

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>0</b>	<b>General</b>														
0.01	Site establishment for OP		X												
0.02	Site establishment for IN			X											
0.03	Site establishment for IR				X										
0.04	Site establishment for GO					X									
0.05	Site de-establishment for OP		X												
0.06	Site de-establishment for IN			X											
0.07	Site de-establishment for IR				X										
0.08	Site de-establishment for GO					X									
0.09	Open inspection doors		X	X	X	X									
0.10	Close inspection doors		X	X	X	X									
0.11	Wash the complete fan casing, concrete pedestals and fan bearing pedestals.			X	X	X									

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<b>ID Fans</b>															
<b>1</b>	<b>Fan Inspection OP</b>														
1.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Visually inspect fan bearing pedestals for damage p) Visually inspect fan bearing holding down bolts for damage q) Visually inspect fan motor bearings for any oil leaks		X												

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ID Fans															
2	Fan Inspection IN														
2.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks			X											

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Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
ID Fans															
3	Fan Inspection IR														
3.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. Tighten loose bolts g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks			X											

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Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
ID Fans															
4	Fan Inspection GO														
4.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks				X										

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Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>ID Fans</b>															
<b>5</b>	<b>NDT - Inspection</b>														
5.01	Microblast impeller clean for preparation for NDT				X	X									
5.02	Do complete impeller NDT weld inspection as per 240-89218242 Boiler Centrifugal Fan Inspection Standard				X	X									
5.03	Do complete impeller NDT thickness testing inspection as per 240-89218242 Boiler Centrifugal Fan Inspection Standard														
5.04	NDT testing of all weld repairs after waiting period														
<b>6</b>	<b>Impeller Weld Repairs - ID Fans</b>														
6.01	Inspection of Fan In-situ by Engineer to determine damage and repairs required and submit detailed report			X	X	X									
6.02	Compilation of detailed fan in-situ repair procedure by Engineer														
6.03	Weld repair of impeller in-situ by crew required based on a 12 hour shift.														
6.04	Install correct balance weights after dynamic balancing by approved method			X	X	X									
6.05	NDT the balance weights welding after waiting period to procedure			X	X	X									
6.06	Remove 100% of the impeller secondary/nose cap blade liners					X									
6.07	Refit 100% new secondary/nose cap blade liners					X									
6.08	Remove 8 of the impeller secondary/nose cap blade liners			X	X										
6.09	Refit 8 new secondary/nose cap blade liners			X	X										

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<b>ID Fans</b>															
<b>7</b>	<b>Coupling - Spring</b>														
7.01	Remove coupling guards			X	X	X									
7.02	Open and clean coupling, Inspect covers, springs and teeth. Replace springs if required. Re-grease coupling and close up coupling. Submit wear report			X	X	X									
7.03	Remove fan shaft end coupling half and refit fan shaft end coupling half														
7.04	Remove motor shaft end coupling half and refit motor shaft end coupling half.														
7.05	Laser align fan impeller and motor to correct specifications and coupling gap			X	X	X									
7.06	Carry out minor repairs on coupling guard and replace missing bolts.			X	X	X									
7.07	Refit coupling guards			X	X	X									
<b>8</b>	<b>Lubrication System - Shaft Driven Pump</b>														
8.01	Remove and refit pump motor														
8.02	Remove and refit electric driven pump														
8.03	Remove and refit shaft driven pump														
8.04	Remove and refit pressure regulating valve														
8.05	Remove and refit needle valve														
8.06	Remove and refit filters														
8.07	Remove and replace oil														
8.08	Remove and refit duplex filter unit														
8.09	Remove and refit flexible hoses to bearings				X	X									
8.10	Open, drain, clean and inspect tank for rust and damage. Inspect all oil pipework for leaks and repair where required. Inspect suction strainer/foot valve (Where fitted). Fit new gaskets and close tank. Refill tank via filtration unit.			X	X	X									
8.11	Microblast clean tank inside, clean tank and re-coat inside of tank with special coating														
8.12	Remove lubrication oil filters and clean/replace filters as required. Service filter change over handles and repair oil leaks on piping and filter unit.			X	X	X									
8.13	Inspect lubrication oil pumps for leaks and repair leaks where required.			X	X	X									
8.14	Remove lubrication oil pumps and inspect couplings and bell housing/guards for damage. Repair any damage and replace coupling or bell housing if required. Refit pumps			X	X	X									

