onus thereafter is for the Contractor to immediately arrange, at his/her cost, for blood samples to be taken by a Registered Laboratory and for this sample to be sent to the Excellerator Laboratory in Cape Town for full radiation exposure tests. This test results are then to be discussed with the Duvha Occupational Health Practitioners, who will then advise the Power Station Management on the risk, if any, of the incident/exposure.
- 17) The Contractor takes full responsibility and accountability for all other people/staff/personnel/labour that he/she employs or utilises, whether in full-time/part-time/contract basis, in executing the works or other work whilst on the Employers premises.
- 18) The Contractor ensures that Safety Harnesses are used for all work carried out in elevated positions, as defined in the Occupational Health and Safety Act, No 85 of 1993 or any other Code of Practice or standard or the Construction Regulations.
- 19) All safety equipment or Machinery used complies with the SANS Codes of Quality and Practice or any Code as stipulated in the Occupational Health and Safety Act, No 85 of 1993, and any amendments thereto.
- 20) The Contractor at all times consider himself as “Employer” as defined in the Occupational Health and Safety Act, No 85 of 1993 and do not consider himself as under supervision or management of the Employer with regard to Health and Safety Requirements but only from a Commercial Contractual Condition of Contract. Under no circumstances does the Contractor consider himself a sub-ordinate or being given supervision.
- 21) The Contractor provides and maintains his own facilities as required in the Occupational Health and Safety Act, No 85 of 1993 or any other Code of Practice or standard or the Construction Regulations, if not agreed contractually or arranged by the Employer.
- 22) The Contractor has Safety Systems in place at his premises for the total contract period and these shall include the following:
 - a. Safety Management Structure and Compliance to these.
 - b. Statutory Appointments.
 - c. Records and documentation of all Risk and Hazard Analyses.
 - d. Planned Job Observations Records and Documents.
 - e. Employment history and records of all personnel, part-time or full-time or contract labour.
 - f. Medical History of all personnel, part-time or full-time or contract labour
 - g. Training and Competency Records with regard to Safety, Health and Environment.
 - h. Training and Competency Records with regard to the skills he uses to carry out the works or any other works in the Employers premises.
 - i. Compensation Commissioner records and proof of registration.
 - j. Records and documentation with regard to any sub-contractor or labour-only contracts he places or uses to carry out the works or any other works in Employers premises.
 - k. Personal Protective Equipment and Safety Equipment Inspection, training and competency records and documentation.

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- l. Employment contracts for all sub-contractor or labour-only contracts.
- m. Compliance to a Safety System, such as NOSA or any other system that is similar in nature.
- n. Records of all incidents or accidents, and vehicle accidents, incurred during execution of this works or any other works in the Employers premises.
- o. Records of all man-hours, including sub-contractors or labour-only contracts, the Contractor spends on the Employers premises.
- p. Written Safe Work Procedures for all hazardous tasks the Contractor executes on the Employers premises.
- q. A Fall Protection Plan for all elevated work the Contractor does on the Employers premises.
- r. Environmental Plan and awareness training.
- s. Induction training records of his staff by himself/herself.
- t. Minimum wage compliance for the different skills and to which Bargaining Council compliance is made to and proof of membership, if any.
- u. Risk Assessment of this type of works
- v. Proof of authorisation/accreditation from Department of Labour and or other Statutory Body for this type of works, if applicable
- w. Emergency Evacuation and Rescue Plan for the hazardous tasks related to the works.

Specific Risks

23) The following risks are identified by the Employer and Contractor specifically addresses these risks to ensure that the works is carried out safely:

- a. Working at heights
- b. High temperatures
- c. Low temperatures
- d. High pressures
- e. High voltage
- f. Windy conditions
- g. Dusty conditions
- h. High noise area
- i. Work is being carried out overhead
- j. Work is being carried out below
- k. Possibility of drowning exists
- l. Work in confined spaces
- m. Possibility of noxious gasses
- n. Possibility of steam release
- o. Possibility of fires or explosions
- p. Chemicals
- q. Biological Hazards

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- 24) Gaskets used are fit for the type of liquid, solid or gas being transported and do not contain any asbestos fibres.
- 25) The ash dust is harmful if inhaled and the Contractor provides proper dust masks to all his personnel working in dusty environments.

