

	Scope of Work	Boiler Plant Engineering
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Title: **Replacement of Boilers 1 to 5 Air
Heater Element Packs**

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1. Introduction

Air heater packs wear over time and get partially blocked. Partial blockage can be remedied by high pressure of packs but worn packs cannot be refurbished. Air heater packs are therefore replaced at a certain interval for wear as per maintenance philosophy. Pack wear measurements are carried out to help predict the replacement and this assist in the planning. This document seeks to define the scope of work for replacement of air heater packs and the battery limits.

2. Supporting Clauses

2.1 Scope

The scope of work for the replacement of air heater element packs includes the supply and delivery and installation. The supply scope of supply includes air heater element packs, U-bracket/supports and U-channels, safe working platform and provision of associated equipment like forklift, compressor etc. The installation of the elements includes removal of old elements, repair of the stator radial and divisional plates, and installation of new packs, welding of U-channels on radial and divisional plates and the supply of equipment.

2.1.1 Purpose

The document defines the scope of work for the replacement of air heater element packs. This scope of work includes the supply of air heater element packs, U-brackets pack supports, spacer boxes and U-channels and the removal and replacement of element packs.

2.1.2 Applicability

This document shall apply to Tutuka Power Station.

2.1.3 Effective date

The document is effective from the authorisation date.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

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2.2.1 Normative

- [1] 15ENG GEN-0903 – Outage philosophy
- [2] 15ENG STR-001 – Draught Plant Maintenance Execution Strategy
- [3] 32-727 SHEQ Policy

2.2.2 Informative

- [4] ISO 9001 Quality Management Systems

2.3 Definitions

2.3.1 Document:

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

2.4 Abbreviations N/A

Abbreviation	Explanation

2.5 Roles and Responsibilities

- Boiler Plant Engineering shall include the air heater element packs replacement in the outage scope of work for the upcoming outages.
- Projects shall, in conjunction with Procurement, place contracts for air heater element packs, U-brackets/ supports, U-channels and for provision of safe working platforms, forklift and compressor and for replacement of element packs and shall coordinate the replacement of element packs

2.6 Process for Monitoring

- Air heater pack plates will be extracted during major outages from selected packs for mass loss measurements to assist in prediction of wear.

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2.7 Related/Supporting Documents

- Not applicable

3. Scope of work

The scope of work is divided into two:

- Supply and delivery of air heater element packs, space boxes, U-bracket pack supports, U-channels and safe working platforms.
- Installation of air heater packs including hiring of compressors and equipment for the work.

3.1 Description of air heater packs

The air heater element packs are for Rothemühle twin flow air heaters. The air heaters are twin flow type/size: VU 13.2-6.23 (0.655 + 0.655 + 0.3C). The air heater stator consists of 64 radial plates and 7 rings which form 448 cells in which the element packs are installed. A lube oil tunnel takes a cell of each ring. The element packs are supported at the bottom by pack supports welded onto the radial plates. Spacer boxes are installed between the cold end and intermediate element packs to ensure the element packs are only about 50mm short of the air heater stator flange

- 3.1.1 The air heater element packs consist of 3 layers; the hot end elements (top), the intermediate elements and the cold end elements (bottom).
- 3.1.2 The element packs are of HC11 profile made from 0.5mm thick mild steel (SAE 1008) for hot end and intermediate layers and 0.8mm thick mild steel (SAE 1008) for cold end layer.
- 3.1.3 The heights of elements are 600mm for hot end, 655mm for intermediate and 300mm for the cold end.
- 3.1.4 The lengths and widths of the element packs are sized based on the size of the air heater stator cells.

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3.2 Scope of work for supply

3.2.1 Manufacture, supply and deliver, as per table 1:

- Air heater element packs,
- Design and manufacture spacer boxes. The height of the spacer box is about 355mm.
- U-brackets/supports. The U-channels will be released from the spares contract and therefore will not be part of the scope of supply
- Set of safe working platforms for use during the replacement of air heater element packs to cover cells from which air heater element packs have been removed.

3.2.2 The spacer boxes must be designed in such a way that they do not take significant space of the cells. The general arrangement drawings of proposed/ designed spacer boxes will need to be sent for acceptance by Eskom.

3.2.3 The air heater element packs shall be packaged. Packaging shall be of material that will not be damaged, to an extent possible, by harsh weather conditions during transportation.

Packaging shall be such that the spare/ element packs can be positively identified through the packaging. In the event that the packaging is damaged during transportation of the air heater element packs, supplier shall make arrangement to replace the damaged packaging.

- a) The Supplier will ensure proper handling of the spares (from procurement of equipment, storage and transportation). The *Supplier* shall supply preservation and storage procedure/s for the element packs.

No.	Ring	Material Numbers	Description	Quantity per air heater	Quantity per boiler	Total quantity
1	1	0590952	Hot end	63	126	378
2	2	0590947	Hot end	63	126	378
3	3	0590950	Hot end	63	126	378
4	4	0590896	Hot end	63	126	378
5	5	0590895	Hot end	63	126	378
6	6	0590898	Hot end	63	126	378
7	7	0590955	Hot end	63	126	378
8	1	0590904	Intermediate	63	126	378