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<b>ID Fans</b>															
8.15	Disconnect and remove oil coolers. Open water boxes and inspect coolers for damage and wear. Replace gaskets/O-rings where required. Clean coolers. Close coolers and refit coolers.			X	X										
8.16	Disconnect and remove oil coolers. Send coolers for inspection and pressure testing off site. Refit coolers.					X									
8.17	Chemically flush lubrication piping to remove any rust and scaling.														
8.18	Flush lubrication system by bypassing bearings and using mobile filtration unit.			X	X	X									
8.19	Commission lubrication system by setting pressures and/or flow rates			X	X	X									

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<b>ID Fans</b>															
<b>9</b>	<b>Jacking Oil System</b>														
9.01	Remove and refit pump motor														
9.02	Remove and refit pump														
9.03	Remove and refit pressure regulating valve														
9.04	Remove jacking oil nozzle from bearing														
9.05	Inspect jacking oil nozzle			X	X	X									
9.06	Refit jacking oil nozzle into bearing			X	X	X									
9.07	Remove all flexible hoses					X									
9.08	Refit all flexible hoses					X									
9.09	Commissioning of system and adjusting of pressure			X	X	X									
<b>10</b>	<b>Bearings - White Metal Force Lubricated DE &amp; NDE</b>														
10.01	Clean bearing and working area.			X	X	X									
10.02	Remove lubrication oil piping and blank of oil lines to prevent dirt getting into the lines					X									
10.03	Remove thermocouple					X									
10.04	Open bearing top cap					X									
10.05	Remove bearing sleeve top half					X									
10.06	Jack up shaft and remove bearing bottom half					X									
10.07	Inspect bearing sleeves white metal surfaces for damage and wear.					X									
10.08	Send sleeves away for re-metal					X									
10.09	Remove fan bearing holding down bolts, Inspect bolts and re-fit bolts					X									
10.10	Remove fan bearing housing when bearing has been removed														
10.11	Inspect fan bearing pedestal for flatness and damage when bearing has been removed														
10.12	Refit fan bearing housing														
10.13	Inspect bearing bottom and top saddles for damage and spherical seats for wear and damage.					X									
10.14	Inspect the shaft surface finish and dimensions on the bearing landings, thrust collars and shaft seal landings					X									
10.15	Refit new/refurbished bearing sleeves by fitting the bottom half first. Apply a layer of oil on the lower sleeve.					X									
10.16	Check that the bearing lip clearances are correct and the ears are open on the thrust faces.					X									

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<b>ID Fans</b>															
10.17	Lower the fan shaft and allow the sleeve to settle in the spherical seat on the bottom.					X									
10.18	Fit the top half of the sleeve					X									
10.19	Fit the bearing top cap, labyrinth seals and take plastiguage readings of the bearing clearances.					X									
10.20	Remove and service labyrinth seals														
10.21	Refit Labyrinth Seals														
10.22	Check the clearances are correct to specification					X									
10.23	Re-install the thermocouple.					X									
10.24	Flush the lubrication oil piping before re-installing the piping onto the bearing.					X									

