Eskom	MATLA POWER STATION SCOPE OF WORK	Document Identifier	14593
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PLANT AREA OUTSIDE PLANT GEARBOX CONTRACT SOW TITLE GEARBOX CONTRACT SOW			
REF MEA-06921	Reference Rev No 0	MULTIDISCIPLINARY No	Plant Level 3
COMPILED BY	[redacted]		
APPROVED	[redacted]		
APPROVED	[redacted]		
REVIEWED	Name [redacted] Quality Department		
REVIEWED	Name [redacted] Environmental Department		
RECEIVED	Name Maintenance	Signature	Date

NB Do not tamper with the template

GENERAL

- Data books, reviews, reports and diagrams/drawings shall be submitted to Engineering after the completion of the work Engineering to forward the data books to Quality Department (Document Control)
- All QCP's to be submitted to Engineering and Quality for approval prior to outage/project or maintenance work commencement

	SCOPE OF WORK DESCRIPTION / ACTIVITY	PROCEDURE, SPECIFICATION, ENG REQUIREMENTS / DOCUMENTATION	HOLD POINTS, WITNESS, REPORTS	RESPONSIBLE PARTY
1 1	Safety	• All work is to be done in accordance with Matla plant procedures and safety regulations (GGR 0992) • Matla power station induction must be done before any work commences • Permit to work must be in place before any work commences • Worker's register must be completed and daily risk assessment conducted before any work commences	Eskom to witness	Contractor
1 2	Environmental Management	• All activities listed in the National Environmental Act 107 of 1998, EIA Regulation 982,983,984 & 985(2014), must have **AUTHORISATION** before commencement of work • The contractor shall comply with all applicable legal and other requirements • The polluter pays principle will be applied	Eskom to witness	Contractor

		• The contractor manager shall ensure compliance with Eskom Matla Environmental procedures to ensure the prevention of pollution (refer OMOP 4090 and 4402) • The last payment will be processed based on the status of the last housekeeping check sheet (Annexure C OMOP 4402) of designated area • EMS file based on ISO14001 will be required		
1 3	Quality Management	• The contractor/executioner of work will be responsible for drawing up all QCP documentation and this must be approved by engineering and authorised by the Quality Department before commencing with the work • Contractors/executioner to adhere to QM 58 and OMOP4497 requirements • Number of NCR issued can affect your next tendering process • The QCP shall be signed progressively by the Engineer/Supervisor, Eskom QC Inspector, Contractor QC Inspector and/or AIA • No procuring of outage items without the approval of scopes by quality • All outage scopes creep and scopes addition should be approved by quality • No contractor should be in the possession of scopes for execution without the scopes approved by quality • The contractor is subjected to quality auditing at any point in time during execution of scope	Hold point	Contractor
1 4	Inputs from other departments			

1.5	Commissioning reference			

DETAILED SCOPE

This Scope of Work (SOW) covers the contract scope for coal plant, slurry plant, sewage plant and water treatment plant for the disassembling, inspection, repair, testing and certifying of the mechanical gearboxes. When the gearbox is damaged, it will be removed from the plant and the Contractor must collect the item, transport to their workshop for full inspection, stripping and full repair, once the work is completed necessary inspections must be done by an engineer and maintainer representative before the item is transported to site.

2	SCOPE OF WORK DESCRIPTION / ACTIVITY	PROCEDURE, SPECIFICATION, ENG. REQUIREMENTS / DOCUMENTATION	HOLD POINTS, WITNESS, REPORTS	RESPONSIBLE PARTY
2.1	Work Standards	Work must be conducted in line with the following procedures/standards and regulations [1] Occupation Health and Safety Act No 181 of 1993 [2] ISO 9001: 1987, ISO 9002: 1987 and ISO 9003: 1987 [3] SABS 0157: Parts I, II and III. BS 436 [4] ISO 14635-1:2000 Gearbox test procedures	Hold point	Contractor

