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Compiled by

E.M. Patel

Senior Consultant: Air  
Pollution Control

Date: 05/02/2016

Approved by

Y. Singh

SCOT: AQC SC Chairperson

Date: 08/02/2016

Authorised by

D. Odendaal

General Manager: Plant  
Engineering

Date: 12/02/2016

Supported by TDAC

Dr. T. Mathe

SCOT: Power Plant TC  
Chairperson

Date: 18/02/2016

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SCOT Study Committee Number/Name: **SC03-01: Air Quality Control**

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## **1. INTRODUCTION**

Eskom utilizes fabric material to curb particulate emissions. There are several different types of material currently available. Eskom has completed extensive research in order to understand fabric filter media within the current operating environment

This standard is developed to ensure that a standard minimum standard is used for the procurement of routine replacement bags for the respective power stations.

## **2. SUPPORTING CLAUSES**

### **2.1 SCOPE**

This document covers the minimum standard requirements for the purchase of replacement fabric filter plant bags and serves to provide a consistent technical approach to the supply and delivery of fabric filter bags to all applicable Eskom Operating Units. Information regarding PPS and PAN materials as well as sample material requirements and plant guarantee requirements is contained herein.

#### **2.1.1 Purpose**

None

#### **2.1.2 Applicability**

This document shall apply to the following Power Stations which have fabric filter plants installed:

- Arnot Power Station
- Camden Power Station
- Duvha Power Station (Units 1-3)
- Grootvlei Power Station
- Hendrina Power Station
- Majuba Power Station
- Medupi Power Station
- Kusile Power Station
- Tutuka Power Station
- Kriel Power Station
- Generic standards for power stations to be retrofitted with fabric filter plants are included herein. These could however change during the design of the fabric filter plants following finalisation of their process conditions and plant designs.

This document applies to all bags utilised at the above mention power stations, be it spares or routine bags.

### **2.2 NORMATIVE/INFORMATIVE REFERENCES**

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

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## 2.2.1 Normative

- [1] 240-56242363 – Eskom Standard for Emissions Monitoring and Reporting.
- [2] 240-56244749 – Fabric Filter Plant Operational Procedure.
- [3] GBEG 474-011 – Technical Evaluation Guideline.
- [4] ISO 9001 – Quality Management System.
- [5] SABS ISO 14001, Framework of control to ensure that all SHE risks are considered along an auditable tract to ensure a successful outcome and continuous improvement.
- [6] 32-391 - Eskom Integrated Risk Management Procedure.
- [7] 39-7 - Reporting, Recording, Investigating, Costing and the Follow-up of SHE Incidents / Accidents.
- [8] 62P4004 – Eskom Fabric Tearing Strength Standard
- [9] 62P4002 – Eskom Fabric Air Permeability Standard
- [10] 62P4003 – Eskom Fabric Bursting Strength Standard
- [11] 62P4005 – Eskom Fabric Breaking Strength Standard
- [12] 209-4141 - Determination of Fabric Mass, Ash mass and Cleanability of fabric filter bags
- [13] 209-4143 - pH Determination of aqueous extract from fabric filter bags
- [14] 209-4144 - Determination of dimensional change in fabric filter bags
- [15] 209-4145 - Solubility of Polyimide(P84) in Polyacrylonitrile (PAN)
- [16] 209-4146 - Solubility of Polyimide(P84) in Polyphenylene Sulfide (PPS)
- [17] 209-4147 - Determination of the maximum force of fabric filter bags using the grab method
- [18] 209-4142 - Determination of Permeability of fabric filter bags to air
- [19] QM-58 Supplier Contract Quality Requirements Standard
- [20] EN ISO 9073-2 – Methods of testing nonwovens: Determinations of thickness
- [21] 209-449 - Data Interpretation from the Textile Laboratory

## 2.2.2 Informative

- [22] EN 29073 – Methods of testing nonwovens: Determination of tensile strength and elongation
- [23] EN ISO 9237 – Textiles: Determination of air permeability
- [24] DIN 53887 – Frazier Differential Pressure air permeability tester
- [25] DIN 53861 – Testing of Textiles; Vaulting test and bursting test
- [26] UNI 8279/12 – Methods of testing nonwovens: Determination of dimensional change by heat
- [27] EN 12127 – Textiles and fabrics. Determination of Mass per unit area using small samples

## 2.3 DEFINITIONS

Definition	Description
Warp	Machine direction (MD)
Weft	Cross-machine direction or cross-direction (CD)