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<b>ID Fans</b>															
<b>11</b>	<b>RVC System - Annular Plates</b>														
11.01	Remove RVC annular plates			X	X	X									
11.02	Inspect pull rod clevises', operating ring rollers, operating ring, connecting links, operating levers, outer blade pins and bushes for damage and wear.			X	X	X									
11.03	Inspect RVC inner vanes and inner cones for damage and wear			X	X	X									
11.04	Inspect RVC inner pins and bushes for wear			X	X	X									
11.05	Remove all RVC connecting links, operating levers, swivel pins and pin bushes in-situ					X									
11.06	Install all RVC connecting links, operating levers, swivel pins and pin bushes in-situ					X									
11.07	Remove 2 off RVC connecting links, operating levers, swivel pins and pin bushes in-situ			X	X										
11.08	Install 2 off RVC connecting links, operating levers, swivel pins and pin bushes in-situ			X	X										
11.09	Remove operating ring guide rollers														
11.10	Replace operating ring guide rollers														
11.11	Remove operating ring and guide rollers					X									
11.12	Replace operating ring and guide rollers					X									
11.13	Refit and seal RVC annular plates			X	X	X									
11.14	Clean and re-grease lay shaft bearings			X	X	X									
11.15	Fit lay shaft bearings														
11.16	Remove lay shaft pull rods and operating levers														
11.17	Refit lay shaft pull rods and operating levers														
11.18	Remove RVC actuator					X									
11.19	Inspect RVC actuator plinth and holding down bolts					X									
11.20	Re-fit RVC actuator					X									
11.21	Adjust and synchronise RVC and lay shaft system			X	X	X									
11.22	Assist with RVC actuator stroking			X	X	X									

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<b>ID Fans</b>															
<b>12</b>	<b>Shaft Seals</b>														
12.01	Remove the shaft seal guards			X	X	X									
12.02	Remove the shaft seals			X	X	X									
12.03	Refit the shaft seals			X	X	X									
12.04	Remove shaft seal housing														
12.05	Carry out minor repairs to shaft seal housing and reseal and refit shaft seal housing														
12.06	Refit the shaft seal guards			X	X	X									
<b>14</b>	<b>Motor</b>														
14.01	Remove motor					X									
14.02	Open the Motor DE Bearing. Clean out the bearing housing. Remove and inspect the bearing sleeves. Inspect and measure the oil rings and record the findings. Refit oil rings and bearing sleeves. Measure the bearing clearances and record. Close up the bearing. Fill the bearing to the correct oil level. Ensure that the oil rings turn correctly.			X	X	X									
14.03	Open the Motor NDE Bearing. Clean out the bearing housing. Remove and inspect the bearing sleeves. Inspect and measure the oil rings and record the findings. Refit oil rings and bearing sleeves. Measure the bearing clearances and record. Close up the bearing. Fill the bearing to the correct oil level. Ensure that the oil rings turn correctly.			X	X	X									
14.04	Inspect motor base mounting pads for flatness when motor has been removed					X									
14.05	Clean base and refit motor					X									
14.06	Remove the motor holding down bolts and inspect them. Re-fit the motor holding down bolts and tighten to correct torque			X	X	X									
<b>15</b>	<b>Casing - ID Fan</b>														
15.01	Repair casing with welding team consisting of one welder and one assistant for a 12 hour shift														
15.02	Carry out minor repairs to casing doors and fit new gaskets, Replace bolts and clamps that are damaged where required			X	X	X									
15.03	Carry out thickness testing on casing in areas of most wear and report			X	X										
15.04	Carry out 100% casing thickness testing					X									
15.05	Remove 100% of the casing liners					X									

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<b>ID Fans</b>															
15.06	Refit 100% of the casing liners with new liners					X									
15.07	Remove 25% of the casing liners			X	X										
15.08	Refit 25% of the casing liners with new liners			X	X										
<b>16</b>	<b>General</b>														
16.01	Remove complete impeller when casing is closed														
16.02	Re-install complete impeller after removal														
<b>17</b>	<b>Commissioning</b>														
17.01	Test run fan		X	X	X	X									
17.02	Dynamically balance fan		X	X	X	X									

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<b>FD Fans</b>															
<b>1</b>	<b>Fan Inspection OP</b>														
1.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Visually inspect fan bearing pedestals for damage p) Visually inspect fan bearing holding down bolts for damage q) Visually inspect fan motor bearings for any oil leaks		X												

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FD Fans															
2	Fan Inspection IN														
2.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks			X											

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FD Fans															
3	Fan Inspection IR														
3.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. Tighten loose bolts g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks			X											

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FD Fans															
4	Fan Inspection GO														
4.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks				X										