Plant Safety Regulations

- 26) The Employer, on request from the Contractor, isolates required plant from all sources of danger as described in the Plant Safety Regulations.
- 27) The Project Manager, on request, makes available a copy of the latest revision of the Plant Safety Regulations available to the Contractor.
- 29) The Contractor conforms to all rules and regulations applicable to plant safety and completes the Workman's Register prior to working on the plant.
- 30) The Contractor declares any grinding and welding to be carried out on the workers register.
- 31) At every permit change the Contractor withdraws himself/herself/his staff for that period of permit suspension/revocation and thereafter only proceeds with the works after signing onto the new permit.
- 32) The Contractor ensures that he/she/all sub-contractors/personnel/staff/his visitors are medically, physically and psychologically fit to enter the Duvha Power Station, and specifically any confined space.
- 33) The Contractor is prohibited from entering Radiation Areas.
- 34) The onus is on the Contractor to ensure that the correct confined space requirements and tests have been done/met by the Employer prior to entry into any confined space or hazardous plant areas.
- 35) The Contractor ensures that all personnel are competent to carry out the works.
- 36) Proof of competency for technical and safety aspects must be available as and when required on site.

Limited Access Register (LAR)

- 37) The LAR is for the person in charge of the plant to maintain control over activities taking place on his plant that are not covered by the Plant Safety Regulation and Operating Regulations for High Voltage Systems.
- 38) Activities that are allowed to be carried out under the LAR must not require a permit and must satisfy the following criteria:
- 39) They must not involve danger to the person carrying out the activity;
- 40) No plant isolations must be required;
- 41) The activity must be performed by a skilled person and there must be no risk of a production loss;
- 42) The duration of the activity must be less than 24 hours
- 43) The Supervisor accompanies the Contractor during the first instances of working under a LAR on a specific plant area.
- 44) It is very important that the person who plans to do an activity on a plant under the LAR informs the person in charge of the plant (ASS on the panel or PPO at WTP) of what will be done.

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- 45) This means verbally telling the person in charge of the plant what will be done and not just signing the LAR book. The LAR book is also signed.
- 46) It is also important that as soon as the activity is completed the person, who was doing the activity, notify (verbally) the person in charge of the plant that conditions are back to normal and that the LAR has been signed off. Just signing the LAR book is not sufficient.
- 47) For more information please refer to Plant Safety Regulation C11.

Fire precautions

- 48) Any tampering with the Employer's fire equipment is strictly forbidden.
- 49) All exit doors, fire escape routes, walkways, stairways, stair landings and access to electrical distribution boards must be kept free of obstruction, and not be used for work or storage at any time. Fire fighting equipment remains accessible at all times.
- 50) In case of a fire, report the location and extent of the fire to the Electrical Operating Desk at extension 2222.
- 51) Take the necessary action to safe guard the area to prevent injury and spreading of the fire.
- 52) Reporting of accidents
- 53) The Employer follows an accident prevention policy that includes the investigation of all accidents involving personnel and property. This is done with the intention of introducing control measures to prevent a recurrence of the same incidents.
- 54) The Contractor is expected to fully co-operate to achieve this objective.
- 55) The Project Manager is informed immediately of any Category B or C incidents. Category A incidents and any damage to property or equipment must be reported to the Supervisor within 24 hours.
- 56) Radiation incidents must be reported immediately.
- 57) In reporting Category C and D incidents, the Contractor submits the following documents, or any additional as required by the Employers investigation team.
- a. Proof of Contract of Employment.
 - b. Proof of WCL notification to Department of Labour.
 - c. Proof of Medical Doctors Note/Certificate detailing nature of injury and period of rest.
 - d. Death Certificate, if Category C fatality.
 - e. Risk and Hazard Analysis, if not in place prior to injury.
 - f. Written Safe Working Procedure, if not in place prior to injury.

NOTE! This report does not relieve the Contractor of his legal obligation to report certain incidents to the Department of Labour, or to keep records in terms of the Occupational Health and Safety Act, and Compensation for Occupational Injuries and Diseases Act.

Occupational Health and Safety Act 1993 - SECTION 37

- 58) The Contractor and Employer agrees to the arrangements and procedures between them to ensure compliance by the main Contractor (as the mandatory) with the provisions of Section 37.2 of the

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Occupational Health and Safety Act, No 85 of 1993.

59) The Contractor complies with:

- a. the Occupational Health and Safety Act, 1993, and all Regulations made hereunder;
- b. all Eskom Safety and Operating Procedures.