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### 2.3.1 Classification

**Controlled Disclosure:** Controlled Disclosure to External Parties (either enforced by law, or discretionary).

### 2.4 ABBREVIATIONS

Abbreviation	Description
°C	Degrees Celsius
dtex	Decitex
FFP	Fabric Filter Plant
g/m <sup>2</sup>	Gram per square meter
g/Nm <sup>3</sup>	Gram per normal cubic meter (normalised to 6% O <sub>2</sub> on a dry basis at 101.325 kPa & 0 °C)
K	Kelvin
kPa	Kilo Pascal
m <sup>3</sup> /m <sup>2</sup> /minute	Cubic meter per square meter per minute
Max	Maximum
MCR	Maximum Continuous Rating
mg/Nm <sup>3</sup>	Milligram per normal cubic meter (normalised to 6% O <sub>2</sub> on a dry basis at 101.325 kPa & 0 °C)
Min	Minimum
mm	Millimeter
N/cm	Newton per centimetre
Nm <sup>3</sup>	Normal cubic meter (normalised to 6% O <sub>2</sub> on a dry basis at 101.325 kPa & 0 °C)
O <sub>2</sub>	Oxygen
Pa	Pascal
PAN	Polyacrylonitrile
PI	Polyimide (P84 ®)
PPS	Polyphenylene sulfide

### 2.5 ROLES AND RESPONSIBILITIES

It is the responsibility of the system engineer to ensure that the standard contained here-in are included in any purchase for filter bags at their respective stations.

### 2.6 PROCESS FOR MONITORING

It is the System Engineers responsibility to ensure that all fabric intended for use are sampled and issued to the Eskom RT&D laboratory for analysis.

**Step 1:** Order Placed and data sheet signed off

**Step 2:** Suppliers/ Laboratory Results received

**Step 3:** Fabric and Scrim Sample received (with transmittal sheet)

**Step 4:** Sample sent to RT&D for analysis

**Step 5:** RT&D analysis report received

**Step 6:** Supplier given feedback on sample analysis.

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## 2.7 RELATED/SUPPORTING DOCUMENTS

None

## 3. FABRIC FILTER PLANT BAG STANDARD

The objectives for this document include:

- Providing a consistent technical approach to the supply and delivery of fabric filter bags to the stations in line with the terms and conditions of applicable contract.
- Ensuring that Eskom accepts and receives the right quality filter bags which are reliable, efficient and operating throughout their intended life expectancy.
- Sustaining and improving the efficient operation of its power station's emission performance.
- Ensuring the application, implementation and development of appropriate filter bag design, manufacturing and testing techniques.
- Developing performance standards which support the Eskom's reliability and optimised availability targets.
- The supplier shall provide adequate resources and engineering capability to support Eskom's objectives.

### 3.1 POWER STATION UNIT BAG NUMBERS

Station	Unit No.	Installed No. of Bags	Recommended Min. No. of Bags to be Ordered (per full replacement set)
Arnot	1	13 584	13 650
	2	13 584	13 650
	3	13 584	13 650
	4	10 934	11 000
	5	10 934	11 000
	6	10 934	11 000
Camden	1	9 616	9 650
	2	9 616	9 650
	3	9 616	9 650
	4	9 616	9 650
	5	9 616	9 650
	6	9 616	9 650
	7	9 616	9 650
	8	9 616	9 650
Duvha <sup>*1</sup>	1	26 928	26 980
	2	26 928	26 980
	3	26 928	26 980

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Station	Unit No.	Installed No. of Bags	Recommended Min. No. of Bags to be Ordered (per full replacement set)
Grootvlei <sup>*2</sup>	1	8 832	8 880
	2	9 744	9 800
	3	9 744	9 800
	4	9 744	9 800
	5	8 832	8 880
	6	8 832	8 880
Hendrina	1	8 074	8 100
	2	8 832	8 900
	3	8 832	8 900
	4	8 832	8 900
	5	8 832	8 900
	6	7 984	8 050
	7	7 984	8 050
	8	7 984	8 050
	9	7 984	8 050
	10	7 984	8 050
Majuba	1	30 976	31 000
	2	30 976	31 000
	3	30 976	31 000
	4	32 512	32 550
	5	32 512	32 550
	6	32 512	32 550
Medupi	6	18 480	18 525
	5	18 480	18 525
	4	18 480	18 525
	3	18 480	18 525
	2	18 480	18 525
	1	18 480	18 525
Kusile	1	18 480	18 525
	2	18 480	18 525
	3	18 480	18 525
	4	18 480	18 525
	5	18 480	18 525
	6	18 480	18 525