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<b>FD Fans</b>															
<b>5</b>	<b>NDT - Inspection</b>														
5.01	Microblast impeller clean for preparation for NDT				X	X									
5.02	Do complete impeller NDT weld inspection as per 240-89218242 Boiler Centrifugal Fan Inspection Standard				X	X									
5.03	Do complete impeller NDT thickness testing inspection as per 240-89218242 Boiler Centrifugal Fan Inspection Standard														
5.04	NDT testing of all weld repairs after waiting period														
<b>6</b>	<b>Impeller Weld Repairs</b>														
6.01	Inspection of Fan In-situ by Engineer to determine damage and repairs required and submit detailed report			X	X	X									
6.02	Compilation of detailed fan in-situ repair procedure by Engineer														
6.03	Weld repair of impeller in-situ by crew required based on a 12 hour shift.														
6.04	Install correct balance weights after dynamic balancing by approved method			X	X	X									
6.05	NDT the balance weights welding after waiting period to procedure			X	X	X									
<b>7</b>	<b>Coupling - Spring</b>														
7.01	Remove coupling guards			X	X	X									
7.02	Open and clean coupling, Inspect covers, springs and teeth. Replace springs if required. Re-grease coupling and close up coupling. Submit wear report			X	X	X									
7.03	Remove fan shaft end coupling half and refit fan shaft end coupling half														
7.04	Remove motor shaft end coupling half and refit motor shaft end coupling half.														
7.05	Laser align fan impeller and motor to correct specifications and coupling gap			X	X	X									
7.06	Carry out minor repairs on coupling guard and replace missing bolts.			X	X	X									
7.07	Refit coupling guards			X	X	X									
<b>8</b>	<b>Lubrication System - Shaft Driven Pump</b>														
8.01	Remove and refit pump motor														
8.02	Remove and refit electric driven pump														
8.03	Remove and refit shaft driven pump														

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<b>FD Fans</b>															
8.04	Remove and refit pressure regulating valve														
8.05	Remove and refit needle valve														
8.06	Remove and refit filters														
8.07	Remove and replace oil														
8.08	Remove and refit duplex filter unit														
8.09	Remove and refit flexible hoses to bearings				X	X									
8.10	Open, drain, clean and inspect tank for rust and damage. Inspect all oil pipework for leaks and repair where required. Inspect suction strainer/foot valve (Where fitted). Fit new gaskets and close tank. Refill tank via filtration unit.			X	X	X									
8.11	Microblast clean tank inside, clean tank and re-coat inside of tank with special coating														
8.12	Remove lubrication oil filters and clean/replace filters as required. Service filter change over handles and repair oil leaks on piping and filter unit.			X	X	X									
8.13	Inspect lubrication oil pumps for leaks and repair leaks where required.			X	X	X									
8.14	Remove lubrication oil pumps and inspect couplings and bell housing/guards for damage. Repair any damage and replace coupling or bell housing if required. Refit pumps			X	X	X									
8.15	Disconnect and remove oil coolers. Open water boxes and inspect coolers for damage and wear. Replace gaskets/O-rings where required. Clean coolers. Close coolers and refit coolers.			X	X										
8.16	Disconnect and remove oil coolers. Send coolers for inspection and pressure testing off site. Refit coolers.					X									
8.17	Chemically flush lubrication piping to remove any rust and scaling.														
8.18	Flush lubrication system by bypassing bearings and using mobile filtration unit.			X	X	X									
8.19	Commission lubrication system by setting pressures and/or flow rates			X	X	X									
<b>9</b>	<b>Jacking Oil System</b>														
9.01	Remove and refit pump motor														
9.02	Remove and refit pump														
9.03	Remove and refit pressure regulating valve														
9.04	Inspect jacking oil nozzle			X	X	X									

