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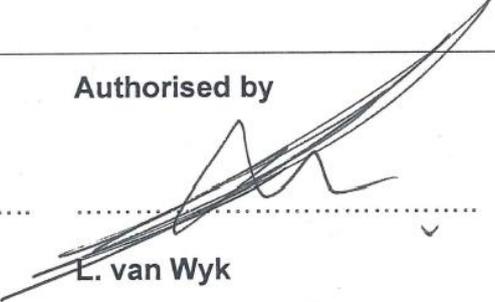
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Compiled by	Functional Responsibility	Authorised by
		
<b>H.W. van Riel</b> Senior Air Quality Control Engineer	<b>E.M. Patel</b> Senior Consultant: Air Pollution Control	<b>L. van Wyk</b> Boiler Auxiliary Manager (Acting)
Date: <u>02/06/2017</u>	Date: <u>02/06/2017</u>	Date: <u>02/06/2017</u>

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## 1. INTRODUCTION

The filter bag specification for Medupi Power Station has changed from polyacrylonitrile (PAN) material to polyphenylene sulphide (PPS) material. This document provides the specification for the material and bag needed for Medupi Power Station.

## 2. SUPPORTING CLAUSES

### 2.1 SCOPE

The document describes the bag construction and material requirements for Medupi Power Station.

#### 2.1.1 Purpose

The purpose of the document is to provide a clear specification to the contractor of how the filter bag should be constructed.

#### 2.1.2 Applicability

This document applies to Group Generation

### 2.2 NORMATIVE/INFORMATIVE REFERENCES

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

#### 2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] 240-53113965 FFP bag Standard

#### 2.2.2 Informative

None

### 2.3 DEFINITIONS

Definition	Description
Dtex	<b>Decitex</b> is the count grading for filament and spinning yarns recognized by all international bodies in the man-made fibres industry. Decimal multiple. Mass in kilograms per 1000 meters length. Kilotex [ktex] 1 kg / 1000 m = 1000 tex)

#### 2.3.1 Disclosure Classification

**Confidential:** the classification given to information that may be used by malicious/opposing/hostile elements to **harm** the objectives and functions of Eskom Holdings Limited.

### 2.4 ABBREVIATIONS

Abbreviation	Description
Dtex	Decitex
FFP	Fabric Filter Plant
mm	millimetre
OEM	Original Equipment Manufacturer

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Abbreviation	Description
PI	Polyimide
PPS	Polyphenylene Sulphide
RT&D	Research Testing and Development
PAN	Polyacrylonitrile

**2.5 ROLES AND RESPONSIBILITIES**

N/A

**2.6 PROCESS FOR MONITORING**

N/A

**2.7 RELATED/SUPPORTING DOCUMENTS**

N/A

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### 3. SPECIFICATION

#### 3.1 MATERIAL SELECTION

The Contractor is to provide material compliant to the specification below.

It should be noted that 19 800 (24 cells with 6 cells spare) bags should be procured according to the standards in section 3.1.1 and 2 800 bags (4 cells with 150 bags spare) should be procured according to section 3.1.2.

The 2 800 bags should be installed in Cells 11, 31, 21, and 41 for future long term analysis and bag life extension investigations.

#### 3.1.1 PPS bag standard for the 19 800 bags:

##### 3.1.1.1 Needle Felt Standard and Cloth Construction

Fabric construction:	Scrim supported needle felt
Fibre chemical name:	Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene
Weight:	580 – 620 g/m <sup>2</sup> range, 600 g/m <sup>2</sup> average
Fabric thickness:	Minimum 1.8 mm
Sides needled	Both
Sewing Thread	Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene
Snap band	Riveted/Welded Stainless Spring Steel (Diameter to fit tube plate)
Cuff Seal	Endless Rontex Ring (PPS) – Procon, Torcon or Nexylene
Cuff Material	Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene
Foot/Sock Material	Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene

##### 3.1.1.2 Scrim

Construction:	The scrim will be woven from Polyphenylene sulphide (PPS) yarns.
Material:	Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene
Yarn type:	Spun staple yarn and/or multifilament
Weight:	175 -185 g/m <sup>2</sup> before needling (Loom State)
Fibre Dimension:	2.2 dtex

##### 3.1.1.3 Batt – Cascade Construction

###### 3.1.1.3.1 Surface Layer (First Surface Layer – Dust Side)

*Construction: The surface layer will be a blend of the following fibre materials*