		[5] BS 292 Part 1 1987 Dimensions of ball bearings, cylindrical and spherical roller bearings [6] SANS 10162-4 Structural use of Steel Part 4 The design of cold-formed stainless steel structural [7] SANS 10111-2-1 Engineering Drawing Part 1 General principles Engineering Drawing Part 2 Geometric Tolerancing Section 1 [8] SANS 10341 Installation and maintenance of bearings – General guidelines [9] ISO 281 Rolling bearings – Dynamic load ratings and rating life [10] BS 4999 General requirements for rotating electrical machines Specification for standard dimensions [11] 240-48197042 Procedure for the Identification and Planning of Plant Asset Obsolescence		
2 2	**Pre Inspection Activities**	a) Damaged gearbox must be collected from the Client by the supplier for assessment and repair b) Clean the gearbox with wire brush and remove all the rust and grease on the casing and moving parts	Hold	Contractor

		c) Conduct a comprehensive visual inspection and can consist of non-destructive testing such as magnetic particle inspection, dye penetrant tests, and ultra-sonic testing on various components to look for surface and sub-surface cracking. (Report must be provided) d) Mark all the bearing side covers and casings with punch marks. e) A detailed report defect found, pictures, that clearly outlines our findings and summarizes our gearbox repair scope is then submitted to the Client. f) Conduct a complete gearbox disassembling as well as cleaning all the external parts for an inspection. Damaged parts must be manufactured as per original design and replaced on the gearbox		

2 3	**Gearbox Repair**	**Standard machine's gearbox repair scope includes comprehensive technical services that cover all of the following:** a) Conduct an overall inspection for the gearbox and the auxiliary parts b) Witness and assess the complete gearbox fitting parts c) All bearing must be inspected and replace when damaged d) Remove internals parts of the gearbox, input, and outputs shafts e) Pull the drive shaft bearings and remove the oils seals f) Couplings must be removed, inspected and replaced when damaged g) Inspect the gears teeth and measure the sizes, out of tolerance size or defected worm items must be replaced	Hold	Contractor

		Manufacture new gear teeth and grinding to achieve better tooth geometry as per the original design. h) Polish wear marks on gear teeth to ensure meshing action is correct i) Replace all the bearings on the gearbox frames as per original design j) Replace the gearbox shaft seals k) Inspect the casing inner and outer structure layers for any cracks and conduct welding repair l) Inspect the drive shafts (input and output) and fabricate the new shafts when worn out or damaged. The key ways and shaft dimensions must as per original design and ISO standards. All heat treatment, hardening and condition		

		process and materials certificated signed by the technician must be provided m) Replace the oil drain nips, plugs and valves n) Replace the oil inspection windows o) Inspect the gearbox fan cooler and the cover for damaged and replace when damaged p) Install new gasket on the frames q) Replace the oil breather with the new one r) The gearbox must be epoxy painted, preserved for storage s) Inspect the casing base plate holes for damages and replace the base plate casing when damaged beyond repair		

		t) All damaged gearbox lifting lugs must be replace with new lugs or repair (Repaired lugs must met the minimum safe weight of the gearbox) u) Mark the direction of the hold back on the bearing cover, when there is no direction arrow fitted on the casing. v) Replace bolts, studs, and fittings equivalent grade and material as per the original manufacture's recommendations. Tighten all bolts to the correct torque settings as per the OEM specifications. w) Paint the gearbox with high wear resistance paint before assembling the covers and topping up the oil. x) Add the new oil before the gearbox is tested and shipped to site and inspect for any oil leak on the gearbox before testing.		