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Station	Unit No.	Installed No. of Bags	Recommended Min. No. of Bags to be Ordered (per full replacement set)
Tutuka <sup>*3</sup>	1	20 160	20 250
	2	20 160	20 250
	3	20 160	20 250
	4	20 160	20 250
	5	20 160	20 250
	6	20 160	20 250
Kriel <sup>*4</sup>	1	19 800	19 850
	2	19 800	19 850
	3	19 800	19 850
	4	19 800	19 850
	5	19 800	19 850
	6	19 800	19 850

Notes:

\*1 – As per the strategic report, Duvha will revert back to using the original number of bags to make sure that Duvha gets the maximum gas-to-cloth ratio. This is on-line with current best practise and also ensures sufficient margin against deteriorating coal and process conditions. It also assists in minimising the load losses incurred during on-load compartment outages.

\*2 – Grootvlei 2 to 4 FFP retrofits expected to be completed in 2016/17.

\*3 – Tutuka FFP retrofits expected to be completed between 2018 and 2024

\*4 – Kriel FFP retrofits expected to be completed between 2019 and 2025

### 3.2 DOCUMENT CONTROL

The Supplier carries out complete inspection at all stages of fabric and bag manufacture. The Supplier repairs defects revealed during the routine quality control checks, provided the Supplier demonstrates to the Purchaser's Representative satisfaction that such repairs do not, in any way, lessen the service life and performance of the material. The Purchaser's Representative may carry out a random inspection of the fabric and bags during manufacture. As a minimum every 50<sup>th</sup> bag must be checked thoroughly using the developed bag inspection sheet during the manufacturing and records to be kept by the supplier and included in the data books.

The Supplier submits QA data sheets including test data. The data sheets must include, as a minimum, the results for measurements of the following parameters:

**Raw Materials:** Certificates of compliance and source of material and periodic batch tests of all components and raw materials.

**Fabric Manufacture:** Weight, Thickness, Air permeability, Breaking Strength and % elongation at 50 N/cm and at break (warp and weft directions), P84 content and the Dimensional Stability (free shrinkage at 150 °C (PAN) or 180 °C (PPS) over 24 hrs, warp and weft).

**Bag Manufacture:** Length (under 5 kg tension), flat width and general compliance to Eskom Drawings.

All certificates are to reflect the Eskom order number.

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### 3.3 QUALITY ASSURANCE REQUIREMENTS

The Supplier assures that they comply with the requirements contained within the ISO 9001/9002 quality system and the Eskom Supplier Quality Management Specification (QM-55) requirements.

The generic Quality Plan as well as a proposed Inspection and Test Plan in strict compliance with the product standard is to be submitted with the Tender.

The Quality Assurance (QA) data sheets for fabric are provided at least three (3) week before the bag manufacturing commences.

The QA data sheets for bag manufacture will be provided with the bag delivery.

The Purchaser will inspect the quality of the fabric according to the following Eskom Research and Strategy testing methods:

METHOD	ESKOM NUMBER	EQUIVALENT STANDARD
Tearing Strength	62P4004	EN 29073-3
Air Permeability	62P4002	EN ISO 9237 / DIN 53887
Bursting Strength	62P4003	DIN 53861
Breaking Strength	209-4147	EN 29073-3
Thermal Stability	209-4144	UNI 8279/12
P84 Content	209-4145/46	
Area Weight, Mass & Cleanability	209-4141	EN 12127
Thickness		EN ISO 9073-2
Micro analysis to determine the distinct cascaded layers of the cloth construction	To be advised	
pH Determination of aqueous extract from fabric filter bags	209-4143	
- Determination of Fabric Mass, Ash mass and Cleanability of fabric filter bags	209-4141	
- Determination of dimensional change in fabric filter bags	209-4144	
Solubility of Polyimide(P84) in Polyacrylonitrile (PAN) 2 (11 2013)	209-4145	
Determination of the maximum force of fabric filter bags using the grab method	209-4147	
Determination of Permeability of fabric filter bags to air	209-4142	
Solubility of Polyimide(P84) in Polyphenylene Sulfide (PPS)	209-4146	

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The Supplier can view and discuss these methods or other applicable testing methods prior to contract award in order to agree about their suitability with the Purchaser's Representative.