Material 1:	Polyphenylene sulphide
Fibre dimension:	1.7 dtex trilobal
Weight:	0 g/m <sup>2</sup> (Before Needling)
Material 2:	Polyphenylene sulphide (PPS) – Procon
Fibre dimension:	1.7 dtex trilobal
Weight:	100 - 110 g/m <sup>2</sup> (Before Needling)

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**3.1.1.3.2 Support Layer (Second Inner Layer – Dust Side)**

Material: Polyphenylene Sulphide (PPS) – Procon, Torcon or Nexylene  
 Fibre dimensions: 2.2 dtex  
 Weight: 125 – 135 g/m<sup>2</sup> (Before Needling)

**3.1.1.3.3 Support Batt (Inner Layer – Clean Side)**

Material: Polyphenylene Sulphide (PPS) – Procon, Torcon or Nexylene  
 Fibre dimension: 2.2 dtex  
 Weight: 190 - 200 g/m<sup>2</sup> (Before Needling)

**3.1.1.4 Cloth Construction**

Fabric Construction: Scrim supported needle felt  
 Weight: 580 – 620 g/m<sup>2</sup> range, 600 g/m<sup>2</sup> average  
 Number of sides needed: Both sides

**3.1.1.5 Fabric Special Treatments**

Coatings: None  
 Heat Set: Yes, as Required by Supplier  
 Singeing: Yes, as Required by Supplier  
 Calendaring: Yes, as Required by Supplier

**3.1.1.6 Fabric Properties**

Air permeability: 7.6 – 10 m<sup>3</sup>/m<sup>2</sup>/minute @ 125 Pa  
 Elongation: Warp: max. 6% @ 50 N/cm  
 Weft: max. 8 % @ 50 N/cm  
 Bursting strength: min. 2800 kPa  
 Dimensional stability: (Free shrinkage at 180 °C  
 Dry heat for 24hrs) Warp: max. 1.5%  
 Weft: max. 1.5%  
 Tensile strength: Warp: min. 9 00 N/50mm  
 Weft: min. 1 200 N/50mm

**3.1.2 PPS/PI specification for the 2 800 bags****3.1.2.1 Needle Felt Standard and Cloth Construction**

Fabric construction: Scrim supported needle felt  
 Fibre chemical name: Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene  
 Weight: 580 – 620 g/m<sup>2</sup> range, 600 g/m<sup>2</sup> average  
 Fabric thickness: Minimum 1.8 mm  
 Sides needed: Both  
 Sewing Thread: Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene  
 Snap band: Riveted/Welded Stainless Spring Steel (Diameter to fit tube plate)  
 Cuff Seal: Endless Rontex Ring (PPS) – Procon, Torcon or Nexylene  
 Cuff Material: Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene  
 Foot/Sock Material: Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene

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**3.1.2.2 Scrim**

Construction:	The scrim will be woven from Polyphenylene sulphide (PPS) yarns.
Material:	Polyphenylene sulphide (PPS) – Procon, Torcon or Nexylene
Yarn type:	Spun staple yarn and/or multifilament
Weight:	175 -185 g/m <sup>2</sup> before needling (Loom State)
Fibre Dimension:	2.2 dtex

**3.1.2.3 Batt – Cascade Construction****3.1.2.3.1 Surface Layer (First Surface Layer – Dust Side)**

*Construction: The surface layer will be a blend of the following fibre materials and to be needled as a distinct surface layer.*

Material 1:	Polyimide (P84)
Fibre dimension:	1.7 dtex Multi-lobal
Weight:	45 - 55 g/m <sup>2</sup> (Before Needling)
Material 2:	Polyphenylene sulphide (PPS) – Procon
Fibre dimension:	1.7 dtex trilobal
Weight:	45 - 55 g/m <sup>2</sup> (Before Needling)

**3.1.2.3.2 Support Layer (Second Inner Layer – Dust Side)**

Material:	Polyphenylene Sulphide (PPS) – Procon, Torcon or Nexylene
Fibre dimensions:	2.2 dtex
Weight:	125 – 135 g/m <sup>2</sup> (Before Needling)

**3.1.2.3.3 Support Batt (Inner Layer – Clean Side)**

Material:	Polyphenylene Sulphide (PPS) – Procon, Torcon or Nexylene
Fibre dimension:	2.2 dtex
Weight:	190 - 200 g/m <sup>2</sup> (Before Needling)

**3.1.2.4 Cloth Construction**

Fabric Construction:	Scrim supported needle felt
Weight:	580 – 620 g/m <sup>2</sup> range, 600 g/m <sup>2</sup> average
Number of sides needed:	Both sides

