



NEC3 Term Service Contract (TSC3)

Between **ESKOM HOLDINGS SOC LIMITED**
(Reg No. 2002/015527/06)

and

(Reg No. _____)

for **Repairs and Refurbishment of LV Electrical Motors**

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ENQUIRY No. **MPGXC006126**

PART C1: AGREEMENTS & CONTRACT DATA

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Part one - Data provided by the *Employer*

Clause	Statement	Data
1	General	
	The <i>conditions of contract</i> are the core clauses and the clauses for main Option:	
	dispute resolution Option and secondary Options	<p>A: Priced contract with price list</p> <p>W1: Dispute resolution procedure</p> <p>X1: Price adjustment for inflation</p> <p>X2: Changes in the law</p> <p>X17: Low Service Damage</p> <p>X18: Limitation of liability</p> <p>X19: Task Order</p> <p>Z: Additional conditions of contract</p>
	of the NEC3 Term Service Contract (June 2005) ¹	
10.1	The <i>Employer</i> is (name):	Eskom Holdings SOC Limited (Reg No: 2002/015527/06), a juristic person incorporated in terms of the company laws of the Republic of South Africa
	Address	Registered office at Megawatt Park, Maxwell Drive, Sandton, Johannesburg
	Tel No.	
	Fax No.	
10.1	The <i>Service Manager</i> is (name):	E Gumede
	Address	Majuba Power Station Private Bag x 9001 Volksrust 2470
	Tel	017 799 3426
	Fax	017 799 3259
	e-mail	ndilal@eskom.co.za

¹ Available from Engineering Contract Strategies Tel 011 803 3008 Fax 011 803 3009

11.2(2)	The Affected Property is	Majuba Power Station
11.2(13)	The <i>service</i> is	Repairs and Refurbishment of LV Electrical Motors
11.2(14)	The following matters will be included in the Risk Register	N/A
11.2(15)	The Service 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	1 Day
2	The Contractor's main responsibilities	(If the optional statement for this section is not used, no data will be required for this section)
21.1	The <i>Contractor</i> submits a first plan for acceptance within	N/A
3	Time	
30.1	The <i>starting date</i> is.	01 July 2020
30.1	The <i>service period</i> is	60 Months
4	Testing and defects	
5	Payment	
50.1	The <i>assessment interval</i> is	between the 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	Four weeks.
51.4	The <i>interest rate</i> is	<p>(i) zero percent above the publicly quoted prime rate of interest (calculated on a 365 day year) charged by from time to time by the Standard Bank of South Africa (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</p> <p>(ii) the LIBOR rate applicable at the time for amounts due in other currencies. LIBOR is the 6 month London Interbank Offered Rate quoted under the caption "Money Rates" in The Wall Street Journal for the applicable currency or if no rate is quoted for the currency in question then the rate for United States Dollars, and if no such rate appears in The Wall Street Journal then the rate as quoted by the Reuters Monitor Money Rates Service (or such service as may replace the Reuters Monitor Money Rates Service) on the due date for the payment in question, adjusted <i>mutatis mutandis</i> every 6</p>

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.

	These are additional compensation events:	1	N/A
7	Use of Equipment Plant and Materials		
8	Risks and insurance		
80.1	These are additional <i>Employer's</i> risks	1.	N/A
83.1	The <i>Employer</i> provides these insurances from the Insurance Table	as stated for "Format TSC3" available on http://www.eskom.co.za/live/content.php?Item_ID=9248 (See Annexure A for basic guidance).	
83.1	The <i>Employer</i> provides these additional insurances	as stated for "Format TSC3" available on http://www.eskom.co.za/live/content.php?Item_ID=9248 (See Annexure A for basic guidance)	
83.1	The minimum amount of cover for insurance against loss and damage caused by the <i>Contractor</i> to the <i>Employer's</i> property is	the amount of the deductibles relevant to the event described in the "Format TSC3" insurance policy available on http://www.eskom.co.za/live/content.php?Item_ID=9248	
83.1	The minimum amount of cover for loss of or damage to Plant and Materials provided by the <i>Employer</i> is:	the amount of the deductibles relevant to the event described in the "Format TSC3" insurance policy available on http://www.eskom.co.za/live/content.php?Item_ID=9248	
83.1	The minimum amount of cover for insurance in respect of loss of or damage to property (except the <i>Employer's</i> property, Plant and Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the <i>Contractor</i>) arising from or in connection with the <i>Contractor's</i> Providing the Service for any one event is:	whatever the <i>Contractor</i> deems necessary in addition to that provided by the <i>Employer</i>.	
83.1	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	There is no Contract Data required for this section of the <i>conditions of contract</i>.	

10	Data for main Option clause		
A	Priced contract with price list		
20.5	The <i>Contractor</i> prepares forecasts of the final total of the Prices for the whole of the <i>service</i> at intervals no longer than	Four weeks.	
11	Data for Option W1		
W1.2(3)	The <i>Adjudicator nominating body</i> is:	the Chairman of the Joint Civils Division of the South African Institution of Civil Engineering. (See www.jointcivils.co.za)	
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	As mutually agreed within the boundaries of 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		
X1	Price adjustment for inflation		
		On each anniversary of the contract date contract manager and the contractor must confirm the increase/ decrease with the QS department before the revised prices are stated on the invoice. The QS and the contract Manager must confirm the escalation with the financial department before it may be implemented. The CPA adjustment calculated will be the 12 months and will be adjusted on the contract anniversary date. The first 12 months the rates are without escalation.	
X1.1	The <i>base date</i> for indices is	1 month before contract start date	
	The proportions used to calculate the Price Adjustment Factor are:	proportion	linked to index for
		0.10	Transport
		0.65	Labour
		0.10	Copper
		0.15	non-adjustable
		1.00	Total
			Index prepared by
			L2 Road Freight Cost
			C3 Actual Labour Cost All hourly Paid Employees
			F Metal Prices Copper RCP Metric Ton

X2	Changes in the law	No data is required for this Option
X3	Multiple currencies	N/A
X4	Parent company guarantee	No data is required for this Option
X12	Partnering²	N/A
X13	Performance bond	N/A
X13.1	The amount of the performance bond is	
X17	Low service damages	
X17.1	The <i>service level table</i> is in	C3:Scope of work
X18	Limitation of liability	
X18.1	The <i>Contractor's</i> liability to the <i>Employer</i> for indirect or consequential loss is limited to	R0.0 (zero Rand)
X18.2	For any one event, the <i>Contractor's</i> liability to the <i>Employer</i> for loss of or damage to the <i>Employer's</i> property is limited to	the amount of the deductibles relevant to the event described in the "Format TSC3" insurance policy available on http://www.eskom.co.za/live/content.php?Item_ID=9248
X18.3	The <i>Contractor's</i> liability for Defects due to his design of an item of Equipment is limited to	The greater of <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> insurance (other than the resulting physical damage to the <i>Employer's</i> property which is not excluded) plus the applicable deductibles in the <i>Employer's</i> assets and works / maintenance policies available on http://www.eskom.co.za/live/content.php?Item_ID=9248
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 the excluded matters, is limited to	the total of the Prices other than for the additional excluded matters. The <i>Contractor's</i> total liability for the additional excluded matters is not limited. The additional excluded matters are amounts for which the <i>Contractor</i> is liable under this contract for

² See **Bennett, J and Baird, A** *NEC and Partnering - The Guide to Building Winning Teams* Thomas Telford London 2001 available from Engineering Contract Strategies

- Defects due to his design, plan and specification,
- Defects due to manufacture and fabrication outside the Affected Property,
- loss of or damage to property (other than the *Employer's* property, Plant and Materials),
- death of or injury to a person and
- infringement of an intellectual property right.

X18.5 The *end of liability date* is **One months after the end of the *service period*.**

X19	Task Order
X19.5	The <i>Contractor</i> submits a Task Order programme to the <i>Service Manager</i> within No programme is to be submitted
X20	Key Performance Indicators (not used when Option X12 applies) N/A
Z	The <i>additional conditions of contract</i> are Z1 to Z11 always apply.

Z1 Cession delegation and assignment

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

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

Z2 Joint ventures

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

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

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

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

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

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

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

Z3.4 Failure by the *Contractor* to notify the *Employer* of a change in its B-BBEE status may constitute a reason for termination. If the *Employer* terminates in terms of this clause, the procedures on termination are P1, P2 and P4 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 *Contractor*, 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 *Contractor's* obligation to Provide the Service or taking any other action as appropriate against the *Contractor* (including civil or criminal action).

Z4.2 The *Employer* may terminate the *Contractor's* obligation to Provide the Service 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 P4 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 *Contractor* does not disclose or make any information arising from or in connection with this contract available to Others. This undertaking does not, however, apply to information which at the time of disclosure or thereafter, without default on the part of the *Contractor*, enters the public domain or to information which was already in the possession of the *Contractor* at the time of disclosure (evidenced by written records in existence at that time). Should the *Contractor* disclose information to Others in terms of clause 25.1, the *Contractor* ensures that the provisions of this clause are complied with by the recipient.

Z5.2 If the *Contractor* is uncertain about whether any such information is confidential, it is to be regarded as such until notified otherwise by the *Service Manager*.

Z5.3 In the event that the *Contractor* is, at any time, required by law to disclose any such information which is required to be kept confidential, the *Contractor*, to the extent permitted by law prior to disclosure, notifies the *Employer* so that an appropriate protection order and/or any other action can be taken if possible, prior to any disclosure. In the event that such protective order is not, or cannot, be obtained, then the *Contractor* may disclose that portion of the information which it is required to be disclosed by law and uses reasonable efforts to obtain assurances that confidential treatment will be afforded to the information so disclosed.

Z5.4 The taking of images (whether photographs, video footage or otherwise) of the Affected Property or any portion thereof, in the course of Providing the Service and after the end of the *service period*, requires the prior written consent of the *Service Manager*. All rights in and to all such images vests exclusively in the *Employer*.

Z5.5 The *Contractor* 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 *Service Manager* or the *Adjudicator* does not constitute a waiver of rights, and does not give rise to an estoppel unless the Parties agree otherwise and confirm such agreement in writing.

Z7 Health, safety and the environment: Add to core clause 27.4

Z7.1 The *Contractor* undertakes to take all reasonable precautions to maintain the health and safety of persons in and about the execution of the *service*. Without limitation the *Contractor*:

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

Z7.2 The *Contractor*, in and about the execution of the *service*, complies with all applicable environmental laws and regulations and rules, guidelines and procedures otherwise provided for under this contract and ensures that his Subcontractors, employees and others under the *Contractor's* direction and control, likewise observe and comply with the foregoing.

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 *Service 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 Service 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 *Service 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 82.1 is provided for in 60.1(12) and the *Employer's* liability under the indemnity is limited to compensation as provided for under the

compensation events stated in this contract.

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 judicial management order granted against it.

Annexure A: Insurance provided by the Employer

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

1. Services provided in a TSC3 contract could include some element of construction or refurbishment as well as a continuous maintenance or operational service activity. If an event occurs which causes loss or damage, a claim could be made either against the *Employer's* "works" type policy which may be in place for the *Employer's* portion of the Affected Property concerned or against the *Employer's* assets policy which may be in place for the *Employer's* portion of the Affected Property concerned, or both.
2. The cover provided and the deductibles under the works policy are different to those under the assets policy. Each policy has a range of applicable deductibles depending on the location of the Affected Property and the nature of the insurable event.
3. The *Contractor* is required in terms of Contract Data for clause 83 to provide cover for the deductibles in the insurance provided by the *Employer*. This can be provided from his own resources on a 'self insured' basis or obtained by him from his own insurers. In order to assess the extent of this cover, tendering contractors and their brokers should consult the internet web link given below and scroll to '**Format TSC3**' to establish both the cover and the deductibles in relation to the *service* provided in terms of this contract.
4. 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 83.2. In terms of clause 83.1 "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.
5. If 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.
6. **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

Annexure B: The *Employer's* Panel of Adjudicators

The following persons listed in alphabetical order of their surname have indicated their willingness to be included in the Eskom Panel of Adjudicators. Their CV's may be obtained by using the contact details provided.

Name	Location	Contact details (phone & e mail)
Nigel ANDREWS	Gauteng	+27 11 836-6760 nigela@quoin.net
Andrew BAIRD	Gauteng	+27 11 803 3008 andrewbaird@ecsconsult.co.za
Christopher BINNINGTON	Gauteng	+27 11 888-6141 cdb@bca.co.za
Peter HIGGINS	UK	+44 1293 873 868 peterhiggins@pdconsult.co.uk
Bruce LEECH	Gauteng	+27 11 290 4000 leech@counsel.co.za
Nigel NILEN	Gauteng	+27 11 465 3601; nilences@global.co.za
Robert St. LEGER	Cape Town	+27 21 794 7488 bobst@iafrica.com
Peter THURLOW	Gauteng	+27 11 787 6226 info@thurlowassoc.com

Information about the Panel and appointment of the selected *Adjudicator* is available from Eskom Supply Chain Operations management, by contacting Leighton Itholeng (Tel.: +27 (0)11 800 4031) (Fax :+27 (0)86 668 0419) E-mail: Leighton.Itholeng@eskom.co.za

C1.2 Contract Data

Part two - Data provided by the *Contractor*

Notes to a tendering contractor:

1. Please read both the both the NEC3 Term Service Contract (June 2005) and the relevant parts of its Guidance Notes (TSC3-GN)³ in order to understand the implications of this Data which the tenderer is required to complete.
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(14)	The following matters will be included in the Risk Register	
11.2(15)	The Service Information for the <i>Contractor's</i> plan is in:	
21.1	The plan identified in the Contract Data is contained in:	
24.1	The key persons are: 1 Name: Job: Responsibilities: Qualifications: Experience: 2 Name: Job Responsibilities: Qualifications:	

³ Available from Engineering Contract Strategies Tel 011 803 3008 Fax 011 803 3009

Experience:

CV's (and further key person's data including CVs) are in .

A	Priced contract with price list
11.2(12)	The <i>price list</i> is in
11.2(19)	The tendered total of the Prices is R

PART 2: PRICING DATA

TSC3 Option A

Document reference	Title	
C2.1	Pricing assumptions: Option A	
C2.2	The <i>price list</i>	

C2.1 Pricing assumptions: Option A

1. The conditions of contract

1.1. How work is priced and assessed for payment

Clause 11 in NEC3 Term Service Contract, June 2005 (TSC3) core clauses and Option A states:

Identified and defined terms	11	
	11.2	(12) The Price List is the <i>price list</i> unless later changed in accordance with this contract.
		(17) The Price for Services Provided to Date is the total of
		<ul style="list-style-type: none">the Price for each lump sum item in the Price List which the <i>Contractor</i> has completed andwhere a quantity is stated for an item in the Price List, an amount calculated by multiplying the quantity which the <i>Contractor</i> has completed by the rate.
		(19) The Prices are the amounts stated in the Price column of the Price List. Where a quantity is stated for an item in the Price List, the Price is calculated by multiplying the quantity by the rate.