All raw materials (i.e. fibre, thread, snapbands, seals, etc.) must come with certificates of compliance.

The data books will also include the details of the tags and numbers with complete traceability to the fabric slit width roll number.

### **3.4 PROGRAM CONSTRAINTS**

The Supplier delivers all bags to site as per the required delivery schedule. The Supplier provides manufacturing and delivery schedules.

The Supplier submits to the Purchaser's Representative the Quality Management documentation as follows:

- Generic Quality Plan Included in Tender
- Proposed Inspection and Test Plan Included in Tender
- QA/QC procedure for approval Prior to manufacturing commencement
- QA data sheets for fabric manufacture for each batch one week before bag manufacturing starts
- QA data sheets for bags manufacture with bag delivery
- The Contractor compiles a Delivery Schedule in liaison with the Purchaser's Representative.
- The Contractor submits to the Purchaser's Representative the Delivery
- Schedule, Accepted Programme and subsequent revisions on hard copy, as well as a software copy. The software package is Microsoft compatible (e.g. MS Project etc.).

### **3.5 SUPPLIER'S MANAGEMENT, SUPERVISION AND KEY PEOPLE**

The Contractor is to provide names of key people responsible for this project as requested by the project manager.

### **3.6 PROVISION OF PERFORMANCE BONDS AND GUARANTEES**

The form in which a bond or guarantee is required by the conditions of contract (if any) is to be provided by the Contractor is given in the Contract Data. The purpose of this section is to ensure that technically the guarantees provided in whichever form covers the performance expectation of the filter media and bags.

The Employer may withhold payment of amounts due to the Contractor until the bond or guarantee required in terms of this contract has been received and accepted by the person notified to the Contractor by the Project Manager to receive and accept such bond or guarantee. Such withholding of payment due to the Contractor does not affect the Employer's right to termination stated in this contract.

#### **Performance Bonds (Minimum requirements)**

The amount of the performance bond is 5 (five) % of the Contract Value per Unit. The performance bond will be released as follows:

- 50 % will be released 104 weeks after sectional completion of the whole of the works.
- The remaining 50 % will be released at the end of the defects guarantee period.

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Routine Spare Bags (if applicable):

- 50 % will be released 52 weeks after sectional completion of the whole of the works.
- The remaining 50 % will be released at the end of the defects guarantee period.

Spare Unit Bags (if applicable):

- 50 % will be released 104 weeks after sectional completion of the whole of the works.
- The remaining 50 % will be released at the end of the defects guarantee period.

The Supplier will as part of the tender returnables, provide a written assurance from the Supplier's bank that the Performance Bond can and will be issued within 4 (four) weeks of Contract Award/Acceptance Letter Issued.

### Bag Life Guarantee

The guarantee period is expected from all suppliers:

- Arnot PPS bags: minimum of 32 000 operating hours for Units 1 to 3 and 28 000 for Units 4 to 6 operating hours after installation.
- Duvha PPS bags: minimum of 36 000 operating hours after installation.
- Camden PPS bags: minimum of 30 000 operating hours after installation.
- Grootvlei PPS bags: minimum of 32 000 operating hours after installation.
- Hendrina PPS bags: minimum of 38 000 operating hours after installation.
- Hendrina PAN bags: minimum of 34 000 operating hours after installation.
- Majuba PAN bags: minimum of 25 000 two-shifting operating hours after installation and/or a minimum of 32 000 base-load/load-following operating hours.
- Medupi PAN bags: minimum of 30 000 operating hours after installation.
- Kusile PAN bags: minimum of 30 000 operating hours after installation.
- Tutuka PPS bags: minimum of 36 000 operating hours after installation.
- Kriel PPS bags: minimum of 34 000 operating hours after installation.
- All guarantee limitations are to be specifically stated in the tender submission. If viewed as unreasonable by the Purchaser, these submissions will not be considered.
- The Purchaser will factor limitations of guarantee into the life cycle evaluation of each offer.

Note that the PPS and PAN referred to above, is for the predominant base fibre used in the material which could or could not be blended with other fibre types, such as PTFE and/or P84®.

## **3.7 MATERIAL AND BAG STANDARD**

### **3.7.1 Parts of the works that the supplier is to design**

3.7.1.1 The Contractor provides fabric filter bags in accordance with the Product Information, including the design and manufacturing of the fabric and the filter bags to suit the process standards and the installation onto the existing bag cages and tube plate.