**3.1.2.5 Fabric Special Treatments**

Coatings:	None
Heat Set:	Yes, as Required by Supplier
Singeing:	Yes, as Required by Supplier
Calendaring:	Yes, as Required by Supplier

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### 3.1.2.6 Fabric Properties

Air permeability:	7.6 – 10 m <sup>3</sup> /m <sup>2</sup> /minute @ 125 Pa
Elongation:	Warp: max. 6% @ 50 N/cm Weft: max. 8 % @ 50 N/cm
Bursting strength:	min. 2800 kPa
Dimensional stability: (Free shrinkage at 180 °C Dry heat for 24hrs)	Warp: max. 1.5% Weft: max. 1.5%
Tensile strength:	Warp: min. 9 00 N/50mm Weft: min. 1 200 N/50mm

### 3.2 ADDITIONAL REQUIREMENTS ON THE BAGS

- i. The Contractor manufactures the bag according to the details shown on the latest drawings from the Eskom.
- ii. The double circular base and the 100 mm wide reinforcing strip will be off 100% PPS.
- iii. The Filter Bag detail comprises of a 8280 mm x 160 mm diameter bag with one end open with Stainless Steel snap band covered with a felt strip sewn into a woven false hem with 4 rows of stitching to fit cell plate 167 mm diameter x 5 mm thick (exact sizes according to drawing 0.84/42161). The other end is closed with double circular base with exterior base the filter fabric and the interior base 100% PPS plus 100 mm wide reinforcing strip also from 100% PPS treated side outside.
- iv. The snap band should be stainless steel and the joint is to be riveted/welded.
- v. The longitudinal seam of the bag shall be triple stitched. Thermo-welded longitudinal seams may be considered, but needs to be discussed with the Employer.
- vi. The sewing thread will be PPS (Procon, Torcon or Nexylene).
- vii. The stitching thread will be 100% PPS (Procon, Torcon or Nexylene).
- viii. It is the Supplier's responsibility to ensure that the bags fit correctly into the tube plate and cages.
- ix. Before bag manufacturing will commence the Supplier will provide a sample bag to the Purchaser for his evaluation and acceptance according to section 3.4.1.
- x. No manufacturing of bags will commence prior to an Eskom representative receiving, analysing and releasing the fabric following fabric tests done by the Purchaser's RT&D department.

### 3.3 TOLERANCES

The tolerances of Eskom and the bag supplier shall be adhered to at all times. The following is supplementary requirements which shall apply unless the manufacturer's and Eskom's requirements are more conservative. All dimensions shall be recorded by showing the actual value measured.

- i. The bottom of the tubesheet to the inside bottom of the bag shall be within

$$(\pm 1.5xL)mm$$

Where L is the length of bag in meters. The value obtained shall not exceed  $\pm 12$ mm. Bag length to be measured with a 50N load applied.

- ii. The flat width of the bag shall be held to  $\pm 3$ mm measured at three points along the bag.

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- iii. Pinch test – this measurement is taken by placing the bag onto the sample cage and taking the measurement at the cage rings. The pinch tolerance is  $\pm 3\text{mm}$ . The pinch is measured for the 1st and 50th bag with control monitored by the flat width dimension.
- iv. Bag to tubesheet fit – The bag to tubesheet fit is checked by trail fit of the bag to the tubesheet standard 1 and standard 2. Proper fit must be achieved to both standards. Standard 1 refers to a tubesheet test plate equal to the tubesheet thickness with a hole size equal to the nominal tubesheet hole plus the maximum hole tolerance as specified by the OEM. Standard 2 refers to a tubesheet test plate equal to the tubesheet thickness with a hole size equal to the nominal tubesheet hole minus the maximum tolerance of the hole.
- v. Bag seam straightness (with a maximum 13mm deviation) with a 50N load applied.