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>FD Fans</b>															
9.05	Remove all flexible hoses					X									
9.06	Refit all flexible hoses					X									
9.07	Commissioning of system and adjusting of pressure			X	X	X									
<b>10</b>	<b>Bearings - White Metal Force Lubricated DE &amp; NDE</b>														
10.01	Clean bearing and working area.			X	X	X									
10.02	Remove lubrication oil piping and blank of oil lines to prevent dirt getting into the lines					X									
10.03	Remove thermocouple					X									
10.04	Open bearing top cap					X									
10.05	Remove bearing sleeve top half					X									
10.06	Jack up shaft and remove bearing bottom half					X									
10.07	Inspect bearing sleeves white metal surfaces for damage and wear.					X									
10.08	Send sleeves away for re-metal					X									
10.09	Remove fan bearing holding down bolts, Inspect bolts and re-fit bolts					X									
10.10	Remove fan bearing housing when bearing has been removed														
10.11	Inspect fan bearing pedestal for flatness and damage when bearing has been removed														
10.12	Refit fan bearing housing														
10.13	Inspect bearing bottom and top saddles for damage and spherical seats for wear and damage.					X									
10.14	Inspect the shaft surface finish and dimensions on the bearing landings, thrust collars and shaft seal landings					X									
10.15	Refit new/refurbished bearing sleeves by fitting the bottom half first. Apply a layer of oil on the lower sleeve.					X									
10.16	Check that the bearing lip clearances are correct and the ears are open on the thrust faces.					X									
10.17	Lower the fan shaft and allow the sleeve to settle in the spherical seat on the bottom.					X									
10.18	Fit the top half of the sleeve					X									
10.19	Fit the bearing top cap, labyrinth seals and take plastiguage readings of the bearing clearances.					X									
10.20	Remove and service labyrinth seals														
10.21	Refit Labyrinth Seals														
10.22	Check the clearances are correct to specification					X									

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>FD Fans</b>															
10.23	Re-install the thermocouple.					X									
10.24	Flush the lubrication oil piping before re-installing the piping onto the bearing.					X									
<b>11</b>	<b>RVC System - Annular Plates</b>														
11.01	Remove RVC annular plates			X	X	X									
11.02	Inspect pull rod clevises', operating ring rollers, operating ring, connecting links, operating levers, outer blade pins and bushes for damage and wear.			X	X	X									
11.03	Inspect RVC inner vanes and inner cones for damage and wear			X	X	X									
11.04	Inspect RVC inner pins and bushes for wear			X	X	X									
11.05	Remove all RVC connecting links, operating levers, swivel pins and pin bushes in-situ					X									
11.06	Install all RVC connecting links, operating levers, swivel pins and pin bushes in-situ					X									
11.07	Remove 2 off RVC connecting links, operating levers, swivel pins and pin bushes in-situ			X	X										
11.08	Install 2 off RVC connecting links, operating levers, swivel pins and pin bushes in-situ			X	X										
11.09	Remove operating ring guide rollers														
11.10	Replace operating ring guide rollers														
11.11	Remove operating ring and guide rollers					X									
11.12	Replace operating ring and guide rollers					X									
11.13	Refit and seal RVC annular plates			X	X	X									
11.14	Clean and re-grease lay shaft bearings			X	X	X									
11.15	Fit lay shaft bearings														
11.16	Remove lay shaft pull rods and operating levers														
11.17	Refit lay shaft pull rods and operating levers														
11.18	Remove RVC actuator					X									
11.19	Inspect RVC actuator plinth and holding down bolts					X									
11.20	Re-fit RVC actuator					X									
11.21	Adjust and synchronise RVC and lay shaft system			X	X	X									
11.22	Assist with RVC actuator stroking			X	X	X									
<b>12</b>	<b>Shaft Seals</b>														
12.01	Remove the shaft seal guards			X	X	X									
12.02	Remove the shaft seals			X	X	X									
12.03	Refit the shaft seals			X	X	X									
12.04	Remove shaft seal housing														
12.05	Carry out minor repairs to shaft seal housing and reseal and refit shaft seal housing														