24	**Testing and Recording**	a) Engineering must be engaged for any changes on the parts used for the gearbox b) When all new and reworked components are complete, the gearbox must be reassembled and spin-tested must be conducted using the simulated conditions of the running plant c) The testing involves measuring temperature, sound and vibration levels, tooth contact and backlash, and bearing end play d) Use clock gauge and measure the end float of the shaft e) Conduct the condition monitoring while testing f) Conduct smooth operation when gearbox is turned by hand to ensure is freely rotating g) Report documents must be complied and submitted to the Client for record		

		h) During the gearbox repair review the parts status and obsoleteness and recommend to the client the type of component which will enhance the gearbox performance and best option which will minimize the cost in a long run as solutions.		
2.5	**Special Tools/Equipment**	Associated tools required for the repair and testing of the gearbox: a) Wire rope sling (SABS standard) b) Overhead crane c) Bearing heater d) Bearing puller e) 0-25 mm micrometre and clock gauge f) Feeler gauge g) Rubber mallet		

		h) Sealer compound i) Pin punch		
2 6	**Additional Requirements**	a) Open box inspection and testing must be conducted and record for the findings and performance must be complied in the report which will be submitted to the Client (Engineering must be invited to witness the test) b) All QCPs must be submitted prior to testing and must be signed for hold points by the maintenance technician, supplier representative and the engineer before the equipment is chipped to Site		

		c) Provide the name plate tag with the detail specifications for the gearbox which will be readable and will not be worn off. d) The testing facility must be in line with the required standards as per ISO 14635-1:2000 e) Repair gearbox parts must have a warrant for at least six (6) months from the day of installation.		
2.7	**Coal Plant Gearboxes**	The following Gearboxes are installed at the Coal Plant: a) Belt : 7A/B, Type: SN22522, Description: Worm Gear, Size 14, Ratio: 24.5:1; Input shaft 75.011/75.030 mm and output 120.013/120.035mm; Installed Quantity X 2; Estimated repair quantities within 5 years contract duration x 24. Stock Number: 26524. b) Belt : 7C-F, Type: SN22522, Description: Worm Gear, Size 12, Ratio: 24.5:1; Input shaft 65.011/65.030 mm and output		

		110 013/110 035 mm, Installed Quantity X 4, Estimated repair quantities within 5 years contract duration x 40 Stock Number 176999 c) Belt 8A-F, Type SD3134, Description Helical Gear, Size 400/560, Ratio 28 4 1, Power 113kW, Input shaft 70 00 mm and output 160 00 mm, Quantity X 6, Estimated repair quantities within 5 years contract duration x 12 Stock Number 176992 d) Belt 9A-F, Type SN22520, Description Worm Gear, Size 80 inch, Ratio 24 5 1, Power 22kW, Input shaft 50 00 mm and output 80 00 mm, Quantity X 6, Estimated repair quantities within 5 years contract duration x 60 Stock Number 177249 e) Belt 10/11A-F and 16A-B, Type SN22520, Description Worm Gear, Size 70 inch, Ratio 24 5 1, Power 15kW, Input shaft 45 00 mm and output 75 00 mm, Quantity X 14, Estimated repair		

		quantities within 5 years contract duration x 60. Stock number: 177248		
2.8	**Slurry Plant Gearboxes**	a) 20-Series Shuttle Conveyor Gearbox; Type: SK3282AZG-48-80L/4 IP66; Serial no: 13102111505C; Ratio: 48.04; Speed: 1375/ 29 rpm; Kw: 0.75; H7 Hollow Shaft, 40mm; Quantity X4, Estimated repair quantities within 5 years contract duration x 24. Stock number: 581073. b) 20-Series Conveyor Drive Gearbox; Make: Flender RSA; Serial number: 0610-MW4203; Type: KA148-K2-160; Ratio: 73.80:1; MTG: H01-A-2A; Hollow Output Shaft, 90mm; Motor 11 kW; Frame: 160M; Full load speed: 1460rpm; QuantityX4, Estimated repair quantities within 5 years contract duration x 24. Stock number: 581088. c) Mixer Agitator Gearbox: type: mixer; ratio: 32.45:1; speed: 1460 rpm; power: 15 kW; shaft size: 80 mm; application: slurry; rotation direction: clockwise; position vertical; model no: 2137; Serial no:		