This confirms that Option A is a priced contract where the Prices are derived from a list of items of service which can be priced as lump sums or as expected quantities of service multiplied by a rate or a mix of both.

1.2. Function of the Price List

Clause 54.1 in Option A states: "Information in the Price List is not Service Information". This confirms that instructions to do work or how it is to be done are not included in the Price List but in the Service Information. This is further confirmed by Clause 20.1 which states, "The *Contractor* Provides the Service in accordance with the Service Information". Hence the *Contractor* does **not** Provide the Service in accordance with the Price List. The Price List is only a pricing document.

1.3. Link to the *Contractor's* plan

Clause 21.4 states "The *Contractor* provides information which shows how each item description on the Price List relates to the operations on each plan which he submits for acceptance". Hence when compiling the *price list*, the tendering contractor needs to develop his first clause 21.2 plan in such a way that operations shown on it can be priced in the *price list* and result in a satisfactory cash flow in terms of clause 11.2(17).

1.4. Preparing the *price list*

It will be assumed that the tendering contractor has read Pages 14, 15 and 73 of the TSC3 Guidance Notes before preparing the *price list*. Items in the *price list* may have been inserted by the *Employer* and the tendering contractor should insert any additional items which he considers necessary. Whichever party provides the items in the *price list* the total of the Prices is assumed to be fully inclusive of everything necessary to Provide the Service as described at the time of entering into this contract.

1 As the *Contractor* has an obligation to correct Defects (core clause 42.1) and there is no compensation event for this unless the Defect was due to an *Employer's* risk, the lump sum Prices and rates must also include for the correction of Defects.

2 If the *Contractor* has decided not to identify a particular item in the *price list* at the time of tender the cost to the *Contractor* of doing the work must be included in, or spread across, the other Prices and rates in the *price list* in order to fulfil the obligation to complete the *service* for the tendered total of the Prices.

3 There is no adjustment to lump sum prices in the *price list* if the amount, or quantity, of work within that lump sum item of service 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. See Clause 60.1.

4 Hence the Prices and rates tendered by the *Contractor* in the *price list* are inclusive of everything necessary and incidental to Providing the Service in accordance with the Service Information, as it was at the time of tender, as well as correct any Defects not caused by an *Employer's* risk.

5 The *Contractor* does not have to allow in his Prices and rates for matters that may arise as a result of a compensation event. It should be noted that the list of compensation events includes those arising as a result of an *Employer's* risk event listed in core clause 80.1.

1.5. Format of the *price list*

(From page 73 of the TSC3 Guidance Notes)

Entries in the first four columns in the *price list* in section C2.2 are made either by the *Employer* or the tendering contractor.

If the *Contractor* is to be paid an amount for the item which is not adjusted if the quantity of work in the item changes, the tendering contractor enters the amount in the Price column only, the Unit, Expected Quantity and Rate columns being left blank.

If the *Contractor* is to be paid an amount for an item of work which is the rate for the work multiplied by the quantity completed, the tendering contractor enters the rate which is then multiplied by the Expected Quantity to produce the Price, which is also entered.

If the *Contractor* is to be paid a Price for an item proportional to the length of time for which a service is provided, a unit of time is stated in the Unit column and the expected length of time (as a quantity of the stated units of time) is stated in the Expected Quantity column.

C2.2 the *price list*

1. MOTOR SIZE- 0.7-10KW

Item	Description	QTY	Unit Price	Total
1	TRANSPORT			
1.1	Transport to Majuba	20		
1.2	Transport from Majuba	20		
2	MAJOR REFURBISHMENT			
2.1	Strip and quote	20		
2.2	Rotor rewind	20		
2.3	Stator rewind	20		
3	BEARINGS			
3.1	Drive end bearings replacement	20		
3.2	Non-drive end bearings	20		
4	SHAFT			
4.1	Shaft repairs	30		
4.2	Shaft replacement	30		
4.3	Shaft key	30		
5	SUNDRY ITEMS			
5.1	Extra terminal Box	10		
5.2	Motor Cowl	15		
5.3	New rating plate	10		
5.4	Grease nipples	10		
5.5	Extra End shields	15		
5.6	Fan	20		
5.7	Motor brake replacement	20		
5.8	Motor test	20		
5.9	Wash and dry out stator	20		
5.10	Test Paint & assemble	20		

2. MOTOR SIZE- 11-50KW

Item	Description	QTY	Unit Price	Total
1	TRANSPORT			
1.1	Transport to Majuba	25		
1.2	Transport from Majuba	25		
2	MAJOR REFURBISHMENT			
2.1	Strip and quote	25		
2.2	Rotor rewind	25		
2.3	Stator rewind	25		
3	BEARINGS			
3.1	Drive end bearings replacement	25		
3.2	Non-drive end bearings	25		
4	SHAFT			
4.1	Shaft repairs	20		
4.2	Shaft replacement	10		
4.3	Shaft key	15		
5	SUNDRY ITEMS			
5.1	Extra terminal Box	10		
5.2	Motor Cowl	15		
5.3	New rating plate	15		
5.4	Grease nipples	30		
5.5	Extra End shields	15		
5.6	Fan	25		
5.7	Motor brake replacement	50		
5.8	Motor test	50		
5.9	Wash and dry out stator	50		
5.10	Test Paint & assemble	50		

3. MOTOR SIZE: 50-315KW

Item	Description	QTY	Unit Price	Total
1	TRANSPORT			
1.1	Transport to Majuba	25		
1.2	Transport from Majuba	25		
2	MAJOR REFURBISHMENT			
2.1	Strip and quote	25		
2.2	Rotor rewind	25		
2.3	Stator rewind	25		
3	BEARINGS			
3.1	Drive end bearings replacement	25		
3.2	Non-drive end bearings	25		
4	SHAFT			
4.1	Shaft repairs	15		
4.2	Shaft replacement	10		
4.3	Shaft key	10		
5	SUNDRY ITEMS			
5.1	Extra terminal Box	5		
5.2	Motor Cowl	20		
5.3	New rating plate	20		
5.4	Grease nipples	10		
5.5	Extra End shields	5		
5.6	Fan	10		
5.7	Motor brake replacement	0		
5.8	Motor test	25		
5.9	Wash and dry out stator	25		
5.10	Test Paint & assemble	25		

The total of the Prices

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Motor Sizes

Motor Description	Stock N.
MOTOR,AC 2,2KW 1430RPM 380V 5,3A "MOTOR, ELECTRIC: POWER: 2.2 KW POTENTIAL: 220/380 VAC CURRENT: 9.2/5.3 A SPEED: 1430 RPM FRAME: DX100LD MOUNTING: B3 FOOT PHASE: 3 ENCLOSURE RATING: IP55 SHAFT SIZE: DIA 28 X LG 64 MM INSULATION CLASS: F TYPE: INDUCTION BEARINGS DE AND NDE 6206Z, SHAFT HEIGHT 175MM, CONNECTION STAR / DELTA, 0.8 SERVICE FACTOR, 50HZ	0140699
MOTOR,AC 3,0KW 1430RPM 380V 6,9A MOTOR, ELECTRIC: POWER: 3 KW; POTENTIAL: 380 VAC; CURRENT: 6.9 A; SPEED: 1430 RPM; FRAME: DX100LD; MOUNTING: FLANGE; PHASE: 3; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 28 X LG 64 MM; INSULATION CLASS: F; BEARINGS DE AND NDE 6206Z; CONNECTION DELTA; 50HZ;	0140506
MOTOR,ELECT:04E6346/01/1077,2.2KW,380VAC MOTOR, ELECTRIC: POWER: 2.2 KW; SPEED: 1390 RPM; FRAME: 100L; CURRENT: 4.8 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 30 MM; INSULATION CLASS: F; PHASE: 3; MIXTEC, CONNECTION DELTA, 0.85 SERVICE FACTOR; PART NO: 04E6346/01/1077,	0221903
MOTOR,ELECT:1.5KW,380VAC,3.9A,1410 RPM MOTOR, ELECTRIC: POWER: 1.5 KW; SPEED: 1410 RPM; FRAME: D90LQ; CURRENT: 3.9 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT FLANGE 165; ENCLOSURE RATING: IP55; SHAFT SIZE: 24 MM; CONNECTION LOCATION: SIDE; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; GEC, MILL MAIN LUBE OIL,	0218552

CONNECTION STAR; SERIAL NO: X041710/05RK	
MOTOR,ELECT:1.5KW,380VAC,4.8A,685 RPM MOTOR, ELECTRIC: POWER: 1.5 KW; SPEED: 685 RPM; FRAME: DX112MQ; CURRENT: 4.8 A; POTENTIAL: 380 VAC; ' OUNTING: B3 FOOT FLANGE 215; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 28 MM; CONNECTION LOCATION: SIDE; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; GEC, MILL TRUNION THRUST PUMP, CONNECTION STAR; REFERENCE NO: 123670/4	0218551
MOTOR,ELECT:110KW,380V 50HZ,148A MOTOR, ELECTRIC: POWER: 110 KW; SPEED: 1480 RPM; FRAME: 280M; CURRENT: 148 A; POTENTIAL: 380 VAC; PHASE: 3; CONNECTION DELTA, 50HZ;	0216878
MOTOR,ELECT:110KW,380V 50HZ,205A MOTOR, ELECTRIC: POWER: 110 KW; SPEED: 1480 RPM; FRAME: 280; CURRENT: 205 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA, 50HZ; PART NO: LA6285/4CA/ZECA	0217194
MOTOR,ELECT:110KW,380V/50HZ,205A MOTOR, ELECTRIC: POWER: 110 KW; SPEED: 1480 RPM; FRAME: 280S/M; CURRENT: 205 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: TEFL; SHAFT SIZE: DIA 80 MM; INSULATION CLASS: F; PHASE: 3; TERMINAL BOX ON THE LEFT HAND SIDE, CONNECTION DELTA, 0.75 SERVICE FACTOR, 50HZ; PART NO: M4280B3110,	0214732
MOTOR,ELECT:11KW,380VAC,22.5A,1450 RPM MOTOR, ELECTRIC: POWER: 11 KW; SPEED: 1450 RPM; FRAME: 160MD; CURRENT: 22.5 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE B5; ENCLOSURE RATING: CI; SHAFT SIZE: DIA 42 MM; INSULATION CLASS: F;	0215501

PHASE: 3; CONNECTION D, 0.84 SERVICE FACTOR;	
MOTOR,ELECT:15KW,380VAC,32A,970 RPM MOTOR, ELECTRIC: POWER: 15 KW; SPEED: 970 RPM; FRAME: ADF180LD; CURRENT: 32 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA (45 X 36) X LG 225 MM; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; 50HZ; REFERENCE NO: ADF180LD;	0179023
MOTOR,ELECT:160KW,380V,305A,1485 RPM MOTOR, ELECTRIC: POWER: 160 KW; SPEED: 1485 RPM; FRAME: 315M; CURRENT: 305 A; POTENTIAL: 380 V; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; SIEMENS, SURGE BIN FEEDER, CONNECTION DELTA, 0.84 SERVICE FACTOR; SERIAL NO: K4-10738029;	0217276
MOTOR,ELECT:160KW,380VAC,285A,2980 RPM MOTOR, ELECTRIC: POWER: 160 KW; SPEED: 2980 RPM; FRAME: 315MD; CURRENT: 285 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE B5; ENCLOSURE RATING: IP56; SHAFT SIZE: 60 MM; CONNECTION LOCATION: TOP; POLES: 2; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; TEMPERATURE CLASS: B; TYPE: INDUCTION; ALSTOM / GEC, DE AND NDE BEARING 6315 C3, COS 0.90 SERVICE FACTOR, CONNECTION DELTA; SERIAL NO: X055790/01/TE;	0216219
MOTOR,ELECT:160KW,380VAC,295A,1485 RPM MOTOR, ELECTRIC: POWER: 160 KW; SPEED: 1485 RPM; FRAME: 315M; CURRENT: 295 A; POTENTIAL: 380 VAC; MOUNTING: FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 85 X LG 170 MM; INSULATION CLASS: F; PHASE: 3; FOR BUCKET WHEEL COAL STACKER / RECLAIMER, CONNECTION DELTA, 1.0 SERVICE FACTOR, 50HZ; REFERENCE NO: 315M;	0179049
MOTOR,ELECT:18.5KW,220VDC,95.4A,1450 RPM MOTOR, ELECTRIC: POWER: 18.5 KW; SPEED: 1450 RPM; CURRENT: 95.4 A; POTENTIAL: 220 VDC; MOUNTING: FLANGE; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 43 X LG 110 MM; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; REFERENCE NO: 07-08-00	0179027

<p>MOTOR,ELECT:18.5KW,380VAC,37A,1460 RPM</p> <p>MOTOR, ELECTRIC: POWER: 18.5 KW; SPEED: 1460 RPM; FRAME: 180M; CURRENT: 37 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 48 X LG 110 MM; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; CONNECTION DELTA, 50HZ</p>	<p>0179066</p>
<p>MOTOR,ELECT:18/75KW,380VAC,49.5/142A</p> <p>MOTOR, ELECTRIC: POWER: 18/75 KW; SPEED: 740-1480 RPM; FRAME: 280S; CURRENT: 49.5-142 A; POTENTIAL: 380 VAC; MOUNTING: FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 80 X LG 170 MM; INSULATION CLASS: F; PHASE: 3; COOLING IC 0141; COS ANGLE 0.86/61; CONNECTION DELTA/STAR; 1.0 SERVICE FACTOR; REFERENCE NO: LA62831CA-ZEBA</p>	<p>0179059</p>
<p>MOTOR,ELECT:185KW,380VAC,343A,2978 RPM</p> <p>MOTOR, ELECTRIC: POWER: 185 KW; SPEED: 2978 RPM; FRAME: D315MX; CURRENT: 325 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 99 X LG 150 MM; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; GEC, CONNECTION DELTA</p>	<p>0180625</p>
<p>MOTOR,ELECT:2.2KW,380V 50 HZ,4.8</p> <p>MOTOR, ELECTRIC: POWER: 2.2 KW; SPEED: 2830 RPM; FRAME: D90L; CURRENT: 4.8 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; ALSTOM, CONNECTION STAR, 50 HZ</p>	<p>0226323</p>
<p>MOTOR,ELECT:20HP,230VDC,77A,725 RPM</p> <p>MOTOR, ELECTRIC: POWER: 20 HP;</p>	<p>0213802</p>