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>FD Fans</b>															
12.06	Refit the shaft seal guards			X	X	X									
<b>14</b>	<b>Motor</b>														
14.01	Remove motor					X									
14.02	Open the Motor DE Bearing. Clean out the bearing housing. Remove and inspect the bearing sleeves. Inspect and measure the oil rings and record the findings. Refit oil rings and bearing sleeves. Measure the bearing clearances and record. Close up the bearing. Fill the bearing to the correct oil level. Ensure that the oil rings turn correctly.			X	X	X									
14.03	Open the Motor NDE Bearing. Clean out the bearing housing. Remove and inspect the bearing sleeves. Inspect and measure the oil rings and record the findings. Refit oil rings and bearing sleeves. Measure the bearing clearances and record. Close up the bearing. Fill the bearing to the correct oil level. Ensure that the oil rings turn correctly.			X	X	X									
14.04	Inspect motor base mounting pads for flatness when motor has been removed					X									
14.05	Clean base and refit motor					X									
14.06	Remove the motor holding down bolts and inspect them. Re-fit the motor holding down bolts and tighten to correct torque			X	X	X									
<b>15</b>	<b>Casing</b>														
15.01	Repair casing with welding team consisting of one welder and one assistant for a 12 hour shift														
15.02	Carry out minor repairs to casing doors and fit new gaskets. Replace bolts and clamps that are damaged where required			X	X	X									
<b>16</b>	<b>General</b>														
16.01	Remove complete impeller when casing is closed														
16.02	Re-install complete impeller after removal														
<b>17</b>	<b>Commissioning</b>														
17.01	Test run fan		X	X	X	X									
17.02	Dynamically balance fan		X	X	X	X									

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>PA Fans</b>															
<b>1</b>	<b>Fan Inspection OP</b>														
1.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Visually inspect fan bearing pedestals for damage p) Visually inspect fan bearing holding down bolts for damage q) Visually inspect fan motor bearings for any oil leaks		X												

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
PA Fans															
2	Fan Inspection IN														
2.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks			X											

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
PA Fans															
3	Fan Inspection IR														
3.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. Tighten loose bolts g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks			X											

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
PA Fans															
4	Fan Inspection GO														
4.01	a) Visually inspect fan impeller for wear and erosion b) Visually inspect complete casing internally and externally for damage and erosion c) Visually inspect casing flanges for damage and wear d) Visually inspect casing flange bolts for missing and damaged bolts where bolts are visible (no stripping of cladding) e) Visually inspect coupling guard for damage f) Visually inspect shaft seal guards and bolts for damage. g) Visually inspect RVC lay shaft system for damage or broken links h) Visually inspect RVC system for wear, damage and loose links (No opening of annular plates) i) Visually inspect Dorsal Fins for damage and erosion j) Visually inspect bearings for any oil leaks k) Visually inspect lubrication system for oil leaks l) Visually inspect stay rods for damage and wear m) Visually inspect casing holding down bolts for damaged or loose bolts n) Visually inspect the suction cones for damage and erosion o) Measure suction cone penetration and clearance p) Visually inspect fan bearing pedestals for damage q) Visually inspect fan bearing holding down bolts for damage r) Visually inspect fan motor bearings for any oil leaks				X										

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>PA Fans</b>															
<b>5</b>	<b>NDT - Inspection</b>														
5.01	Microblast impeller clean for preparation for NDT				X	X									
5.02	Do complete impeller NDT weld inspection as per 240-89218242 Boiler Centrifugal Fan Inspection Standard				X	X									
5.03	Do complete impeller NDT thickness testing inspection as per 240-89218242 Boiler Centrifugal Fan Inspection Standard														
5.04	NDT testing of all weld repairs after waiting period														
<b>6</b>	<b>Impeller Weld Repairs</b>														
6.01	Inspection of Fan In-situ by Engineer to determine damage and repairs required and submit detailed report			X	X	X									
6.02	Compilation of detailed fan in-situ repair procedure by Engineer														
6.03	Weld repair of impeller in-situ by crew required based on a 12 hour shift.														
6.04	Install correct balance weights after dynamic balancing by approved method			X	X	X									
6.05	NDT the balance weights welding after waiting period to procedure			X	X	X									
<b>7</b>	<b>Coupling - Spring</b>														
7.01	Remove coupling guards			X	X	X									
7.02	Open and clean coupling, Inspect covers, springs and teeth. Replace springs if required. Re-grease coupling and close up coupling. Submit wear report			X	X	X									
7.03	Remove fan shaft end coupling half and refit fan shaft end coupling half														
7.04	Remove motor shaft end coupling half and refit motor shaft end coupling half.														
7.05	Laser align fan impeller and motor to correct specifications and coupling gap			X	X	X									
7.06	Carry out minor repairs on coupling guard and replace missing bolts.			X	X	X									
7.07	Refit coupling guards			X	X	X									
<b>8</b>	<b>Lubrication System - Shaft Driven Pump</b>														
8.01	Remove and refit pump motor														
8.02	Remove and refit electric driven pump														
8.03	Remove and refit shaft driven pump														