		C21584/01/A to C, Quantityx3, Estimated repair quantities within 5 years contract duration x 24 Stock number 563423		
2 9	**Water Treatment Plant**	a) Clarifier Reel Type, 73/22-1254-71, Type SK 73/22 - 71 L/4, Shaft type, Output Shaft diameter 75 0 mm x 140 mm, Operating Temperature -10/+40 °C, Oil type CLP 220, Duty Ratio 100 %, Wind speed 2 m/s, Safety Factor 1 7, Power Required 0 37 kW, Rev Speed 1380 rpm, QuantityX6, Estimated repair quantities within 5 years contract duration x 24 Stock Number 592889 b) Clarifier Agitator Type, MR4E69 6F C26 200L 4 B5/2 6, Duty Gear ratio 2 6, Power Required 30 kW, Rev Speed 1465 rpm, QuantityX6, Estimated repair quantities within 5 years contract duration x 24 Stock Number 597794 c) Portable Water Clarifier Type 307/202, Model No 57176, QuantityX1,		

		Estimated repair quantities within 5 years contract duration x 24. Stock Number: 597797		
2.10	**Sewage Plant**	a) Aerator Gearbox: Model Type, JHK14113004107466; Position Vertical; Speed, 64 rpm; Power 7.5kW – 400V;Ratio, 22:86:1, 2.8; Quantity x3, Estimated repair quantities within 5 years contract duration x 45. Stock Number: 646952.		
2.11	Gearbox Spares Supply	Contractor is to supply below Gearbox Spares: a) Size 80" 25/1 Ratio worm shaft, 5 Year's supply quantities: 10. Stock number: 28115.		

		b) Size 80" 25/1 Ratio worm wheel, 5 Year's supply quantities 24 Stock number 28116 c) Size 70 x 25/1 Ratio worm shaft -metric, 5 Year's supply quantities 10 Stock number 48808 d) Size 70 x 25/1 ratio worm wheel, 5 Year's supply quantities 24 Stock number 28251 e) Size 70" double shaft, 5 Year's supply quantities 10 Stock number 38233 f) Size 70" WRG- Fan, 5 Year's supply quantities 10 Stock number 40619 g) Size 12" x 25/1 ratio worm wheel, 5 Year's supply quantities 4, Stock number 28250 h) Size 12" output shaft, 5 Year's supply quantities 4, Stock number 38232		

2.11	**General Consideration**	a) Data books, reviews, reports and diagrams / drawings shall be submitted to Engineering after the completion of the work. b) All QCP's to be submitted to Engineering and Quality for approval prior to the client / repair work commencement. c) All work is to be done in accordance with Matla Plant Procedures and Safety Regulations. d) The Contractor / Executioner of the work will be responsible for drawing up all QCP documentation, which must be approved by Engineering and Authorized by the Quality Department prior to commencing with the work.		

Budget Bill of Materials

List of installed gearboxes and spares

SUBSYSTEM:							
№	SERVICE TYPE	COMPONENT DESCRIPTION	COMPONENT MATERIAL SPECIFICATION	OPERATING PARAMETERS	PART No.	STOCK No.	ESTIMATED FOR 5 YEARS
1	Repair	Coal Plant Size 70 Inch Gearboxes	Carbon Steel – Bronze Wheel	Ratio 25 1	WU7	0177248	60
2	Repair	Coal Plant Size 70 Inch Gearboxes	Carbon Steel – Bronze Wheel	Ratio 60 1	WU7	0037659	30
3	Repair	Coal Plant Size 80 Inch Gearboxes	Carbon Steel – Bronze Wheel	Ratio 25 1	WU8	0177249	60
4	Repair	Coal Plant Size 12 Inch Gearboxes	Carbon Steel – Bronze Wheel	Ratio 25 1	TWU12	0176999	40
5	Repair	Coal Plant Size 14 Inch Gearboxes	Carbon Steel – Bronze Wheel	Ratio 25 1	TWU14	0026524	24
6	Repair	Coal Plant Size 500/700 double reduction Gearboxes	Steel	Ratio 28 1	H Series	0176992	12