<p>SPEED: 725 RPM; FRAME: 80V; CURRENT: 77 A; POTENTIAL: 230 VDC; MOUNTING: FLANGE; ENCLOSURE RATING: 5VP; PHASE: 1; CONNECTION SHUNT WOUND; PART NO: 273013,</p>	
<p>MOTOR,ELECT:220VDC,OPEN ENCLOSURE</p> <p>MOTOR, ELECTRIC: POTENTIAL: 220 VDC; MOUNTING: FLANGE; ENCLOSURE RATING: OPEN; SHAFT SIZE: DIA 6 X LG 17 MM; CIRCUIT BREAKER SPRING REWIND; PART NO: 886662,</p>	0140941
<p>MOTOR,ELECT:22KW,380VAC,42A,2955 RPM</p> <p>MOTOR, ELECTRIC: POWER: 22 KW; SPEED: 2955 RPM; FRAME: D200L; CURRENT: 42 A; POTENTIAL: 380 VAC; MOUNTING: FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 55 X LG 110 MM; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA, 1.0 SERVICE FACTOR, 50HZ; REFERENCE NO: 7008CPUM002; REFERENCE NO: FM50949301/1</p>	0140554
<p>MOTOR,ELECT:30KW,380VAC,53A,1470 RPM</p> <p>MOTOR, ELECTRIC: POWER: 30 KW; SPEED: 1470 RPM; FRAME: D1250MD; CURRENT: 53 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE; ENCLOSURE RATING: IPV55; SHAFT SIZE: DIA 70 X LG 118 MM; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; CONNECTION STAR, 50HZ;</p>	0179024
<p>MOTOR,ELECT:30KW,380VAC,58A,1465 RPM</p> <p>MOTOR, ELECTRIC: POWER: 30 KW; SPEED: 1465 RPM; FRAME: 200L; CURRENT: 58 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 58 X LG 112 MM; INSULATION CLASS: F;</p>	0179044

PHASE: 3; GEC, CONNECTION DELTA;	
MOTOR,ELECT:37KW,380V 50HZ,70A,985 RPM MOTOR, ELECTRIC: POWER: 37 KW; SPEED: 985 RPM; FRAME: D2505; CURRENT: 70 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 70 X LG 150 MM; INSULATION CLASS: F; PHASE: 3; ALSTOM, TO BE TESTED PRIOR TO DELIVERY AND RESULTS TO BE INCLUDED, 0.86 SERVICE FACTOR, CONNECTION DELTA, 50HZ; PART NO: 87260/1	0223953
MOTOR,ELECT:37KW,380V 50HZ,72A,1475 RPM MOTOR, ELECTRIC: POWER: 37 KW; SPEED: 985 RPM; FRAME: D2505; CURRENT: 70 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 70 X LG 150 MM; INSULATION CLASS: F; PHASE: 3; ALSTOM, TO BE TESTED PRIOR TO DELIVERY AND RESULTS TO BE INCLUDED, 0.86 SERVICE FACTOR, CONNECTION DELTA, 50HZ; PART NO: 87260/1	0216801
MOTOR,ELECT:37KW,380VAC 3PH,1.15A MOTOR, ELECTRIC: POWER: 37 KW; SPEED: 1390 RPM; CURRENT: 1.15 A; POTENTIAL: 380 VAC; ENCLOSURE RATING: IP55; PHASE: 3; STAR, 50 HZ, COMPLETE WITH GEARBOX, NORD GEARS;	0140703
MOTOR,ELECT:37KW,380VAC 50HZ,75A MOTOR, ELECTRIC: POWER: 37 KW; SPEED: 1468 RPM; FRAME: D225S; CURRENT: 75 A; POTENTIAL: 380 VAC; MOUNTING: FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 60 X LG 140 MM; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; CONNECTION DELTA; 50HZ; PART NO: LA6220-4CA-ZEEA	0139607
MOTOR,ELECT:37KW,380VAC,71.4A,1470 RPM MOTOR, ELECTRIC:	0179026

<p>POWER: 37 KW; SPEED: 1470 RPM; FRAME: D225MD; CURRENT: 71.4 A; POTENTIAL: 380 VAC; MOUNTING: FOOT; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA, 1.0 SERVICE FACTOR, 50HZ; REFERENCE NO: A2F045; REFERENCE NO: FH49351101-2</p>	
<p>MOTOR,ELECT:380 VAC,86A,1475 RPM</p> <p>MOTOR, ELECTRIC: SPEED: 1475 RPM; FRAME: D225M; CURRENT: 86 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP56; SHAFT SIZE: DIA 60 MM; INSULATION CLASS: CL 1; REQUIRED FOR TRANSVERSE CONVEYOR, CONNECTION DELTA;</p>	0187355
<p>MOTOR,ELECT:3KW,380V 50HZ,7.2A,960 RPM</p> <p>MOTOR, ELECTRIC: POWER: 3 KW; SPEED: 960 RPM; FRAME: 132S6; CURRENT: 7.2 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE B5; ENCLOSURE RATING: IP54; SHAFT SIZE: DIA 40 X LG 72 MM; INSULATION CLASS: F80; PHASE: 3; SERVICE FACTOR: S1; CONNECTION DELTA, 50HZ;</p>	0223993
<p>MOTOR,ELECT:45KW,380VAC,1465 RPM</p> <p>MOTOR, ELECTRIC: POWER: 45 KW; SPEED: 1465 RPM; FRAME: 225M; POTENTIAL: 380 VAC; MOUNTING: FOOT; ENCLOSURE RATING: CI; SIZE: DIA 60 MM; INSULATION CLASS: H; PHASE: 3; CONNECTION D, 50HZ</p>	0215496
<p>MOTOR,ELECT:45KW,380VAC,82A,2955 RPM</p> <p>MOTOR, ELECTRIC: POWER: 45 KW; SPEED: 2955 RPM; FRAME: 225M; CURRENT: 82 A; POTENTIAL: 380 VAC;</p>	0179063

<p>MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 55 X LG 110 MM; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA, 0.90 SERVICE FACTOR, 50HZ;</p>	
<p>MOTOR,ELECT:45KW,380VAC,84A,1475 RPM</p> <p>MOTOR, ELECTRIC: POWER: 45 KW; SPEED: 1475 RPM; FRAME: 225MD; CURRENT: 84 A; POTENTIAL: 380 VAC; MOUNTING: 1MBS; SHAFT SIZE: DIA 60 MM; INSULATION CLASS: F; PHASE: 3; CONNECTION D;</p>	0215495
<p>MOTOR,ELECT:45KW,380VAC,85A,1470 RPM</p> <p>MOTOR, ELECTRIC: POWER: 45 KW; SPEED: 1470 RPM; FRAME: IEC225M IMB3; CURRENT: 85 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; INSULATION CLASS: FETT; PHASE: 3; SPECIFICATION: VDE0530; 50HZ; DELTA CONNECTION; SSC MAIN DRIVE; 220V 80W 0.36A; REFERENCE NO: KA3225M-BB014-2; PART NO: TEIL 1/12.84 V/K</p>	0215502
<p>MOTOR,ELECT:4KW,380V 50 HZ,8.2/4.7A</p> <p>MOTOR, ELECTRIC: POWER: 4 KW; SPEED: 1440 RPM; FRAME: 280S; CURRENT: 8.2-4.7 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 28 MM; INSULATION CLASS: F; PHASE: 3; CONNECTION STAR, 50 HZ, 0.83 SERVICE FACTOR; PART NO: 1LA6113-4AA60-ZN00</p>	0226322
<p>MOTOR,ELECT:5.5KW,380V 50HZ,12.1A</p> <p>MOTOR, ELECTRIC: POWER: 5.5 KW; SPEED: 1445 RPM; FRAME: X132S; CURRENT: 12.1 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 38 X LG 72 MM; INSULATION CLASS: F;</p>	0224089

PHASE: 3; SERVICE FACTOR: S1; CONNECTION DELTA, 50HZ;	
MOTOR,ELECT:5.5KW,380VAC,12.1A,1445 RPM MOTOR, ELECTRIC: POWER: 5.5 KW; SPEED: 1445 RPM; FRAME: DX132SQ; CURRENT: 11.3 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT FLANGE 265; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 38 X LG 78 MM; CONNECTION LOCATION: SIDE; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; GEC, MILL GEARBOX, LUBE OIL, CONNECTION DELTA; SERIAL NO: 123650/3	0218550
MOTOR,ELECT:55KW,380V 50HZ,100A,2970 RPM MOTOR, ELECTRIC: POWER: 55 KW; SPEED: 2970 RPM; FRAME: 250S; CURRENT: 100 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 60 X LG 40 MM; INSULATION CLASS: H; PHASE: 3; SIEMENS; CONNECTION STAR; COS 0.89 SERVICE FACTOR; 50HZ; PART NO: LA6253-2CA-ZCGA	0223951
MOTOR,ELECT:55KW,380V 50HZ,106A,960 RPM MOTOR, ELECTRIC: POWER: 55 KW; SPEED: 960 RPM; FRAME: D280MD; CURRENT: 106 A; POTENTIAL: 380 VAC; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA, 50HZ;	0216886
MOTOR,ELECT:55KW,380V,104A,1475 RPM MOTOR, ELECTRIC: POWER: 55 KW; SPEED: 1475 RPM; FRAME: 250S; CURRENT: 104 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; CONNECTION D; SERIAL NO: X044660/01/SB; PART NO: LA6253-4AA-FACA,	0214614
MOTOR,ELECT:55KW,380VAC,104,1475 RPM	0179064

<p>MOTOR, ELECTRIC: POWER: 55 KW; SPEED: 1475 RPM; FRAME: 250S; CURRENT: 104 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 70 MM; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA, 50HZ;</p>	
<p>MOTOR,ELECT:60KW,380VAC,110A,2965 RPM</p> <p>MOTOR, ELECTRIC: POWER: 60 KW; SPEED: 2965 RPM; FRAME: AD250MD; CURRENT: 110 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA (60 X 49) X LG 270 MM; INSULATION CLASS: F; PHASE: 3; FOR USE ON KSB 50 PCT, ELECTRIC FEED PUMP, CONNECTION DELTA, 50HZ; ARTICLE NO: 119-903-017-050;</p>	0179029
<p>MOTOR,ELECT:7.5KW,380VAC,16.8A,1450 RPM</p> <p>MOTOR, ELECTRIC: POWER: 7.5 KW; SPEED: 1450 RPM; FRAME: DXC132MD; CURRENT: 16.8 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE B5; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 38 MM; INSULATION CLASS: 0141; PHASE: 3; SERVICE FACTOR: S1; DE BEARING 6208Z-C3, NDE 6208Z-C3, CONNECTION D, 0.84 SERVICE FACTOR, 50HZ</p>	0215494
<p>MOTOR,ELECT:7.5KW,380VAC,16.8A,1450RPM</p> <p>MOTOR, ELECTRIC: POWER: 7.5 KW; SPEED: 1450 RPM; FRAME: DZC132M; CURRENT: 16.8 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP44; SHAFT SIZE: DIA 38 MM; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA; PART NO: 0376920/46/TA,</p>	0214685
<p>MOTOR,ELECT:7.5KW,380VAC,18.1A,715 RPM</p> <p>MOTOR, ELECTRIC: POWER: 7.5 KW; SPEED: 715 RPM; FRAME: DX160CQ; CURRENT: 18.1 A; POTENTIAL: 380 VAC;</p>	0218549

<p>MOUNTING: B3 FOOT FLANGE 300; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 42 MM; CONNECTION LOCATION: SIDE; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; GEC, MILL TRUNION LP, CONNECTION DELTA, 0.72 SERVICE FACTOR; SERIAL NO: X041750/03/SB</p>	
<p>MOTOR,ELECT:7.5KW,380VAC,18.4A,955 RPM</p> <p>MOTOR, ELECTRIC: POWER: 7.5 KW; SPEED: 955 RPM; FRAME: 160MQ; CURRENT: 18.4 A;</p> <p>POTENTIAL: 380 VAC; MOUNTING: B3 FOOT FLANGE 300; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 42 X LG 112 MM; CONNECTION LOCATION: SIDE; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; GEC, MILL TRUNION JACKING PUMP, CONNECTION DELTA; REFERENCE NO: X041740/86/RS</p>	0218547
<p>MOTOR,ELECT:75KW,380VAC,140A,1475 RPM</p> <p>MOTOR, ELECTRIC: POWER: 75 KW; SPEED: 1475 RPM; FRAME: 250M; CURRENT: 140 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA, 50HZ; 0.87 SERVICE FACTOR</p>	0179065
<p>MOTOR,ELECT:78890/1,22KW,380VAC,43A</p> <p>MOTOR, ELECTRIC: POWER: 22 KW; SPEED: 1450 RPM; FRAME: DX180L; CURRENT: 43 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: 48 MM; INSULATION CLASS: 0141; SERVICE FACTOR: S1; MILL MAIN SEAL AIR FAN, CONNECTION DELTA; PART NO: 78890/1</p>	0198043
<p>MOTOR,ELECT:90KW,380V/50HZ,177A,1475 RPM</p> <p>MOTOR, ELECTRIC: POWER: 90 KW; SPEED: 1475 RPM; FRAME: 0280S; CURRENT: 177 A; POTENTIAL: 380 VAC; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55;</p>	0226128

SHAFT SIZE: DIA 80 MM; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; 450MM X 365MM MOUNTING HOLES ON FOOT, CONNECTION DELTA, 50HZ;	
MOTOR,ELECT:B25 AB 004C,LUBE OIL,55KW MOTOR, ELECTRIC: POWER: 55 KW; SPEED: 1470 RPM; FRAME: 250SD; CURRENT: 96 A; POTENTIAL: 380 VAC; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA; PART NO: B25 AB 004C, LUBE OIL	0210702
MOTOR,ELECT:SEAL OIL,15KW,380VAC,31A MOTOR, ELECTRIC: POWER: 15 KW; SPEED: 1460 RPM; FRAME: 180MD; CURRENT: 31 A; POTENTIAL: 380 VAC; ENCLOSURE RATING: IP55; INSULATION CLASS: F; PHASE: 3; CONNECTION DELTA;	0210701
MOTOR,ELECTRIC: 215KW,660V,230A,1481 RPM MOTOR, ELECTRIC: POWER: 215 KW; SPEED: 1481 RPM; FRAME: D355LD; CURRENT: 230 A; POTENTIAL: 660 V; MOUNTING: FLANGE; ENCLOSURE RATING: IP55; SHAFT SIZE: 110 MM; CONNECTION LOCATION: FLANGE MOUNTED; POLES: 4; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: STEEL; SERVICE FACTOR: 0.86; TEMPERATURE CLASS: F; DIRECTION: BI-DIRECTIONAL; SPECIFICATION: ESKOM 240-50237155; IEC 34; TYPE: CAGE INDUCTION; CONNECTION Y; SERIAL NO: AGC 3027/06;	0184365
MOTOR,ELECTRIC: 22KW,380VAC 50HZ,43A,145 MOTOR, ELECTRIC: POWER: 22 KW; SPEED: 1450 RPM; FRAME: DZ180LD; CURRENT: 43 A; POTENTIAL: 380 VAC; MOUNTING: FLANGE B5; ENCLOSURE RATING: IP44; SHAFT SIZE: DIA 47 X LG 110 MM;	0140663

INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: 1; GEC, CONNECTION DELTA, 50HZ; REFERENCE NO: DZ180LD;	
MOTOR,ELECTRIC:1LA6319-4YA902,215KW,660V MOTOR, ELECTRIC: POWER: 215 KW; SPEED: 1481 RPM; FRAME: D355LD; CURRENT: 220 A; POTENTIAL: 660 V; MOUNTING: FLANGE; ENCLOSURE RATING: IP55; SHAFT SIZE: 110 MM; CONNECTION LOCATION: FLANGED MOUNTED; POLES: 4; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; TEMPERATURE CLASS: F; DIRECTION: BI-DIRECTIONAL; SPECIFICATION: ESKOM 240-50237155; IEC 34; TYPE: CAGE INDUCTION; PART NO: 1LA6319-4YA902,	0184267

PART 3: SCOPE OF WORK

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1. Description of the Service

1.1 WORKS INSTRUCTION

1.1.1 LOW VOLTAGE ELECTRICAL MOTORS

This Works Instruction makes provision for the collecting, stripping and assessment, repair (including both stator and rotor rewinds), overhauling/refurbishing, redesign of weak features, general updating of design in accordance with modern design practise, assembling, painting, impregnation, inspection, testing and certification, supply of spares, delivery of as well as the replacement of existing electrical motors on, as and when required at Majuba Power Station for a period of 5 years.