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>PA Fans</b>															
8.04	Remove and refit pressure regulating valve														
8.05	Remove and refit needle valve														
8.06	Remove and refit filters														
8.07	Remove and replace oil														
8.08	Remove and refit duplex filter unit														
8.09	Remove and refit flexible hoses to bearings				X	X									
8.10	Open, drain, clean and inspect tank for rust and damage. Inspect all oil pipework for leaks and repair where required. Inspect suction strainer/foot valve (Where fitted). Fit new gaskets and close tank. Refill tank via filtration unit.			X	X	X									
8.11	Microblast clean tank inside, clean tank and re-coat inside of tank with special coating														
8.12	Remove lubrication oil filters and clean/replace filters as required. Service filter change over handles and repair oil leaks on piping and filter unit.			X	X	X									
8.13	Inspect lubrication oil pumps for leaks and repair leaks where required.			X	X	X									
8.14	Remove lubrication oil pumps and inspect couplings and bell housing/guards for damage. Repair any damage and replace coupling or bell housing if required. Refit pumps			X	X	X									
8.15	Disconnect and remove oil coolers. Open water boxes and inspect coolers for damage and wear. Replace gaskets/O-rings where required. Clean coolers. Close coolers and refit coolers.			X	X										
8.16	Disconnect and remove oil coolers. Send coolers for inspection and pressure testing off site. Refit coolers.					X									
8.17	Chemically flush lubrication piping to remove any rust and scaling.														
8.18	Flush lubrication system by bypassing bearings and using mobile filtration unit.			X	X	X									
8.19	Commission lubrication system by setting pressures and/or flow rates			X	X	X									
<b>10</b>	<b>Bearings - White Metal Force Lubricated DE &amp; NDE</b>														
10.01	Clean bearing and working area.			X	X	X									
10.02	Remove lubrication oil piping and blank of oil lines to prevent dirt getting into the lines					X									

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>PA Fans</b>															
10.03	Remove thermocouple					X									
10.04	Open bearing top cap					X									
10.05	Remove bearing sleeve top half					X									
10.06	Jack up shaft and remove bearing bottom half					X									
10.07	Inspect bearing sleeves white metal surfaces for damage and wear.					X									
10.08	Send sleeves away for re-metal					X									
10.09	Remove fan bearing holding down bolts, Inspect bolts and re-fit bolts					X									
10.10	Remove fan bearing housing when bearing has been removed														
10.11	Inspect fan bearing pedestal for flatness and damage when bearing has been removed														
10.12	Refit fan bearing housing														
10.13	Inspect bearing bottom and top saddles for damage and spherical seats for wear and damage.					X									
10.14	Inspect the shaft surface finish and dimensions on the bearing landings, thrust collars and shaft seal landings					X									
10.15	Refit new/refurbished bearing sleeves by fitting the bottom half first. Apply a layer of oil on the lower sleeve.					X									
10.16	Check that the bearing lip clearances are correct and the ears are open on the thrust faces.					X									
10.17	Lower the fan shaft and allow the sleeve to settle in the spherical seat on the bottom.					X									
10.18	Fit the top half of the sleeve					X									
10.19	Fit the bearing top cap, labyrinth seals and take plastiguage readings of the bearing clearances.					X									
10.20	Remove and service labyrinth seals														
10.21	Refit Labyrinth Seals														
10.22	Check the clearances are correct to specification					X									
10.23	Re-install the thermocouple.					X									
10.24	Flush the lubrication oil piping before re-installing the piping onto the bearing.					X									
<b>11</b>	<b>RVC System - Open Ring</b>														
11.01	Inspect pull rod clevises, operating ring rollers, operating ring, connecting links, operating levers, outer blade pins and bushes for damage and wear.			X	X	X									