60) The Contractor acknowledges that he is fully aware of the requirements of all the above and undertakes to employ only people who have been duly authorised in terms thereof and who received sufficient safety training to ensure that they can comply therewith.

61) The Contractor undertakes not to do, or not to allow anything to be done which will contravene any of the provisions of the Act, Regulations or Safety and Operating Procedures.

62) The Contractor appoints a person who liaises with the Eskom Safety Officer responsible for the premises relevant to the Contract.

63) The person so appointed on request:

- a. supplies the Eskom Safety Officer with copies of minutes of all Health and Safety Committee meetings, whenever he is required to do so;
- b. supplies the Eskom Safety Officer with copies of all appointments in respect of employees employed on this Contract, in terms of the Act and Regulations and notifies the Eskom Safety Officer of any changes thereto.

64) Eskom may, at any stage during the currency of this agreement, be entitled to:

- a. Do safety audits at the Contractor's premises, its work-places and its employees;
- b. Refuse any employee, Subcontractor or agent of the Contractor access to its premises if such person has been found to commit any unsafe act or any unsafe working practice or is found to be not authorised or qualified in terms of the Act;
- c. issue the Contractor with a work stop order or a compliance order should Eskom become aware of any unsafe working procedures or conditions or any non-compliance with the Act, Regulations and Procedures referred to in the Occupational Health and Safety Act - 1993 and all Regulations made there under as well as all Eskom Safety and Operating Procedures.

65) No extension of time will be allowed, as a result of any action taken by Eskom in terms of the foregoing Clause and the Contractor has no claim against Eskom as a result thereof.

Hazardous Substances

66) It is required in terms of the General Administrative Regulation (Regulation 7) that any Manufacture, Importer, Seller or Supplier of hazardous chemical substance supplies the receiver, free of charge, with sufficient information for the user.

Radiation protection

67) The Contractor conforms to Duvha procedure HMS0002 when performing any industrial radiography. Thermal insulation containing asbestos.

68) The Contractor does not disturb any thermal insulating material on the plant until it has been

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positively identified as not containing asbestos. Approval is obtained from the Supervisor before any thermal insulation is disturbed.

- 69) All stripping of asbestos material is undertaken strictly in accordance with the Employer's Standard, SAP 0022, available from Safety Risk Management.
- 70) The Project Manager advises the Contractor whether areas that are to be stripped of lagging have been identified as containing asbestos.
- 71) The Contractor is obliged to ascertain from the Project Manager in advance whether areas required to be stripped, are non-asbestos. Any contractor, other than the contractor appointed to remove asbestos strips no lagging material containing asbestos fibres.
- 72) The Contractor appointed to remove asbestos, does not begin removal without first obtaining the necessary permission from the Deputy Director of Labour and the Project Manager.

Barricading and screens

- 73) The Contractor provides and installs barricades and warning devices to ensure that equipment and persons are not exposed to danger or to prevent access to dangerous areas.
- 74) Additional to barricading, the Contractor installs screening, such as black plastic, on the roadside to keep dust away from the road. This is in the interest of transport safety.
- 75) All welding, flame cutting and grinding work is prohibited inside and directly outside the fabric filter plant area. All such work is done on ground level.
- 76) All gratings are covered with adequate protective screening when welding or flame cutting in the vicinity.

Housekeeping

- 77) The Contractors equipment does not impair the operation of the plant or access to the plant.

Vehicle Safety

- 78) No driver may disregard road signs, drive recklessly, exceed the speed limit, exceed the alcohol limit, or do anything contrary to the National Road Traffic Act while on Eskom business.
- 79) No driver may drive a vehicle while holding a cellular or mobile telephone or radio in one or both hands or with any other part of the body. A cellular or mobile telephone or radio equipment may only be used while driving if such telephone or radio device is fitted with a hands-free device, otherwise it must be switched off.
- 80) All drivers including contractor and contractor employees, when performing work for Eskom, must ensure that they and their passengers remain seated and wear seatbelts at all times.
- 81) No employee may be transported in the back of an open vehicle.
- 82) No driver should park a car in such a way that it will be a hazard to other road users.
- 83) No driver may use a vehicle without being authorised.
- 84) No employee is allowed to drive any Eskom-owned or scheme vehicle if not in possession of a valid national driver's licence as well as an Eskom driver permit.

1. Quality assurance requirements

- 1) All work will be carried out under the CONSTANT Supervision of an Experienced Competent Supervisor.