A probationary period for the initial 12 months of the contract shall apply once the contract commences – this shall ensure that Majuba Power Station receives the service and quality required with regards to the repairs and refurbishments of low voltage electrical motors. This awards the Contracts Manager with powers to terminate the contract due to non-compliance, shoddy workmanship and poor services received from the *Repairer*.

1.1.2 LV Motors description

MOTOR,AC 2,2KW 1430RPM 380V 5,3A	0140699
MOTOR,AC 3,0KW 1430RPM 380V 6,9A	0140506
MOTOR,ELECT:04E6346/01/1077,2.2KW,380VAC	0221903
MOTOR,ELECT:1.5KW,380VAC,3.9A,1410 RPM	0218552
MOTOR,ELECT:1.5KW,380VAC,4.8A,685 RPM	0218551
MOTOR,ELECT:110KW,380V 50HZ,148A	0216878
MOTOR,ELECT:110KW,380V 50HZ,205A	0217194
MOTOR,ELECT:110KW,380V/50HZ,205A	0214732
MOTOR,ELECT:11KW,380VAC,22.5A,1450 RPM	0215501
MOTOR,ELECT:15KW,380VAC,32A,970 RPM	0179023
MOTOR,ELECT:160KW,380V,305A,1485 RPM	0217276
MOTOR,ELECT:160KW,380VAC,285A,2980 RPM	0216219
MOTOR,ELECT:160KW,380VAC,295A,1485 RPM	0179049
MOTOR,ELECT:18.5KW,220VDC,95.4A,1450 RPM	0179027
MOTOR,ELECT:18.5KW,380VAC,37A,1460 RPM	0179066
MOTOR,ELECT:18/75KW,380VAC,49.5/142A	0179059
MOTOR,ELECT:185KW,380VAC,343A,2978 RPM	0180625
MOTOR,ELECT:2.2KW,380V 50 HZ,4.8	0226323
MOTOR,ELECT:20HP,230VDC,77A,725 RPM	0213802
MOTOR,ELECT:220VDC,OPEN ENCLOSURE	0140941
MOTOR,ELECT:22KW,380VAC,42A,2955 RPM	0140554
MOTOR,ELECT:30KW,380VAC,53A,1470 RPM	0179024
MOTOR,ELECT:30KW,380VAC,58A,1465 RPM	0179044
MOTOR,ELECT:37KW,380V 50HZ,70A,985 RPM	0223953
MOTOR,ELECT:37KW,380V 50HZ,72A,1475 RPM	0216801
MOTOR,ELECT:37KW,380VAC 3PH,1.15A	0140703
MOTOR,ELECT:37KW,380VAC 50HZ,75A	0139607
MOTOR,ELECT:37KW,380VAC,71.4A,1470 RPM	0179026
MOTOR,ELECT:380 VAC,86A,1475 RPM	0187355
MOTOR,ELECT:3KW,380V 50HZ,7.2A,960 RPM	0223993
MOTOR,ELECT:45KW,380VAC,1465 RPM	0215496
MOTOR,ELECT:45KW,380VAC,82A,2955 RPM	0179063
MOTOR,ELECT:45KW,380VAC,84A,1475 RPM	0215495

MOTOR,ELECT:45KW,380VAC,85A,1470 RPM	0215502
MOTOR,ELECT:4KW,380V 50 HZ,8.2/4.7A	0226322
MOTOR,ELECT:5.5KW,380V 50HZ,12.1A	0224089
MOTOR,ELECT:5.5KW,380VAC,12.1A,1445 RPM	0218550
MOTOR,ELECT:55KW,380V 50HZ,100A,2970 RPM	0223951
MOTOR,ELECT:55KW,380V 50HZ,106A,960 RPM	0216886
MOTOR,ELECT:55KW,380V,104A,1475 RPM	0214614
MOTOR,ELECT:55KW,380VAC,104,1475 RPM	0179064
MOTOR,ELECT:60KW,380VAC,110A,2965 RPM	0179029
MOTOR,ELECT:7.5KW,380VAC,16.8A,1450 RPM	0215494
MOTOR,ELECT:7.5KW,380VAC,16.8A,1450RPM	0214685
MOTOR,ELECT:7.5KW,380VAC,18.1A,715 RPM	0218549
MOTOR,ELECT:7.5KW,380VAC,18.4A,955 RPM	0218547
MOTOR,ELECT:75KW,380VAC,140A,1475 RPM	0179065
MOTOR,ELECT:78890/1,22KW,380VAC,43A	0198043
MOTOR,ELECT:90KW,380V/50HZ,177A,1475 RPM	0226128
MOTOR,ELECT:B25 AB 004C,LUBE OIL,55KW	0210702
MOTOR,ELECT:SEAL OIL,15KW,380VAC,31A	0210701
MOTOR,ELECTRIC: 215KW,660V,230A,1481 RPM	0184365
MOTOR,ELECTRIC: 22KW,380VAC 50HZ,43A,145	0140663
MOTOR,ELECTRIC:1LA6319-4YA902,215KW,660V	0184267

While this Work Instruction contains quality control and assurance requirements, it does not cover all material and workmanship issues that shall be addressed by the *Repairer* through a duly certified ISO 9001 Quality Management System.

1.2 NORMATIVE REFERENCES – ELECTRICAL MOTOR STANDARDS AND SPECIFICATIONS

The following standards contain provisions that, through reference in the text, constitute requirements of this specification. At the time of publication the editions indicated were valid. All standards are subject to revision and parties involved in refurbishment processes based on this specification are encouraged to apply the most recent revisions of the standards listed below. Information on currently valid national and international standards may be obtained from the Information Centre at Megawatt Park or alternatively via the Electrical System Engineer at Majuba Power Station. Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

- [1] ISO 9001, *Quality Management Systems*.
- [2] BS EN 50209:1999, *Test of insulation of bars and coils of high-voltage machines*.
- [3] BS 2757 *Method for determining the thermal classification of electrical insulation*
- [4] IEEE Std 522 *IEEE Guide for Testing Turn Insulation of Form-Wound Stator Coils for Alternating-Current Electric Machines*.
- [5] SANS IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*
- [6] SANS IEC 60034-2, *Rotating electrical machines – Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles)*
- [7] SANS IEC 60034-2A, *Rotating electrical machines – Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles) – First supplement: Measurement of losses by the calorimetric method*
- [8] SANS IEC 60034-3, *Rotating electrical machines – Part 3: Specific requirements for turbine-t ype synchronous machines*
- [9] SANS IEC 60034-4, *Rotating electrical machines – Part 4: Methods for determining synchronous machine quantities from tests*
- [10] SANS IEC 60034-5, *Rotating electrical machines – Part 5: Classification of degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification*
- [11] SANS IEC 60034-6, *Rotating electrical machines – Part 6: Methods of cooling (IC Code)*

- [12] SANS IEC 60034-7, *Rotating electrical machines – Part 7: Classification of types of construction, mounting arrangements and terminal box position (IM code)*
- [13] SANS IEC 60034-8, *Rotating electrical machines – Part 8: Terminal markings and direction of rotation*
- [14] SANS IEC 60034-9, *Rotating electrical machines – Part 9: Noise limits*
- [15] SANS IEC 60034-10, *Rotating electrical machines – Part 10: Conventions for description of synchronous machines*
- [16] SANS IEC 60034-11, *Rotating electrical machines – Part 11: Built-in thermal protection. Chapter 1: Rules for protection of rotating electrical machines*
- [17] SANS IEC 60034-12, *Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors*
- [18] SANS IEC 60034-14, *Rotating electrical machines – Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher – Measurement, evaluation and limits of the vibration*
- [19] SANS IEC 60034-15, *Rotating electrical machines – Part 15: Impulse voltage withstand levels of rotating a.c. machines with form-wound stator coils*
- [20] SANS IEC 60034-16-1, *Rotating electrical machines – Part 16: Excitation systems for synchronous machines: Chapter 1: Definitions*
- [21] SANS IEC 60034-16-2, *Rotating electrical machines – Part 16: Excitation systems for synchronous machines: Chapter 2: Models for power system studies*
- [22] SANS IEC 60034-16-3, *Rotating electrical machines – Part 16: Excitation systems for synchronous machines: Section 3: Dynamic performance*
- [23] SANS IEC 60034-18-1, *Rotating electrical machines – Part 18: Functional evaluation of insulation systems – Section 1: General guidelines*
- [24] SANS IEC 60034-18-21, *Rotating electrical machines – Part 18: Functional evaluation of insulation systems – Section 21: Test procedures for wire-wound windings – Thermal evaluation and classification*
- [25] SANS IEC 60034-18-22, *Rotating electrical machines – Part 18: Functional evaluation of Insulation systems – Section 22: Test procedures for wire-wound windings – Classification of changes and insulation component substitutions*
- [26] SANS IEC 60034-18-31, *Rotating electrical machines – Part 18: Functional evaluation of insulation systems – Section 31: Test procedures for form-wound windings – Thermal evaluation and classification of insulation systems used in machines up to and including 50 MVA and 15 kV*
- [27] SANS IEC 60034-18-32, *Rotating electrical machines – Part 18: Functional evaluation of insulation systems – Section 32: Test procedures for form-wound windings – Electrical evaluation of insulation systems used in machines up to and including 50 MVA and 15 kV*
- [28] SANS IEC 60034-18-33, *Rotating electrical machines – Part 18: Functional evaluation of insulation systems – Section 33: Test procedures for form-wound windings – Multifactor functional evaluation – Endurance under combined thermal and electrical stresses of insulation systems used in machines up to and including 50 MVA and 15 kV*
- [29] SANS IEC 60034-18-34, *Rotating electrical machines – Part 18-34: Functional evaluation of insulation systems – Functional evaluation of insulation systems – Test procedures for form-wound windings – Evaluation of thermos-mechanical endurance of insulation systems*
- [30] SANS IEC 60034-19, *Rotating electrical machines – Part 19: Specific test methods for d.c. machines on conventional and rectifier-fed supplies*
- [31] SANS IEC 60034-22, *Rotating electrical machines – Part 22: AC generators for reciprocating internal combustion (RIC) engine driven generating tests*
- [33] SANS IEC 60034-26, *Rotating electrical machines Part 26: Effects of unbalanced voltages on the performance of three-phase cage induction motors.*
- [34] SANS IEC 60034-27, *Rotating electrical machines Part 27: Off-line partial discharge measurements on the stator winding insulation of rotating electrical machines.*
- [35] SANS IEC 60034-29, *Rotating electrical machines Part 29: Equivalent loading and superposition techniques - Indirect testing to determine temperature rise.*
- [36] SANS IEC 60034-30, *Rotating electrical machines Part 30: Efficiency classes of single- speed, three-phase, cage-induction motors (IE-code).*
- [37] SANS IEC 60050 (411), *International Electro-technical Vocabulary (IEV) – Chapter 411: Rotating machines*
- [38] SANS IEC 60072-1, *Dimensions and output ratings for rotating electrical machines – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1 080*
- [39] SANS IEC 60072-2, *Dimensions and output ratings for rotating electrical machines – Part 2: Frame numbers 355 to 1 000 and flange numbers 1 180 to 2 360*

- [40] SANS IEC 60072-3, *Dimensions and output ratings for rotating electrical machines – Part 3: Small built-in motors – Flange numbers BF10 to BT50*
- [41] SANS 10242-1:1999, *The rewinding and refurbishing of rotating electrical machines Part 1: Low-voltage three-phase induction motors*
- [42] SANS 1561-1:2006, *Rewound and refurbished rotating electrical machines Part 1: Low-voltage three-phase induction motors*
- [43] SANS 600317:16 *Specification for particular types of winding wires*
- [44] SANS IEC 60851, *Winding wires - Test methods Part 1-6*
- [45] SANS IEC 60085:1984, *Thermal evaluation and classification of electrical insulation.*
- [46] SANS IEC 60270: 1981, *Partial discharge measurements*
- [47] SANS 804:2008, 2.01 *Unwrought tough pitch coppers: Electrolytic tough pitch high conductivity copper*
- [48] ESKASAAU7: Rev 0, *Quality requirements for the procurement of assets, goods and services (Eskom specification)*
- [49] Eskom 240-56361435, *Transport of Power Station Electric Motors standard (Eskom Specification)*
- [50] Eskom 240-56360387, *Storage of Power Station Electric Motors standard (Eskom Specification)*

1.3 QUALITY ASSURANCE

- a. The Repairer shall have a QA program that, as a minimum, meets the requirements of ISO 9001 or Employer approved QA Program. Any sub-contractors completing any portions of the motor repair and reconditioning work shall meet this requirement. The Employer shall accept the QA program before the start of any motor refurbishment or repair work.
- b. If new and/or replacement parts are procured, the *Repairer* has the right to inspect these parts. Technical documentation shall be made available to the *Employer* for inspection. The documentation shall include but is not limited to the following, where applicable:
 - New stator core steel test, power flux test and dimensional data,
 - Technical sheets of original and replacement stator coils, testing, and insulation system,
 - Manufacturer's technical data for new stator lead cables,
 - Details of original and replacement rotor bars and end rings,
 - Details of original and replacement rotor shaft and spider arms,
 - VPI Resin type and maintenance data,
 - Burn-out and dry-out oven temperature charts,
 - New bearing inspection and tests data, and
 - Testing and Inspection reports
- c. The *Employer* has the right to impose witness and hold points, even after the order has been placed. Witness and hold points can only be waived by the *Employer's* Quality Assurance or designated representative in writing. The *Repairer* shall provide appropriate notice of an impending witness or hold point at least 48-hours prior to the event.
- d. At any phase of the Works, the *Employer* or its authorized representative reserves the right to inspect motors and all their components. By entering into a contract with the *Employer*, the *Repairer* therefore, consents the *Employer* or its authorized representative to unlimited access to the *Repairer's*, including *Sub-Contractor's*, premises at all reasonable times to the extent necessary to assess compliance with the provisions of this and such other documents as may apply to the refurbishment of motors. Such inspections shall not relieve the *Repairer* of its obligation or responsibilities under the contract.