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>PA Fans</b>															
11.02	Inspect RVC inner vanes and inner cones for damage and wear			X	X	X									
11.03	Inspect RVC inner pins and bushes for wear			X	X	X									
11.04	Remove all RVC connecting links, operating levers, swivel pins and pin bushes in-situ					X									
11.05	Install all RVC connecting links, operating levers, swivel pins and pin bushes in-situ					X									
11.06	Remove 2 off RVC connecting links, operating levers, swivel pins and pin bushes in-situ			X	X										
11.07	Install 2 off RVC connecting links, operating levers, swivel pins and pin bushes in-situ			X	X										
11.08	Remove operating ring guide rollers														
11.09	Install operating ring guide rollers														
11.10	Remove operating ring and guide rollers					X									
11.11	Install operating ring and guide rollers					X									
11.12	Open lay shaft bearings			X	X	X									
11.13	Inspect lay shaft bearings			X	X	X									
11.14	Clean and re-grease lay shaft bearings			X	X	X									
11.15	Fit new lay shaft bearings														
11.16	Close lay shaft bearings			X	X	X									
11.17	Remove lay shaft pull rods and operating levers														
11.18	Install lay shaft pull rods and operating levers														
11.19	Remove RVC actuator					X									
11.20	Inspect RVC actuator plinth and holding down bolts					X									
11.21	Re-fit RVC actuator					X									
11.22	Adjust and synchronise RVC and lay shaft system			X	X	X									
11.23	Assist with RVC actuator stroking			X	X	X									
<b>12 Shaft Seals</b>															
12.01	Remove the shaft seal guards			X	X	X									
12.02	Remove the shaft seals			X	X	X									
12.03	Refit the shaft seals			X	X	X									
12.04	Remove shaft seal housing														
12.05	Carry out minor repairs to shaft seal housing and reseal and refit shaft seal housing														
12.06	Refit the shaft seal guards			X	X	X									
<b>14 Motor</b>															
14.01	Remove motor					X									

## Lethabo Power Station

### Fan Scope Of Work

#### Unit 1-6

Item No	Description	Spares and Consumables Required	OP	IN	IR	GO	Dur/ Fan (Hrs)	Dur/ Unit (Hrs)	SE	A	W	S/S	L	Price/ Fan	Price/ Unit
<b>PA Fans</b>															
14.02	Open the Motor DE Bearing. Clean out the bearing housing. Remove and inspect the bearing sleeves. Inspect and measure the oil rings and record the findings. Refit oil rings and bearing sleeves. Measure the bearing clearances and record. Close up the bearing. Fill the bearing to the correct oil level. Ensure that the oil rings turn correctly.			X	X	X									
14.03	Open the Motor NDE Bearing. Clean out the bearing housing. Remove and inspect the bearing sleeves. Inspect and measure the oil rings and record the findings. Refit oil rings and bearing sleeves. Measure the bearing clearances and record. Close up the bearing. Fill the bearing to the correct oil level. Ensure that the oil rings turn correctly.			X	X	X									
14.04	Inspect motor base mounting pads for flatness when motor has been removed					X									
14.05	Clean base and refit motor					X									
14.06	Remove the motor holding down bolts and inspect them. Re-fit the motor holding down bolts and tighten to correct torque			X	X	X									
<b>15</b>	<b>Casing</b>														
15.01	Repair casing with welding team consisting of one welder and one assistant for a 12 hour shift														
15.02	Carry out minor repairs to casing doors and fit new gaskets, Replace bolts and clamps that are damaged where required			X	X	X									
<b>16</b>	<b>General</b>														
16.01	Remove complete impeller when casing is closed														
16.02	Re-install complete impeller after removal														
<b>17</b>	<b>Commissioning</b>														
17.01	Test run fan		X	X	X	X									
17.02	Dynamically balance fan		X	X	X	X									