SUBSYSTEM:							
№	SERVICE TYPE	COMPONENT DESCRIPTION	COMPONENT MATERIAL SPECIFICATION	OPERATING PARAMETERS	PART No.	STOCK No.	ESTIMATED FOR 5 YEARS
7	Repair	Slurry Plant 20-Series Shuttle Conveyor Gearboxes	Steel	Ratio: 48.04	SK3282AZG-48-80L/4	581088	24
8	Repair	Slurry Plant 20-Series Conveyor Drive Gearboxes	Steel	Ratio: 73.80:1	KA148-K2-160	581073	24
9	Repair	Slurry Plant Mixer Agitator Gearboxes	Steel	Ratio: 32.45:1	C21584/01/A	563423	24
10	Repair	Slurry Plant Conveyor 32 Drive Gearbox	Steel	N/A	SK9052.IEC132 ALP	582834	24
11	Repair	Water Plant Clarifier Gearboxes (Rotary Feeder Gearbox)	Steel	Duty ratio: 100 %	SK 73/22 - 71 L/4	592889	24

SUBSYSTEM:							
№	SERVICE TYPE	COMPONENT DESCRIPTION	COMPONENT MATERIAL SPECIFICATION	OPERATING PARAMETERS	PART No.	STOCK No.	ESTIMATED FOR 5 YEARS
12	Repair	Auxiliary Clarifier Agitator Gearboxes	Steel	Ratio 2 6	C26 200L 4	727237	24
13	Repair	Water Treatment Plant Gearboxes (brine tank stirrer)	Steel	N/A	B5/2 6 307/202	683429	24
14	Repair	All Sewage Plant Gearboxes (Ammonia Stirrer)	Steel	Ratio, 50 73 1 Ratio, 22 86 1	0405-M17490/2	646952	45
15	Repair	Gearbox Impeller Drive	Steel	Ratio 2 6	MR4E69 6FC26 200L	597794	24
16	Repair	Gearbox planetary	Steel	Type 307/202	57176	597797	24

SUBSYSTEM:							
№	SERVICE TYPE	COMPONENT DESCRIPTION	COMPONENT MATERIAL SPECIFICATION	OPERATING PARAMETERS	PART No.	STOCK No.	ESTIMATED FOR 5 YEARS

Critical Spares Required

Note, the following list outlines the critical spares to be supplied as when required to assist with emergency repair during the plant breakdown,

ITEM NO	COAL PLANT SPARES	QUANTITY INSTALLED	STOCK NUMBER	QUANTITY REQUIRED
1	Size70 Ratio 25 1 Gearbox Worm Shaft	12	48808	10
2	Size 70 Ratio 25 1 Gearbox Worm Wheel	12	28251	24
3	Size 70 Ratio 25 1 Gearbox Double Shaft	12	38233	10

4.	Size 70 Ratio Gearbox WRG Fan	18	40619	24
5.	Size 80 Ratio Gearbox Worm Shaft	6	28115	10
6.	Size 80 Ratio Gearbox Worm Wheel	6	28116	24

SCOPE COMPILATION REFERENCES				
SOURCE & Ref No	**Yes**	**No**	**N/A**	**Comments**
Previous outage service reports			x	
Return to service data packages			x	
Maintenance Strategy with Rev number			x	
SAP defects (attach list as appendix)			x	
GHRMS (STEP) reports (Generation Heat Rate Management System)			x	
Online Condition Monitoring			x	
Pre-outage performance test results			x	
Post outage performance test results			x	
GPSS/ Plant Performance data on UCLF incurred			x	
OMS / IIRMS recommendations (Audits Reports)			x	
Risk controls (IRM system)			x	
Previous audits and reviews (e g. ERAP)			x	
Engineering Change Requests (Projects)			x	

LOPP strategy reports			x	
URS			x	
Philosophy (Outage)			x	
Condition Monitoring Report			x	
VA/PHD Viewer trends			x	
Corrective Actions	x			
CARAB reports			x	
Statutory Requirements			x	
Grid code requirements			x	
Waivers and Exemptions			x	
Calibration requirements			x	
Previous Outage SOW variations			x	
Post Mortems Actions from previous outages			x	
Pre–Outage plant walks			x	
Risk based inspection (RBI) report			x	
Simulation, TOIs, OON, SI			x	