1.4 REPAIR PROCESS REQUIREMENTS

A motor which is to be sent for repair/refurbishment will either be deemed to have failed or it shall have been scheduled for refurbishment by the Employer. There are two phases in the repair/refurbishment process of

an electric motor. Initially Phase I, which is commonly referred to as the “ collect, strip, and assess” phase, requires details necessary to develop the assessment scope of work in order to determine the repair scope of work. Once the repair scope of work is concluded, the repair process enters Phase II in which the motor is repaired and delivered back to site as per the final scope of work determined in Phase I.

1.4.1 PHASE I REQUIREMENTS (Inspect, collect, strip, and assess)

1.4.1.1 BREAKDOWN REPORT

- a. Initially a motor assessment shall be conducted while the motor is in-situ before its removal from the installation base. A visual inspection shall be conducted while the motor is in-situ before its removal where all abnormalities are recorded, together with photographs.
- b. IR, PI and Stator Winding Resistance tests are to be performed where applicable.

1.4.2 ASSESSMENT SOW

The Employer shall develop the scope of work for the collection, dismantling, and assessment of the motor by the Repairer Based on the investigations included in the Breakdown Report, the Employer shall compile an Assessment SOW.

1.4.3 MOTOR COLLECTIONS AND SHIPMENT

Transportation of electrical motors is to be in accordance with document Eskom 240-56361435 - Transport of Power Station Electric Motors Standard. The transport of motors which are still in a serviceable condition shall be transported by the Repairer with the necessary care to prevent damage as a result of the transport. The following are requirements:

- a. The motor collection point and lifting requirements shall be managed by the Employer.
- b. Only authorised Employer personnel shall load the motor to the Repairer’s transport.
- c. The Employer shall supply tools and resources necessary to clamp the motor shaft before transport leaves the collection point.
- d. The Employer is responsible to inform the Repairer of specific Business Unit requirements, e.g. security requirements and collection times.

1.4.4 MOTOR ASSESSMENT

The successful Repairer shall implement the contracted Assessment SOW, without deviation.

1.4.4.1 INCOMING INSPECTION

The following is required:

- a. A visual inspection shall be made to assess the general condition of the motor exterior for cracks, broken welds and missing parts. Photographs are to be taken sufficient to document the motor construction, including accessories.
- b. If the motor was in a working condition all standard routine tests are to be performed on the motor, including the following (where applicable):
 - Phase resistance test,
 - Phase balancing and vibrations, during a test run.
- c. If failed components are identified during the incoming inspection, the *Repairer* shall attempt to verify the cause and reflect the findings in a report.

- d. Bearings or shafts shall be checked for any obvious problems by manual rotation of the rotor, if possible.
- The *Repairer* shall ensure that the bearings are adequately lubricated before performing the manual rotation check.
 - If the motor is fitted with sleeve bearings, the manual rotation test may be omitted, but the bearings and journals shall be checked.
- e. Measure and record bearing insulation resistance if applicable.
- f. Measurements and records of the motor's shaft extension run-out.

1.4.4.2 DISMANTLING THE LV ELECTRICAL MOTOR

After completing the incoming inspection, the motor shall be dismantled to conduct the pre-cleaning assessment. Motors shall be dismantled as follows:

- a. Motors that involve either warranty or insurance claims shall not be disassembled without the *Employer* giving a written 'go ahead' for the *Repairer* to commence with the disassembling. Arrangements shall be made for interested and affected parties to witness the dismantling. The *Employer* Assessment SOW shall have a **HOLD-POINT** for such a requirement. The *Repairer* is required to take pictures and records throughout the disassembly.
- b. All motor components shall be marked with either the motor manufacturer's serial number or *Repairer's* job number during disassembly. Any new stamp identifications added shall be applied to low stress areas with low stress punches. Old nameplates or stamp identifications of previous refurbishments on the motor are not to be removed. Bolts and small parts, from the motor shall be stored in dedicated containers marked with a *Repairer's* job number.
- c. End brackets and frames shall be clearly match-marked.
- d. All components are to be properly stored to ensure that storage conditions do not adversely affect the components.
- e. The *Repairer* shall have readily available records concerning the bearings of the electrical motor that was inspected and assessed.
- f. Rotor removal shall comprise of the utilisation of one or two cranes to move the shaft, with a close fitting pipe installed over one end of the shaft to act as a shaft extension.
- g. Additional information gathered during disassembly inspections shall be used to support the cause of failure analysis – this information must be included in the Failure Report.

1.4.4.3 PRE-CLEANING ASSESSMENTS

Prior to the motor being cleaned, all components shall be inspected and tested. Due to motor contamination however, some components may require cleaning for a complete inspection and testing. The *Repairer* shall notify the *Employer* of any anomalies identified and shall document findings with photographs.

The pre-cleaning assessment shall comprise of the following:

- Stator Assessment
- Rotor Assessment
- Bearing Assembly Assessment

- Assessment of Motor Accessories

1.4.5 POST CLEANING ASSESSMENTS

If any motor component has not been completely inspected and tested as specified during the pre-cleaning assessment, such a component shall have its specified inspection and testing completed after its cleaning and dry-out.

Refer to Eskom document, **240-56358854 Refurbishment and Repair of Power Station Electric Motors Work Instruction**, for details regarding the cleaning and dry-out processes.

1.4.6 FAILURE REPORT

When a motor is received in a failed condition, all effort must be made to determine the root cause of failure. In the case of uncertainty, all possible root causes are to be listed. Root causes of the failures are to be determined during the various stages of the refurbishment process such as testing, dismantling, etc. Abnormalities that could have contributed to the failure are to be properly recorded.

The *Repairer* shall submit a report detailing findings together with photographs identifying the symptoms identified. Recommendation of corrective and preventative actions is to be provided.

1.4.7 REPAIR SOW

The *Repairer* shall provide the *Employer* with a recommended repair SOW based on his own analysis of the failure and the need to fulfil the repaired motor performance requirements.

The *Employer* shall review the recommended SOW, considering all documentation provided by the *Repairer* such as test, assessment and failure reports. The *Repairer* shall prepare the repair SOW that of which shall be accepted by the *Employer* during the Repair Works Site Meeting. The repair SOW shall include:

- a. Nameplate data including a detailed failure assessment report.
- b. Relevant QC&A details on necessary repair activities.
- c. The date by which the motor is to be delivered to Majuba Power Station

1.4.8 PHASE II REQUIREMENTS

All repair works shall be governed by the normative standards referred to in section 2 of this Works Instruction.

1.5 MOTOR REPAIRS

1.5.1 STATOR REPAIRS

1.5.1.1 COMPLETE STATOR REWIND

If a complete stator rewind is necessary, the following methods and procedures shall be used:

- a. All materials employed in the stator winding system shall be compatible and suitable for continuous operation at a Class F (155°C) hot spot temperature or higher. The combined system of insulating materials shall have been certified as suitable for Class F or higher.

- b. Winding insulation shall be oil resistant & non hygroscopic.
- c. Conductors shall be of high conductivity copper to SANS 804 of rectangular section having dimensions, tolerances and corners radiuses according to SANS 600317.
- d. Conductor insulation is to comply to modern systems of rewinding appropriate with IEC standards. Breakdown, bending and elongation tests on the covered conductor shall conform to the relevant IEC standards.
- e. If stator windings have to be burned out, it is recommended that the stator end-windings are cut-off prior to insulation burn out to facilitate better oven temperature control. The process shall be done in an oven with the following capabilities:
 - Automatic precision temperature control system that shall use air temperature sensors at different locations in the oven and winding or core temperatures as control system feedback. The core temperature shall be controlled not to exceed 300°C with a tolerance of $\pm 3.5\%$.
 - Time stamped trended recording of the oven burn-out process. The time-stamped record of the burn-out process shall be kept and provided to the *Employer* for record keeping.
 - A water spray quenching system.
- f. If burn out temperatures higher than the specified limits are used and the stator core losses after removing the old windings are 5% greater than the initial pre-stripping core loss, the *Employer* shall be contacted.

All expenses for restoring the core losses to less than the 5% limit because of core loss degradation occurring during winding removal shall be the responsibility of the *Repairer*.

- g. If the winding has to be replaced with the same winding insulation system, the new coils shall have the same number of turns, same number of conductors, same turn and strand insulation, and same conductor cross-section area as the original coils.

The thermal rating and thickness of the ground wall insulation shall be the same, or greater than that of the original winding. All proposed changes from the original winding system shall be discussed with the *Employer* prior to implementation.

- h. Where replacement coils and bars have a loose fit due to modern insulation types, it is preferred that copper sizes be appropriately increased first to improve the fit. Conductor size may be modified only with the approval of the *Employer* having evaluated the modification impact on motor performance parameters – provided by the *Repairer's* suitably qualified and registered Engineer.

Loose fits between windings/coils in core slots should not be remedied by means of increased insulation. Insulation thickness (conductor and strand) should not be less than the original design unless improved insulation materials are utilised.

- i. Acceptable materials for use as strand insulation are; Double Dacron Glass, Nomex 418, and Mica Tape wrapped or fused over bare copper or Class 180°C and higher enamel, or equivalent.
- j. Materials acceptable for use in end-winding lacing and tying are; heat shrinkable tape, rope, cord, or tie materials made of glass roving. Tapes of 100% Dacron are not allowed.
- k. Acceptable end-winding blocking materials are:

- Epoxy.
- Polyester-saturated Dacron®
- Nomex ® Felt Materials
- Glass Mat

1.5.1.2 GUIDELINES FOR THE VACUUM PRESSURE IMPREGNATION (VPI) PROCESS:

- a. The rewind insulation system for complete form wound windings to be utilised, is the global VPI process.
- b. Where the global VPI process is not possible, the *Employer* is required to approve the alternative process, prior to the rewind process starting.
- c. Within the global VPI process, preference is to utilise the rotate curing process. This process is to ensure the least amount of separation of resin and insulation during curing. If the resin is viscous enough not to run during curing.
- d. The VPI process is to ensure the VPI resin is properly degassed prior to the resin filling of the motor tank.
- e. Only polyester and epoxy resins are acceptable.
- f. The VPI process is to ensure that the ventilation/cooling slots, ducts and pipes are not blocked by the resin. Where possible the slots, ducts and pipes are to be inspected for blockages prior to the VPI process and prior to baking. This necessitates sufficient dripping time between the VPI tank and the oven.
- g. The motor is to be rotated and re-aligned to ensure maximum resin drainage during the dripping time. The motor is to be positioned in the oven such that maximum drainage is ensured.
- h. The *Repairer* shall have a QA&C method of ensuring adequate resin penetration into the conductor before the stator can be removed from the VPI tank for curing.

1.5.1.3 GROUND WALL INSULATION REQUIREMENTS

- a. The new coils must have at least the same number of ½ lap mica tape layers of insulation as the originally taped coils. Mica tape shall be supported by glass cloth, polyester mat, or floc compatible with the VPI epoxy, or polyester resin to ensure proper resin penetration and bonding.
- b. Tapes containing polyester (Mylar™), Polyamide (Kapton™), or other films are not acceptable.
- c. The ground-wall insulation on the end windings and connections shall have the same number of layers of insulation as the slot portions. If the *Repairer* is concerned that winding cooling and inter-phase spacing may be compromised, a concession on this issue should be agreed upon between the *Repairer* and the *Employer*
- d. All windings shall have corona suppression applied.
- e. The maximum clearance between the coils and core slots shall be 0.25mm/side.

1.5.1.4 WEDGES AND UNDER-WEDGE PACKERS (FILLER STRIPS)

- a. The under-wedge packers (filler strips) shall be rigid glass epoxy laminates to enable the replacement of wedges without possible damage to the global VPI stator winding insulation. Rigid polyester fibreglass and a felted Nomex ® may also be used as the under-wedge filler to achieve the coil protection and the objective of a secure fit.
- b. Mid slot and bottom packers as well as side packers, if necessary, shall extend at least 13 mm beyond each end of the stator core.
- c. With semi-conductive tape applied to all coil straight portions, filler strips and side packing made of semi-conductive material which has conductivity limits of 1,000 to 10,000 ohms/square shall be used.
- d. Wedges shall be replaced with wedges of the same type as the original windings. The wedge material utilised should not substantially change the efficiency of the motor. If the original type is unknown, the preferred wedges are the epoxy type wedges.
Should magnetic wedges be offered, the *Employer* is to be provided with written proof that the wedges will provide the expected life.
- e. Replacement wedges shall be bonded with an epoxy resin to the slot, but without causing air-vent blockages
- f. Epoxy glass laminate type wedges are not acceptable.
- g. The *Employer* is to approve the *Repairer* wedge removal/ replacement procedure prior to the replacement process. Where removal of wedges might pose a risk of damage to the winding insulation, the *Employer* is to be notified beforehand. Removal of wedges only to be carried out following approval by the *Employer*.
- h. If more than 10% of the motor wedges are found to be loose, all motor wedges shall be replaced. This is provided the ground wall insulation is not damaged in the process.
- i. Special attention shall be given to the accurate tight fitting and wedging of the stator bars. This is to reduce partial discharge and to prevent the bars from vibrating in the slots. Thereby preventing erosion of the corona shield.