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9	2	0590903	Intermediate	63	126	378
10	3	0590900	Intermediate	63	126	378
11	4	0590905	Intermediate	63	126	378
12	5	0590894	Intermediate	63	126	378
13	6	0590946	Intermediate	63	126	378
14	7	0590949	Intermediate	63	126	378
15	1	0590953	Cold end	63	126	378
16	2	0590951	Cold end	63	126	378
17	3	0590892	Cold end	63	126	378
18	4	0590897	Cold end	63	126	378
19	5	0590893	Cold end	63	126	378
20	6	0590948	Cold end	63	126	378
21	7	0590954	Cold end	63	126	378
22		0774092	U-brackets/ supports	1 764	3 528	10 584
23			Spacer box ring 1	63	126	378
24			Spacer box ring 2	63	126	378
25			Spacer box ring 3	63	126	378
26			Spacer box ring 4	63	126	378
27			Spacer box ring 5	63	126	378
28			Spacer box ring 6	63	126	378
29			Spacer box ring 7	63	126	378

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30		0775110 & 0775111	Safe working platform		64 (1 set)	64 (1 set)
31		0737609	U-channels (6m length)	180	360	1 080
32			Transportation of element packs & U- bracket			
33			Transportation of spacer boxes			
34			Transportation of safe working			

Table 1: Bill of materials / Quantities

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3.3 Scope of work for removal and installation of element packs (site)

- 3.3.1 Carry out site establishment and de-establishment
- 3.3.2 Provide equipment (forklift, tractor etc) for transporting the air heater element packs from storage area to the hoisting bays of the units
- 3.3.3 Provide compressor and hoists for lifting the element packs to the air heaters area (33m level) and to working platforms and into the air heaters.
- 3.3.4 Supply equipment for extracting air heater packs like I-beams with wheeled support on one end, chain blocks etc for lifting and for moving the air heaters elements to different cells inside the air heaters.
- 3.3.5 Open the access doors and cut out a hole on each air heater on the rear (boiler side). Eskom scaffolding partner shall erect scaffolding working platforms and shall remove the lagging.
- 3.3.6 Install equipment for hoisting element packs to or from working platforms
- 3.3.7 Install equipment in the air heaters for removing and installing the air heater element packs.
- 3.3.8 Gouge out all the radial and rings 2 and 3 divisional U-channels on both cold and hot ends
- 3.3.9 Install equipment for replacement of air heater packs and safe working platforms in the air heaters
- 3.3.10 Gouge out all the existing pack bottom supports in preparation for removal of packs
- 3.3.11 Remove the air heater fire detection thermocouples on the cold ends
- 3.3.12 Remove (pull out) all air heater packs. Cover the cells from the air heater packs have been extracted with safe working platform
- 3.3.13 Inspect the radial and divisional plates with all packs removed. Identify all the deformed and erosion-damaged areas requiring repairs
- 3.3.14 Repair the identified defects on the radial and divisional plates.
- 3.3.15 Hoist down the old air heater packs to 0m level and put them the scrap bins or transport to designated area.
- 3.3.16 Install new U-brackets bottom pack supports.
- 3.3.17 Transport a set of air heater packs from the storage area to hoist area for each unit
- 3.3.18 Hoist this set of air heater packs from 0m level to air heaters area (33m level) for each unit.
- 3.3.19 Install new cold end air heater element packs and install the spacer boxes on top the cold end elements in all the cells.
- 3.3.20 Install the intermediate and hot end element packs in all the cells.
- 3.3.21 Install U-channels on both cold and hot ends on the radial and ring 2 and 3 divisional plates making sure that they are at the same level with the hubs and stator flanges and weld.

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- 3.3.22 Grind the air heater U-channel welds ensuring that there are no raised points that can cause excessive rubbing between the stator and the cast iron wear shoes.
- 3.3.23 Remove the pack replacement equipment from the air heaters and the hoists for taking the packs up to and down from the working platforms.
- 3.3.24 Carry out seal setting on both cold and hot ends and lock the spring pin nuts with nut gaps as per data sheet.
- 3.3.25 Close the access doors and close the openings that had been cut out for the replacement of air heater packs
- 3.3.26 Test run the air heaters; note and record the drive motor currents.

3.4 General

- 3.4.1 Eskom, through another service provider, will erect the required scaffolding platforms and also remove cladding when required for this scope of work.
- 3.4.2 Eskom will arrange for collection of old element packs under the scrap metal contract as and when required from the metal bins or from the designated area.

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Appendix A – Costing sheet

No.	Ring	Material Numbers	Description	Total Quantity	Price per Unit	Total Price
1	1	0590952	Hot end	378		
2	2	0590947	Hot end	378		
3	3	0590950	Hot end	378		
4	4	0590896	Hot end	378		
5	5	0590895	Hot end	378		
6	6	0590898	Hot end	378		
7	7	0590955	Hot end	378		
8	1	0590904	Intermediate	378		
9	2	0590903	Intermediate	378		
10	3	0590900	Intermediate	378		
11	4	0590905	Intermediate	378		
12	5	0590894	Intermediate	378		
13	6	0590946	Intermediate	378		
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15	1	0590953	Cold end	378		
16	2	0590951	Cold end	378		
17	3	0590892	Cold end	378		
18	4	0590897	Cold end	378		
19	5	0590893	Cold end	378		
20	6	0590948	Cold end	378		
21	7	0590954	Cold end	378		
22			Spacer box ring 1	378		
23			Spacer box ring 2	378		
24			Spacer box ring 3	378		
25			Spacer box ring 4	378		
26			Spacer box ring 5	378		
27			Spacer box ring 6	378		
28			Spacer box ring 7	378		
29		0774092	U-brackets/ supports	10 584		

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30		0737609	U-channels (6m length)	1 080		
31		0775110 & 0775111	Safe working platform	1		
32			Transportation of element packs			
33			Transportation of spacer boxes			
34			Transportation of safe working			
35	Services for removal & installation of packs including pack replacement equipment and equipment for transporting element packs for storage area			3		
	Total costs					

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Appendix B Document Hierarchy N/A

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