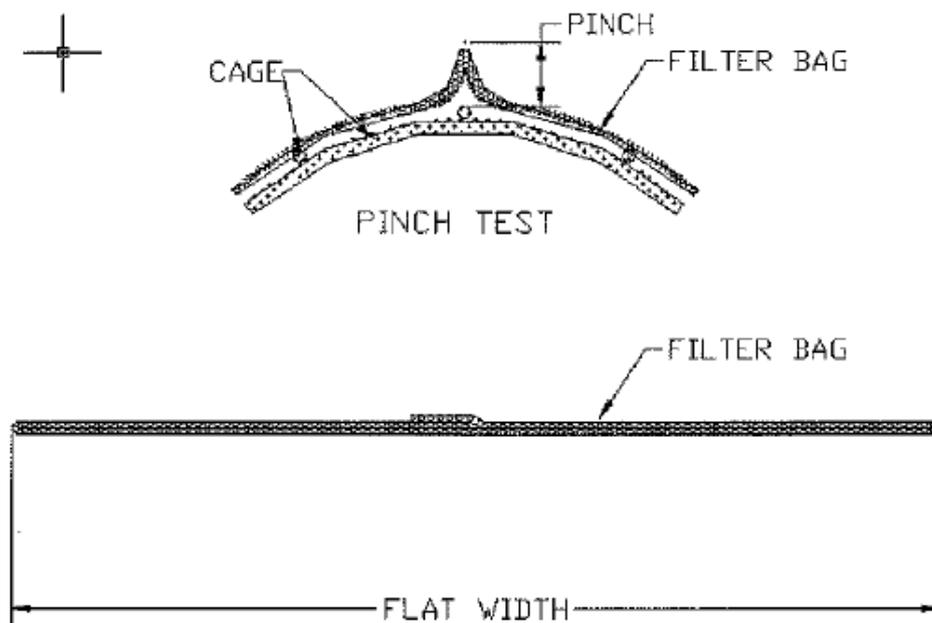


Figure 1: Filter Bag Details

### 3.4 TESTING AND INSPECTION REQUIREMENTS AND SAMPLE BAG MATERIALS

#### 3.4.1 Sample Bag Material

Eskom requires 1 (one) square meter (minimum) of sample fabric for every 10 000 m<sup>2</sup> of fabric produced. The certificates detailing full test results carried out on the fabric and scrim to determine compliance with the standard should be included with the fabric sample.

Furthermore, Eskom requires an additional 4 square meters of fabric plus 2 square meters of the raw scrim per unit that will be removed during the bag manufacturing process for compliance evaluation (at random and at discretion). The provision and cost of this additional fabric must be included in the scope of supply in any contract.

Fabric that does not conform to the standard will need to be rejected and new material that conforms to the standard will need to be produced.

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### **3.4.2 Bag Testing Requirements**

#### **3.4.2.1 Raw Materials**

Certificates of compliance, source of material and periodic batch tests of all components and raw materials will need to accompany material at all stages.

#### **3.4.2.2 Fabric Manufacture**

The following items will need to be verified according to the required limits as per section 3.1 and 3.2 depending on the bag material standard.

- Weight
- Thickness
- Air permeability
- Breaking Strength
- Percentage elongation at 50 N/cm and at break (warp and weft directions)
- P84 content (if part of bag material)
- Dimensional Stability
- Microscopic analysis confirming cascade fabric construction.

#### **3.4.2.3 Bag Manufacture**

The length of the bag, flat width and compliance to bag drawing needs to be verified under a 50N load.

### **3.4.3 Labelling and Packaging of bags**

Labels that identifies each bag with a colour and/or shape coded tag showing the batch and bag number sewn into the top outer cuff such that it may be linked to all relevant information including the name of any manufacturing supplier needs to be attached to newly manufactured bags. No repeatability of tags and numbers will be allowed.

The packaging needs to be clearly marked with the fabric type and order number. Any other relevant information pertaining to the particular shipment should also be marked. Each package contains approximately 10 to 15 bags to facilitate manual handling by one person.

All bags in each package needs to be packed in sealed non-transparent plastic bags. The packaging must clearly differentiate between routine spares bags and the complete spare unit bags.

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#### 4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Hendrik van Riel	Air Quality Engineer
Leon van Wyk	Air Quality Manager (Acting)
Robbie van Rensburg	Corporate Consultant: Fabric Filter Plants
Ebrahim Patel	Senior Consultant: Air Pollution Control
Hendre Grobbelaar	Senior Consultant: Air Pollution Control

#### 5. REVISIONS

Date	Rev.	Compiler	Remarks
April 2016	0.1	HW van Riel	Filter bag specification first Draft for Review
April 2016	1	HW van Riel	Final Document for Authorisation and Publication
May 2017	1.1	HW van Riel	Bag specification changed, first Draft for Review
May 2017	2	HW van Riel	Final Rev 2 Document for Authorisation and Publication

#### 6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- Leon van Wyk
- Hendrik van Riel

#### 7. ACKNOWLEDGEMENTS

- Ebrahim Patel

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