1.5.1.5 CONNECTIONS BETWEEN COILS, PHASE RINGS AND LEADS

- a. Connection are to be brazed with a material containing at least 15% silver and completely sealed with full ground-wall insulation of mica tape, and a final layer of glass or Dacron® armour tape.
- b. Jumpers shall be constructed from copper conductors that have at least the same cross section as those in the coils and shall be insulated with full ground insulation. Dacron® or Nomex ® felt spacers shall be used, where needed, to make the connection structure more rigid and provide phase separation. Where possible, additional series connection bracing shall be furnished by tying series connections to a resin impregnated rope.
- c. All shall be insulated with the same number of layers of mica tape as the coils.
- d. The use of motor lead cables for connections, jumpers, etc., around any part of the end windings, is not acceptable.
- e. Motor lead cables shall be installed after impregnation to prevent ingress of resin during the VPI process.

1.5.1.6 MOTOR TAIL LEADS

- a. Tail lead cables shall be rated to carry at least 125% of motor full load current and have an insulating covering that has a thermal rating of 155°C rating or higher.
- b. The preferred cable insulating material is silicone rubber with an outer glass over-braid for mechanical protection. Other types of cable insulation may be used if approved by the *Employer* and are to be sleeved with a silicone coated glass braid to protect them from the effects of lubricating oil.
- c. The length shall be at least 1 (one) meter long and shall have a slack of at least 500 mm.
- d. The motor leads shall be permanently marked identifying the relevant phase of each. Metal band tagging is not allowed.
- e. Lead spacing and clamping devices shall be used between the winding and terminal box and where the lead cables pass through the stator frame to the terminal box. In this manner the lead cables are to be adequately secured.
- f. The motor lead lug size shall be equivalent to the original size.

1.5.1.7 STATOR CORE

- a. A stator core loss test shall be performed at the following stages of repair:
 - Before any stator core, or winding repairs are performed
 - After removal of the stator winding for replacement
 - After stator core, or winding repairs
- b. Where the core testing and inspection indicates a degraded core, this needs to be indicated to the *Employer* including a recommended repair procedure.
- c. If core inspection and/or testing indicate shorts between laminations, these shall be cleared to obtain a satisfactory core loss test and to eliminate hot spots. The *Employer* is to authorize any core repair technique.
- d. The *Employer* is to be supplied with a written repair method. The expected impact which the proposed repair method has on the motor efficiency/performance is to be highlighted in the report.
- e. If the core restack is necessary, the following process is to be followed:
 - Prior to the restacking of the core, approval needs to be obtained from the *Employer*.
 - The *Repairer* must make a gauge bar that can be appropriately inserted through each original slot.
 - Unstack the core, flatten, and de-burr laminations as required.
 - Remove all loose and flaking varnish.
- f. Core replacement is subject to the following requirements:
 - Core replacement material is required to match the original component dimensions of the motor.
 - Material specifications are to be the same or an improvement of the original specifications.
 - The *Repairer* shall provide the thickness, magnetization losses (W/kg) at 50 Hz, and exciting currents for both original and new laminations.

- Replacement core laminations shall be of the same size and shape as the originals, but may be made of higher grade of steel.
 - New laminations must be burr free.
 - Magnetization losses (W/kg) at 50 Hz and exciting current of replacement laminations shall not exceed values of the original laminations.
 - "Short-stacking" or providing less than original core length is not permitted.
 - Cooling air vents shall be restored to original dimensions and locations.
- g. The repair method is to include particulars of all replacement materials. Deviations from original specifications are to be clearly indicated to the *Employer*. The following information is to be included in the documented repair method:
- Thickness
 - Watt per kilogram loss at 50 Hz
 - RMS exciting current

1.5.2 ROTOR REPAIRS

1.5.2.1 ROTOR CAGE REPAIRS

All repairs on the rotor cages shall be conducted as follows:

- a. If the assessment shows any cracked or broken bar, or broken shorting rings, or complete cage migration in one direction, the cage shall be replaced with material of the same size, grade and conductivity. Metallurgical and conductivity tests shall be performed on original and new bar and ring materials to confirm compatibility with the original rotor specifications.
- b. If loose bars are found, but are not broken or cracked, the *Repairer* shall recommend a method of tightening the bars for acceptance by the *Employer*. Dipping and baking the rotor in epoxy, polyester, or any other type of resin or varnish is not an acceptable repair method for loose bars.
- c. If die-cast aluminium rotor windings are found to have deep cracks, or breaks, the complete winding, or rotor shall be replaced. Replacement of die-cast rotor cage windings with fabricated types is not acceptable.
- d. If the core damage is not too extensive, skimming the rotor in a lathe with a sharp tool should eliminate surface smearing. Such repairs shall not increase the stator-to-rotor air gap by more than 10% and should only be performed once in the life of the rotor core. Acid etching or high speed grinding may be used to repair localized damage.
- e. Rotor core laminations damaged due to broken rotor bars, looseness, or any other cause, shall be considered for replacement if extensive.

1.5.2.2 JOURNALS, MOUNTING SURFACES AND SHAFT EXTENSIONS

Repairs on friction type bearing journals, ball and roller bearing mounting surfaces, seal surfaces and shaft extensions shall be conducted as follows:

- a. Superficial damage can be polished up with Scotch-brite® cloth.
- b. More severe damage requires the correct shaft diameter and surface finish to be restored as follows:

- Remove the damage by machining followed by rebuilding with micro-welding,
- Grind the surface to restore shaft diameter to correct dimensions and surface finish as follows:
 - Bearing journals – 410 µmm, or better
 - Rolling element bearing mounting surfaces – 810 µmm, or better
 - Thrust runner, or bearing hub mounting surfaces – 810 µmm, or better
 - Shaft extensions – 810 µmm, or better
 - Bearing seal surfaces – 1625 µmm, or better
 - Metal spraying is not allowed

1.5.2.3 SHAFT REPLACEMENTS

Bent shafts that cannot be straightened or broken shafts shall be replaced as follows:

- a. Record all critical shaft dimensions relative to one shoulder prior to the start of shaft removal.
- b. Tighten the core, if necessary, before the shaft is removed.
- c. Remove all shafts, except for 2-pole motors with fabricated rotors, by pressing them out of the cage.
- d. The *Repairer* shall obtain OEM information on the existing shaft material. If the shaft design information is not available, tests shall be conducted on the old shaft to determine its material properties, including hardness.
- e. Select and confirm the new shaft material to have properties that are similar to that of the old shaft.
- f. Machine all shaft steps, including keyways, to incorporate appropriate radii to avoid stress concentrations.
- g. Shrink fit the shaft into the core.
- h. Spider arm weld cracks that have been verified by dye penetrant tests require grinding and welding repair if grinding cannot eliminate surface cracks.
- i. Cracked cooling air fans shall be replaced and loose components, such as those used for balancing, shall be welded.

1.5.2.4 ROTOR BALANCING

All motors being refurbished or repaired shall have the rotor balance checked. In the event of rotor repairs or rewinds, the rotor shall be statically balanced followed by dynamical balancing at rated speed. This shall be done on a balancing machine to Dynamic Balancing Standard ISO 1940/1.

- G1.0 Balance Quality Grade for motors with 4 or more poles.
- G0.4 Balance Quality Grade for 2 pole motors

1.5.3 BEARINGS AND BEARING ASSEMBLIES

The assessment of bearing assemblies shall comprise of the following:

1.5.3.1 BEARING ASSEMBLIES

Inspection and measurement of sleeve bearing journal housings and rolling-element bearing housings for correct fits to their respective bearings, in accordance with design values from either the motor OEM drawings or the bearing manufacturer's catalogue. From these measurements comparison is required for the bearing housing fit to the design values.

- Recording bearing fit dimensions

- Performing a visual check of the bearing housing bore for evidence of fretting that may indicate a loose fit between the bearing and its housing.
- a. A check of the bearing white metal surfaces for evidence of wipes and wear. Measurement of the sleeve bearing bores is required at three locations and records of measurements to be in an Assessment Sheet. If the white metal wear pattern indicates misalignment or other problems, the details of this shall be recorded.
- b. Inspect oil rings and oil seals for signs of excessive wear and any other defects. Check oil rings for roundness, roughness of edges, and, if applicable, tightness of split oil-ring screws.
- c. Bearing housings with oversized bores shall be bored out, sleeved and machined to restore the correct bearing outer ring-to-housing fit.
- d. Out-of-tolerance bearing housing axial clearances shall be corrected by machining, or by replacing bearing assembly components.
- e. If the bearing hub-to-shaft fit is too loose, it shall be corrected by either restoring the shaft dimensions to specification or by manufacturing a new hub to specifications or by a combination of the two.

1.5.3.2 ANTI-FRICTION BEARINGS

- a. Anti-friction bearings are not to be repaired and shall be replaced during motor reconditioning and/or repairs that involve disassembly. Anti-friction bearings are to be inspected for abnormalities and the *Employer* is to be provided with a report of the findings.
- b. Tolerances are as follows:
 - Ball Bearings - J6
 - Roller Bearings - K6
- c. The new grease-lubricated bearing should be packed with the type and grade of grease specified in the motor nameplate data or as specified by the *Employer*.

1.5.3.3 THRUST BEARINGS

- a. The removal of the thrust collar shall be carried out by hydraulic methods. Heat shall not be applied to the thrust collars, directly or indirectly, during removal or fitting. Refitting shall take place in a similar fashion. The run-out of guide and thrust faces is to be checked to ensure correctness.
- b. The thrust collar shall not be rested on the thrust face without adequate protection. Surface finishes of thrust guide faces is to comply with the manufacturer's tolerances.

NOTE: Bearing manufacturer specified minimum running speeds and run down times are to be adhered to.

1.5.3.4 SLEEVE BEARINGS

- a. With the bearing shells installed, bearings shall be checked for tolerances, concentricity and nip. On fitting of the rotor into the stator, bearing clearances and lay shall be checked to ensure correct fitting of the shell.
- b. "Blueing/Engineers Blue" and plastic gauges are to be used if the lay is not greater than 90%. The responsible engineer is to be contacted for permission before any scrapping takes place.
- c. All joints, inlets, drain plugs etc. shall be sealed to prevent oil leaks. Copies of the blue prints are to be provided as part of data pack, together with copies of the measured bearing tolerances.
- d. Minor white metal scratches shall be repaired by polishing the damaged surfaces with a polishing pad such as Scotch-brite ® cloth
- e. Major scoring and wipes on the white metal surfaces shall be repaired by replacing, or re-metalling the bearing. If the bearing needs to be re-metalled or replaced, an ultrasonic test shall be conducted on the re-metalled or replacement bearing white metal before bearing installation.

1.5.3.5 GREASE RELIEF SYSTEMS

- a. If no grease release system exists on the bearings the *Repairer* shall provide the *Employer* with a proposal for approval. The *Repairer* will implement the approved solution.
- b. Grease release systems should be designed to ensure grease is not discharged into the motor, the motor fan or slip-ring enclosures.
- c. Extended grease nipples are to be installed where applicable.

1.5.3.6 WATER COOLED BEARINGS

- a. The cooling coil and cooling water jackets shall be cleaned and checked for blockages.
- b. Hydrostatic tests are to be performed on the cooling coils.
- c. New gaskets are to be fitted.
- d. Cleaning of the cooling coils is to be performed by means of an appropriate method. Chemical cleaning is preferred.

1.5.3.7 OIL GAUGE GLASSES

- a. Oil gauge glasses are to be inspected for correct functionality.
- b. Gauge glasses are to be replaced at the sign of cracking.
- c. All leaks are to be repaired by replacing the relevant seals and O-rings.
- d. Oil levels are to be properly and correctly indicated on the oil sight glasses. Indications are to include standing and running oil levels.

- e. Oil level markings on any original gauge glasses are to be verified for correctness. Markings are to preferably indicate both minimum and maximum oil levels.

1.5.4 MOTOR ACCESSORIES

- a. All failed space heater elements shall be replaced with new elements with the same Wattage, Voltage, and surface temperature rating. Unless otherwise agreed between the *Repairer* and *Employer*, new space heaters shall be rated to operate at half their rated voltage and connected in parallel.
- b. All damaged or aged heater wiring shall be replaced with high temperature insulated wires, with the same or increased conductor size.
- c. Rewired space heater circuits shall be checked to verify conformance to original circuit configuration.
- d. All damaged bearing RTD wiring shall be replaced, provided the RTD element indicates the correct temperature.
- e. After repairs, bearing temperature detectors shall be checked for accuracy.

1.5.5 MOTOR ASSEMBLY

All tests and inspections conducted as part of the motor assembly shall be recorded on a motor build report. The procedure for these checks and tests during motor assembly is reflected in section 4.1.8 Inspection & Testing.

1.5.6 PAINTING

- a. Surface preparation shall involve the removal of all corrosion, oil, grease, dirt, and old paint with a combination of commercially accepted cleaning agents, abrasive blasting, power tool, and hand tool cleaning. Metal surfaces shall have sufficient roughness to provide proper adhesion of new paint.
- b. At least one primer coat and two finishing coats of compatible outdoor paint shall be applied in accordance with the paint manufacturer's instructions. Two-part epoxy type paint is preferred because of its toughness and durability.

1.5.7 INSPECTION AND TESTING

Tests and checks shall be performed in accordance with applicable sections in the two phases of repair. If certain results are unacceptable, the *Repairer* shall notify the *Employer* to discuss viable solutions.

- a. During the course of repair, the *Employer* may inspect the work at hand to ensure the methods and materials employed are satisfactory. The relevant QCP is to include agreed test criteria, hold points and inspection points.
- b. On completion of work, the machine shall be inspected and tested by the *Repairer* to the satisfaction and requirements of the *Employer*. Prior to contacting the *Employer* to arrange a date for witness testing, the *Repairer* shall have satisfied the *Employer's* requirements of a successful refurbishment/repair.
- c. Appropriately qualified personnel are to be used for diagnostic testing, inspections and report compilation. The reports are to form part of the quality documentation for the repair.

- d. The *Repairer's* test reports shall include the results of all tests performed, whether the tests are specifically required herein or not.

1.5.8 ROUTINE TESTS

1.5.8.1 PRE-RUN ELECTRICAL CHECKS AND TESTS

The following electrical tests/measurements shall be performed on the motor after assembling and prior to the no-load test-run to be witnessed by the *Employer*. These tests shall also be witnessed by the *Employer* and recorded on the pre-run test data section of the Routine Test Certificate.

- a. Stator Winding Resistance and percentage imbalance;
- b. Stator Winding Insulation Resistance (IR), Dielectric Absorption Ration (DAR), and Polarization Index (PI)

If the measured and corrected IR and calculated PI are less than specified critical limit values, the windings must be dried prior to motor testing. If the measured values are within 120% of critical acceptance criteria, the motor may be energised for test-running and the insulation resistance tests subsequently checked at the completion of the test-run.

- c. Space Heater and winding ETD IR tests and functional checks;
- d. Bearing RTD/Thermocouple Functional Checks;
- e. Bearing insulation IR (if applicable);
- f. Rotational direction with supply phases L1, L2, and L3 connected to U1, V1, and W1. When viewed from DE, the direction of rotation shall be clockwise.
- g. Locked rotor.

1.5.8.2 TEST POWER SUPPLY AND INSTRUMENTATION QUALITY

Due to the effect of power supply quality on the electrical machine's performance, it is essential that a suitable source of power and careful measurement with accurate instrumentation are employed for correct data and performance results to be obtained.

The test facility shall therefore have the power supply source and instrumentation that is capable of meeting the following requirements throughout the test duration:

- a. The harmonic distortion coefficient, THD, shall not exceed 0.05.
- b. The voltage unbalance shall not exceed 0.5%.
- c. The frequency shall be within $\pm 0.5\%$ for routine test, and $\pm 0.1\%$ for performance test of motor rated frequency. The power supply frequency range is, therefore, limited to 49.75-to-50.25 Hz for routine tests, and 49.95-to-50.05 Hz for performance test.
- d. Variations in frequency during a test shall not exceed 0.33% of the average frequency.
- e. Power supply quality shall be monitored, and automatically controlled throughout the test duration. The supply conditions shall be recorded throughout the tests, and such records must form part of the motor test record.
- f. The accuracy of instrumentation used to measure test data shall be in accordance with SANS IEC 60034-2-1 requirements.

- g. The capabilities of vibration measurement instruments shall include the following;
- Can measure displacement, velocity, acceleration, and phase that require at least two channels.
 - The software must be able to convert the vibration time waveform between acceleration and velocity.
 - Minimum zoom factor of 10 to enable high-resolution spectral analysis. The analyser shall therefore be able to permit time period (maximum frequency) settings of 12 000 CPM (200 Hz) for 1 600 lines of resolution by machine speed.
 - Log amplitude scale
 - Wide frequency response range of 0 Hz – 20 kHz, as a minimum, for standard vibration measurements. To reliably detect all calculable rolling element bearing defect frequencies, high-frequency vibration analysis instruments that have a frequency response range of 25 kHz – 36 kHz are required.
 - Therefore be able to permit time period (maximum frequency) settings of 12 000 CPM (200 Hz) for 1 600 lines of resolution by machine speed.

Plots that can be produced include;

- Time waveforms
 - Plots of overall vibration amplitudes
 - Vibration amplitudes in specific frequency bands
 - Trend plots
 - Bode plots
- Vibration spectrum and overall vibration in one measurement
 - Recording of run test data shall be computerised and automatically transferred from the measuring instrument to the test report, without human interference.

1.5.8.3 NO-LOAD RUN

All motors shall be run uncoupled with either the half-key or coupling fitted at rated frequency and voltage in accordance with SANS IEC 60034-2-1 to determine constant losses and other performance parameters.

- a. The routine test run shall be conducted with the motor completely assembled.
- b. Bearings shall be lubricated and cooled as they are designed to be in service, i.e. flood lubrication systems.
- c. Snapshot measurements that are to be recorded every 15-minutes, with the first set as soon as the motor testing power supply requirements are met, are;
- Input power,
 - Line voltages,
 - Line currents,
 - Shaft speed,
 - Supply frequency,
 - Bearing temperatures and bearing coolant inlet and outlet temperature, and
 - Winding temperature from the highest reading ETD, and winding coolant inlet and outlet temperatures.

- d. The test run shall be long enough to allow the motor to reach stability, which is when bearing temperatures and no-load losses have reached equilibrium. Motor stability shall therefore be considered reached when, at two successive 30 minute intervals;
- e. The no-load power input at the same voltage varies by not more than 3%, and
- f. The change in bearing temperatures (ΔT), taking coolant temperature changes into account, is within $1\Delta C$.
- g. Cold and hot motor horizontal, vertical, and axial vibration measurements shall be taken on both bearing housings.
- h. For time waveform analysis, standard resolution measurements shall be taken on all directions with the vibration analyser set to 1600 lines of resolution and maximum frequency to at most 30 kCPM (500 Hz). The direction that exhibits the highest standard resolution vibration on either end shall have high resolution measurements taken with the analyser set to no less than 3200 lines of resolution and maximum frequency to at most 12 kCPM (200 Hz).
- i. Cold vibration levels shall be taken within five minutes of the motor being started. Other vibration measurements must be taken at 30-minute intervals until thermal stability has been reached.
- j. Hot vibrations measurements shall be conducted when stability has been attained.
- k. Acceptance criteria for bearing vibrations with the motor solidly bolted to the floor are as per the following acceptable criteria:

OVERALL VIBRATION LEVELS	NO. OF POLES
2 mm/s	2-pole motors
1.6 mm/s	4-pole motors
1.2 mm/s	6-pole motors
1.0 mm/s	8-pole motors
0.8 mm/s	10-pole motors
0.5 mm/s	18-pole motors

- The change between cold and hot vibrations shall not exceed 20%.
 - Vibration spectra for rolling element bearings shall not show any calculable bearing defect frequencies.
- l. The acceptance criteria for bearing temperature rise when the motor has reached stability are;

For Ball and Roller Bearings:

- 35°C on motors with 4 or more poles
- 40°C for 2 pole motors.

For Sleeve and Tilting Pad Bearings:

- 45°C for vertical motors when measured by the ETD on thrust pads,
- 30°C for on motors with shaft diameter less than 70 mm,
- 40°C for 2 and 4-pole motors with shaft diameter between 70 and 100 mm,
- 30°C for 6-pole and slower motors with shaft diameter between 70 and 100 mm,
- 45°C for 2 and 4-pole motors with shaft diameter above 100 mm,
- 35°C for 6-pole and slower motors with shaft diameter above 100 mm,

- m. Other measurements and checks that shall be conducted and recorded during the rated frequency and voltage test run are,
- Shaft Voltage,
 - Bearing oil and grease leaks
- n. No-load loss separation test shall be conducted after all required measurements at rated voltage and stability have been recorded. Recording of winding temperature, average line voltage and current, and power input at rated frequency and at voltages ranging from 120% of rated voltage down to the point where further voltage reduction increases the current.
- o. To end the test-run, the following measurements shall be conducted during the motor rundown when it has been de-energised;
- The run-down time for 2-pole motors shall be recorded and abnormal values resolved to the *Employer's* approval.
 - The total end-float for horizontal motors with sleeve bearings.
- p. Electrical tests that are to be conducted on a hot motor after the test run are;
- Stator winding Insulation Resistance, Dielectric Absorption (DA), Polarization Index (PI) before and after the following test,
 - Stator AC or DC Hi-pot

1.5.8.4 RECORDS

Each and every electrical motor repair shall have the following records:

- a. **Motor Breakdown Report**
- b. **Assessment Sheet** received from the Repairer,
- c. The final repair **Scope of Work**, including cost thereof,
- d. All **Tests and Check Reports** received from the Repairer
- e. **Repair vs Replacement Analysis** and recommendations, where applicable.
- f. A copy of **Quality Records**

1.6 EMERGENCY REPAIRS

The requirements of the normal repair procedure are applicable to emergency repairs, the difference being the duration for the requirements to be fulfilled.

The *Employer* may classify the motor to require emergency repairs. Having classified that the motor requires emergency repairs, the motor repair/ refurbishment strategy to be utilised shall be determined by Majuba Power Station and shall be agreed upon by the relevant technical personnel, the end users and the respective commercial departments.

All electrical machines repaired under emergency conditions shall have a warranty for a period not less than 12 months.

1.7 ON-SITE WORKS

The *Repair Service Provider* will occasionally be required to perform repair services on site. The *Repair Service Provider* is expected to adhere to Eskom's Plant Safety Regulations and rules governing the manner in which all employees are expected to work.

The *Repair Service Provider* shall submit all the relevant documentation required for and external contractor to perform on-site works.

Interpretation and Terminology

The following abbreviations are used in this Service Information:

Abbreviation	Meaning given to the abbreviation
CACA	Cool Air Cool Air
CACW	Cool Air Cool Water
CDSS	Contractor Document Submission Schedule
COID	Occupational Injuries and Diseases
DAR	Dielectric Absorption Ratio
DE	Drive End
EMS	Environmental Management System
ETD	Embedded Temperature Detector
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IR	Insulation resistance
ISO	International Standard Organisation
KPIs	Key Performance Indicators
MS	Microsoft
MV	Medium Voltage
NDE	Non-Drive End
NEC	New Engineering Contract
NEC	New Engineering Contract
NEMA	National Electrical Manufactures Association
O&M	Operating and Maintenance
OEM	Original Equipment Manufacturer
OHSA	Occupational Health and Safety Act
ORHVS	Operating Regulations for High Voltage System
PI	Polarization Index
RTD	Resistance Temperature Detector
SANS	South African National Standards
SANS	South African National Standards
SAQA	South African Qualification Authority

SOW	Scope of Work
VAT	Value Added Tax

2. Management Strategy and Start Up

2.1 The Contractor's Plan for the Service

In the case of a breakdown that lasts longer than 5 working days the contractor shall provide a plan to correct any defects needed to get the machine running.

This plan includes:

- a) Description of defect
- b) Reasons for lengthy repairs
- c) Date machine will be back in service

2.2 Management meetings

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

Title and purpose	Approximate time & interval	Location	Attendance by:
Kick off meeting and scope clarification.	Within 1 week after start date	Majuba Power Station, Specific conference room TBA	<i>Services Manager, Contractor and Supervisors</i>
Assessment Meetings	As and when required	Service Manager's office	System Engineer, EMD Manager and Relevant Business Partners

- a) Meetings of a specialist nature may be convened at times and locations to suit the Parties. Records of these meetings shall be submitted to the *Service Manager* by the person convening the meeting within five days of the meeting.
- b) 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 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.

2.3 Contractor's Management, Supervision and Key People

2.3.1 The Key Persons

Roles and responsibilities requirements for the contractor's key people required to render the service:

Skill	Quantity	Qualification	Relevant Experience
Contract Manager	x 1	Understanding of NEC Contracts	Minimum of 2 Years Relevant experience
Special requirement	Determined by the contractor Will be works dependant	N/A	On an Ad-Hoc basis will be requested to come to site for field work
Supervisor	X1	Fitter & Turner/ Millwright	Minimum of 10 Years Relevant Experience
Artisan/Technician	Determined by the contractor	Trade Test or Related Competency Certificate	Minimum of 3 years of Related Experience

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- a) Competent MV motor technician/tradesperson will for the purpose of this contract mean a person who-
- a. Has either completed a learnership or an apprenticeship in the trade of ;fitting in turning , millwright or electrical
 - b. Has completed an electrical or mechanical trade qualification and has had at least three years post qualification general practical experience on LV motors or
 - c. Has obtained a minimum of a NQF level 5 electrical or mechanical engineering qualification and has had at least three year post qualification general practical experience on LV motors.
- b) The Contractor's Site Supervisor ensures that only competent persons be allowed to work on plant. The Employer's Service Manager is entitled to verify the qualifications of the Contractor.
- c) Site engineers over and above the key persons mentioned above might also be require on an ad-hoc basis.
- d) The Contractor's supervisor/ Foreman must be knowledgeable about the conditions and scope of work contained in this contract and capable of executing the scope of work.
- e) The Services Manager may, having stated reasons, instruct the Contractor to remove a key person. The Contractor then arranges that, after one day, the key person has no further connection with the work included in this contract.
- f) The Contractor may not replace any of the key persons, without prior written request and approval thereof from the Services *Manager*.
- g) The above qualifications and experience requirements are a minimum
- h) The contractor must provide hourly rates for each of the above key persons in the price list.

2.4 Provision of bonds and guarantees

The form in which a bond or guarantee required by the *conditions of contract* is to be provided by the *Contractor*, is given in Part 1 Agreements and Contract Data, document C1.3, Sureties.

The *Employer* may withhold payment of amounts due to the *Contractor* until the bond or guarantee required in terms of this contract has been received and accepted by the person notified to the *Contractor* by the *Service 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.

2.5 Site Establishment

Not Applicable

2.6 Documentation Control

Document management control will be handled as per the employer's document and records management procedure 32-6, 32-1 and 32-21 which is obtainable from the *Service Manager*. All communication will be in writing.

All NEC standard forms should be used, e.g. Task orders, Early Warnings, Defect certificates and Assessments.

2.6.1 Procedures, Records and Reports

The *Contractor* implements the following procedures or paperwork over the first month of this Contract:

- a) Business Organisation Chart
- b) Safety procedures

The following policies, procedures and specifications will be compiled by the contractor at all times:

- a) Site Regulations – Majuba site Regulations
- c) BIA/RM/STD/01 – Safety, health and environmental requirements to be met by Contractors (available on request)
- d) Eskom Majuba site transport requirements
- e) Construction Regulations
- f) Occupational, health and Safety Act
- g) Eskom Life Serving Rules
- h) BIA/QA/STD/01 – Quality requirements for engineering and construction works (available on request)
- i) All Relevant Majuba Power Station standards, policies and procedures

2.6.2 Sub-contracting

Only sub-*Contractors* authorized by the *Employer* will carry out work on the equipment in terms of this contract.

2.6.3 Possession, Control of Equipment

The *Contractor* will not assume possession or control of any part of the equipment all of which shall remain exclusively the property of the *Employer*.

2.7 Invoicing and Payment

Invoices can be submitted using emails to invoiceseskomlocal@eskom.co.za

Details on how to submit invoices and additional information:

- Ensure that the Eskom order number is clearly indicated on your invoice together with the line number on the order you are billing for.
- All Electronic invoices must be sent in PDF format only.
- Each PDF file should contain one invoice; or one debit note; or one credit note only as Eskom's SAP system does not support more than one PDF being linked into workflow at a time.
- Your E-mail may contain more than one PDF file (e.g. 2 invoices on 2 separate PDF files in one e-mail)
- For Foreign invoices, suppliers will still be required to physically deliver hard copies of original documents to the respective documentation management centers even though you have e-mailed those invoices

- A PDF file that was created directly from a system meets the definition of original document and is allowed (including saving documents from excel to PDF, word to PDF etc.)
- An Invoice that was printed and then scanned to PDF by the Vendor is **not acceptable** as this is not an original tax invoice by SARS definition but a copy.
- The following wording needs to appear on the invoice: "Your invoice is encrypted in order to comply with SARS requirements that invoices and statements sent electronically are tamperproof."
- If there is Cost Price Adjustment (CPA) on your invoice we recommend that you issue a separate invoice for CPA so that if there are any issues on the CPA the rest of the invoice can be paid while resolving the CPA issues.
- You do not require a goods receipt (GR) number to submit your invoices. When the GR number is received you can then send the GR number to the FSS contact center at FSS@eskom.co.za or 011 800 5060.
- All queries and follow up on invoice payments should be made by contacting the FSS Contact Centre:
Tel: 011 800 5060

Payment will be made within 30 Days after receipt of an acceptable invoice at the address stated in the order and the acceptance of the goods by Eskom. Payments are made on Friday's only.
and include on each invoice the following information:

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

2.8 Records of Defined Cost

In order to substantiate the Defined Cost of compensation events, the *Employer* may require the *Contractor* to keep records of hours worked by his employees employed by the *Contractor*, Bill of Materials, work subcontracted by the *Contractor* and Equipment.

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

- Date and day.
- Weather.
- Site Conditions.
- Work Done.
- Labour on site.
- Any incidents during that period.
- Any communication that took place.

2.9 Things provided at the end of the *Service Period* for the *Employer's* use

2.9.1 Equipment

None

2.9.2 Information and other things

None

2.10 Management of work done by Task Order

A task order will be issued for tasks at hand as per descriptions from the Service Manager who will be managing this contract on the employer's behalf.

2.11 Contractor to note and comply with the following

- The Employer reserves the right to have any of the Contractor's personnel removed off site without any compensation to the Contractor in the event of the Contractor's personnel being in contravention with the OHS Act or any of the Employer's Life-saving rules, regulations and procedures.
- The Employer reserves the right to request disciplinary/corrective action if, and when, required.
- The Contractor will operate under the direction and instructions of Employer.
- The Contractor will provide all safety apparel, safety equipment and cleaning materials to comply with the construction regulation.

3. Health and Safety, the Environment and Quality Assurance

3.1 Health and Safety Risk Management

3.1.1 General

The *Contractor* must ensure that all his personnel attend a Health and Safety Induction Course prior to starting with their work. The Induction Course can, on request, be provided by the *Employer* and will be valid for the duration of the *services*.

Safety Risk Management has the right and authority to visit and inspect the *Contractor's* workplace or site establishment to ensure that tools, machinery and equipment comply with the minimum safety requirements.

The *Service Manager* shall be entitled to instruct the *Contractor* to stop work, without penalty to the *Employer*, where the *Contractor's* personnel fail to conform to safety standards or contravene health and safety regulations. The *Service Manager* is entitled to cause the *Contractor* to discipline his employees and to conduct a disciplinary action, and submit a report to *the Service Manager*. The *Contractor* shall implement additional health and safety precautions where necessary.

The *Contractor* will provide all his personnel with the required personal protective equipment.

Risk Assessments, Pre-Job Briefs, Post – Job Briefs & Job Observations will be conducted for all jobs.

All Construction Regulation - safety requirements should also be adhered to.

- Safety Plan
- Fall Protection Plan (repairing / replacing of conveying lines using scaffolding)
- 16.1 and 16.2 appointments

3.1.2 Fire Precautions

Any tampering with the *Employer's* fire equipment is strictly forbidden.

All exit doors, fire escape routes, walkways, stairways, stair landings and access to electrical distribution boards must be kept free of obstruction, and not be used for work or storage at any time. Firefighting equipment must remain accessible at all times.

In case of a fire, report the location and extent of the fire to the Electrical Operating Desk at extension 3803.

Take the necessary action to safe guard the area to prevent injury and spreading of the fire.

3.1.3 Reporting of Accidents/Near Misses

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. The *Contractor* is expected to fully co-operate to achieve this objective. The *Service Manager* must be informed immediately of any incidents and any damage to property or equipment must be reported to the *Service Manager* within 24 hours.

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.

3.1.4 Barricading and screens

The *Contractor* will provide and install barricades and warning devices to ensure that equipment and persons are not exposed to danger or to prevent access to dangerous areas.

All welding, flame cutting and grinding work shall be properly screened to protect persons from any injury.

All gratings shall be covered with adequate protective screening when welding or flame cutting in the vicinity.

3.1.5 Speed Limit

All vehicles must be driven with due consideration for personnel and property. A maximum speed limit of 40 kilometres per hour will be adhered to on the premises at all times.

3.1.6 Safety

- a) The *Contractor* complies with the Occupational Health and Safety Act, 1993, (the Act) and all Safety procedures issued by the *Employer*. The *Contractor* must furthermore comply with the *Employer's* Safety, health and Environmental requirements for *Contractors*, BIA/RM/STD/01, which is available from the Majuba Documentation Centre.
- b) The *Contractor* will carry out work according to Procedure GGR 0992 (Plant Safety Regulations). The *Contractor* will qualify his supervisors to take out permits on the *Employer's* permit to work system in order to always have one authorised person available to take out permits per shift.
- c) The *Contractor* will conform to all rules and regulations applicable to Plant Safety and shall complete a proper risk assessment and Worker's Register prior to working on the plant.
- d) The *Contractor* will ensure that his representatives are duly authorised in terms of the Plant Safety Regulations as a responsible person upon commencement of work.
- e) The *Employer* shall on request from the *Contractor* isolate required plant from all sources of danger as described in the Plant Safety Regulations.
- f) The *Employer* will provide the Plant Safety Regulation training to the *Contractor*.
- g) The *Employer* shall make a copy of the Plant Safety Regulations available to the *Contractor*.
- h) The *Contractor* will attend monthly safety meetings, and conduct monthly safety meetings with staff.
- i) The *Contractor* provides all personal safety equipment, including safety belts and harnesses
- j) The *Contractor* will adhere to the Eskom cardinal rules.
- k) The *Contractor* will not be allowed to transport any of its workers in open vehicles to and from site as prescribed in the Eskom safety policy.

3.2 Lighting

The *Contractor* shall comply with the requirements of the Occupational Health and Safety Act and ensure that adequate lighting is provided to work areas at all times.

3.3 Compressed Air

- a) Facilities for water and compressed air are indicated with Eskom colour coding.

3.4 Supply of Electricity

Employer will make available to the *Contractor* 220/230-volt electrical supply free of charge from the closest existing point of supply.

The *Contractor* is to make provision for the necessary extensions and plug points.

3.5 Telephones and Telecommunications

Should the *Contractor* require a telephone service he shall make his own arrangements with the *Employers Representative*.

3.6 Accommodation

The *Employer* will not provide any accommodation for the *Contractor*

3.7 Welding on site

No welding will be allowed on site unless permission is granted in writing by the *Employers Representative*. All welding should be done according to Weld Rule Book, refer to Document Number 240-106628253.

3.8 Environmental constraints and management

The *Contractor* should adhere to the Majuba Power Station Environmental Management System that must meet the requirements of ISO 14001:2004.

The EMS requirements are detailed in the latest revision of the following documents, which are available from the Majuba Power Station Documentation Centre or Internal Web site, and include:

- a) Environmental Management Policy **BIA/ENV/04**
- b) Environmental Management System Manual **BIA/ENV/03**
- c) Waste Management at Majuba **BIA/ENV/01**
- d) Oil Spill Management at Majuba **BIA/ENV/02**
- e) Environmental Legal Register (List of Environmental Legislation applicable to Majuba) **ENG/ENV/01**

The *Contractor* will be responsible for complying with any new environmental requirements, relevant to the Works Information that may come into effect as part of Majuba Power Station's EMS for the duration of this contract.

If there is uncertainty around any environmental issues, the Environmental Department at Majuba Power Station may be contacted.

All work complies with the relevant environmental regulations. The works may include the use of some toxic or hazardous substances during normal and routine maintenance activities. In this case the *Contractor* uses such hazardous substances in accordance with the applicable regulations and procedures and is disposed of by the *Contractor* in accordance with the applicable law.

3.9 Quality assurance requirements

3.9.1 Quality Requirements

The Contractor guarantees to utilize the OEM approved parts, components and lubricants or as approved by component system engineer.

The *Employer* may, by arrangement, inspect completed work. If, in opinion of the *Employer*, the work does not comply with the quality requirements expected from the *Contractor*, the *Employer* shall instruct the *Contractor* to rectify the faults. The *Contractor* will comply with the instructions.

The Contractor will comply with the Employer's Quality Requirements as specified in procedure QM 58 latest revision, which is available from the Documentation Centre or the internal Majuba Web site.

All Quality Control documentation must be submitted to the Employer's Representative for acceptance prior to any work commencing.

3.9.2 Contractor Document Submission Schedule (CDSS)

Refer to section named "Low service damages" below.

4. Procurement

4.1 People

4.1.1 Minimum requirements of people employed

- a) All Semi-skilled personnel are in possession of valid school senior certificate.
- b) All Artisans are both qualified and in possession of a valid trade test certificate or in possession of a competency certificate issued by the OEM. 3 years minimum experience required.
- c) All Supervisors are qualified and in possession of a valid diploma, and must have undergone supervisory training from a reputable institution. 10 years minimum experience required.
- d) All project managers, site managers and project leaders must have undergone training in contracts management (e.g. NEC3), any technical discipline (e.g. construction, civil, mechanical, electrical, C&I), and managerial course (e.g. project management, etc.) from reputable institutions. 5 years minimum experience required.
- e) The Contractor will provide trained personnel for the implementation of all work.
- f) The Contractor remunerates his employees at not less than the proclaimed statutory wage (Minimum Wages Act). Failure in this regard will result in non-performance and therefore immediate termination of the contract.

In order to fully evaluate a tender, the Contractor is to submit an organogram, which is to include the relevant skills levels.

According to the SKILLS DEVELOPMENT ACT 97 OF 1998, the following definition for artisans and trades are emphasised:

- **Artisan** means a person that has been certified as competent to perform a listed trade in accordance with this Act. (Definition of “artisan” inserted by section 1(a) of Act 37 of 2008)
- **Trade** means an occupation for which an artisan qualification is required in terms of section 26B. (section 1(i) of Act 37 of 2008)

Section 26C section 2 (a) states the following – “No person, whether employed or self-employed, may hold themselves out to be qualified as an artisan in a listed trade unless that person is registered as an artisan in terms of subsection (1)”

With reference to the Act, all personnel are adequately qualified for the task to be performed. Qualifications of all staff to be submitted to the Service Manger two weeks prior to commencement of work and approval of qualifications of staff to be granted within one week of receipt of qualifications.

The Contractor submits requests to change any pre-approved staff together with proof of qualifications for approval prior to changing the staff.

4.2 Plant and Materials

4.2.1 Contractor’s procurement of Plant and Materials

Employer’s purchasing process will be followed.

The Employer provides some of the “Free Issue” materials as listed in section named “Exclusions” above.

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

Plant and materials provided by the Employer are detailed as per section **Error! Reference source not found.** “Exclusions”.

5. Working on the Affected Property

5.1 Employer's site entry and security control, permits, and site regulations

The entry to site is only approved once the following are adhered to:

- a) The Contractor's safety file is approved by the Employer's Safety department.
- b) All personnel have undergone screening for criminal records and outstanding arrest warrants.
- c) All personnel have attended site-specific safety induction training.
- d) Complied with the requirements as stated in the General Works information.

5.2 Callouts - Overtime

- a) The Contractor shall provide emergency service to respond to any stoppage or malfunction of the equipment at any time after the Contractor's working hours, providing a 24 hour standby service, with a response time of within one (12) hour for emergencies.
- b) In the case of any major breakdown, a repair plan of action must be submitted to the Employer within the next working day.

5.3 Health and Safety Facilities on the Affected Property

Refer to the General Works information.

Contractor is required to undergo departmental safety induction programme for every department where service will be rendered.

5.4 Site Services and Facilities

5.4.1 Provided by the *Employer*

- a) Access to all affected areas
- b) Sanitation (drinking water and toilets).
- c) Medical Centre (The Employer will recover all costs)
- d) Electricity connection/disconnection: The *Contractor* to provide all necessary cabling, Certificate of Compliance (COC) etc. Electricity will be made available for construction purposes free of charge from power points, which will be indicated by the *Employers Representative*. The *Contractor* will be made responsible for the provision of the reticulation system from the point of supply. Both 220 (AC) Volt and 380 Volt (AC) are available on request. The *Contractor's* requirements are to be stated in his tender. Eskom does not guarantee the quality of supply of the power and the *Contractor* shall make his own arrangements for alternative supplies where required. Any breakdown or reduction in the power supply will not be grounds for claims for additional time or compensation.
- e) Water connection/disconnection: Water will be made available on request free of charge from water points on site, where available. The *Contractor* will supply at his own cost all the necessary connections, fittings, piping etc. for this facility. Eskom does not guarantee continuity of supply and quality of the water and the *Contractor* shall make his own arrangements for alternative supplies where required. Any breakdown or reduction in the water supply will not be grounds for claims for additional time or compensation. Should the *Contractor* have any particular requirements with respect to water quality or supply, these requirements must be stated in his/her tender.

- f) Compressed Air/Service Air, where available
- g) The *Contractor* provides everything else necessary for providing the service.

5.4.2 Provided by the Contractor

Contractor shall provide everything else necessary for providing the Service.

- a) Tools, equipment and consumables else necessary for providing the required service/s.
- b) Accommodation offsite
- c) Transport
- d) Meals: The *Contractor* or any of his employees or subcontractors may purchase take-away meals from the fast food outlet onsite, if available.
- e) Telecommunications.
- f) Everything else necessary for providing the required service/s.

5.4.3 Low Service Damages

No.	Description	Employer's Requirement	Damages payable by Contractor
1	Approval of safety plan	Approval ASAP after contract award or within 1 (one) week of contract start date. Safety plan must contain all current and relevant information and needs to be reapproved when documents change or at least on each contract anniversary.	R500.00 per day without an approved safety file.
2	Approval of Quality Management System ISO 9001	Within 2 (two) weeks of contract start date.	R500.00 per day without an approved quality management system in place.
3	Non-availability of staff to provide service	Service has to be given on a continuous basis on the commencement of a contract	5% of the total repair cost.
4	Contract (NCR) given 3 times in 6 weeks	<i>Contractor</i> to deliver the service as per the contract scope	R10 000.00 per occurrence.
5	QCP's (Quality Control Plans).	One week after receipt of Task Order	R500.00 per day without an approved quality management system in place.
6	Contractor's Safety file	Two weeks before start of work	R25 000.00 per occurrence.
7	Inspection report	24 hours after stripping activity	N/A
8	Technical report and data pack	Within 7 days of completion of the services	R1000.00 per occurrence
9	Safety file Audit	Every 30 days after approval of initial file until work for specific outage is complete.	N/A

List of drawings

5.5 Drawings issued by the *Employer*

All relevant drawings are available on request from the Majuba Document Centre