3.7.1.2 The Contractor will ensure the following minimum local representation in the manufacturing of the bags:

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- Tubing and cutting to size of the fabric.
- Manufacturing of the cuff and sock components.
- Assembly of the completed bag.

### **3.8 APPROVED SUPPLIERS**

#### **3.8.1 Fibre suppliers**

The following products, components and suppliers are approved by Eskom. No other substitutes will be accepted and Eskom requires written assurance as such.

Products:

- Polyphenylene sulfide (PPS) – Trade Names: Procon, Torcon or Nexylene,
- Polyimide (PI) – Trade Name: P84
- Polyacrylonitrile (PAN) – Trade Names: Dolanit or AKSA-AT200

The following products are currently being evaluated for acceptance by Eskom:

- Didom fibres
- Huvis fibres
- Ruitai fibres
- PSA fibres
- Yilun fibres
- Modacrylic

#### **3.8.2 Suppliers for Fabric Productions**

The following suppliers have been approved by Eskom for fabric productions (including the sourcing of component materials):

- Albany International's Gosford Plant
- Andrew Webron's Lancs Plant
- Beier Envirotec's Pinetown Plant
- BWF's Offingen Plant
- Gutsche's Fulda Plant
- Heimbach's Duren Plant
- Testori's Milan Plant
- Kayser's Einbeck Plant
- Filtafelt's Rosslyn Plant
- Valmet's Ovar Plant

The following fabric suppliers are currently being evaluated for acceptance by Eskom:

- CSIR/ECDC Facility in Eastern Cape

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### 3.8.3 Local Bag Manufacturers

The following suppliers have been approved by Eskom to manufacture bags within the borders of South Africa:

- Beier Envirotec's Pinetown Plant
- GI Filtration's Centurion Plant
- Clear Edge's Robertsham Plant
- Environmental Dynamic's Nigel Plant
- Filter Pure's Kya Sand Plant (limited for production capability)

The following bag supplier is currently being evaluated for acceptance by Eskom:

- ECDC Facility in Eastern Cape

FFP Original Equipment Manufacturers (OEMs) such as Howden Projects, Actom, Alstom, DB Thermal/Balcke-Durr/SPX, Hamon, Bateman, Steinmuller, etc. will be allowed to participate in a competitive tender process as long as the requirements contained in this document are adhered to.

### 3.8.4 Selection of Suppliers

Eskom reserves the right to add and/or remove to the above list (3.8.1 to 3.8.3) solely at its discretion. No exception to Eskom's approved list will be accepted. An additional supplier to this list will require extensive testing to be undergone and after successful trial evaluation may be considered to be included.

### Technical Approval Process

Through Eskom's Research Centre and Supplier Assessment Departments (QA), a comprehensive testing and evaluation programme is followed to ensure that the products used are fit for purpose. The level of detail varies depending on which aspect of the supply value chain is being evaluated. The typical periods of assessments are described below:

**Table: Typical Technical Approval Process Timeframes**

Supply Chain Step	Assessment Description	Typical Assessment Durations
Resin manufacturing	Can the manufacturer produce resin that can be used for fibre extruded and withstand the required process conditions. This development is typically done between the resin and fibre suppliers.	18 to 24 months
Fibre extrusion	Can the resin be extruded for fibre and also spun into yarn. The fibre then undergoes extensive laboratory tests.	18 to 24 months
Yarn spinning	Same evaluation as fibre extrusion.	12 to 18 months
Non-woven needle felt manufacturing	Tests fabric in simulated flue gas conditions in the laboratory.	2 to 3 months
	Tests the fabric in actual plant environment for fatal flaws	6 to 12 months
	Test the fabric in actual plant environment for life cycle assessment	18 to 30 months
Filter bag manufacturing	Assessment capability of bag producer to produce bags to the required quality, volumes and consistency.	3 to 6 months
	Test the final bag in actual plant environment for fatal flaws.	3 to 6 months

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An updated list of approved suppliers can be obtained from the Purchaser's representative prior to an enquiry being issued.

### 3.9 STATION SPECIFIC REQUIREMENTS

#### 3.9.1 Camden Power Station

Continuous operating temperature range (FFP):	• 100 °C to 170 °C
Temperature control set point:	• 145 °C
Gas volume:	• Maximum 490 Am <sup>3</sup> / s
Gas volume:	• MCR 462 Am <sup>3</sup> / s
Flue gas oxygen content:	• 3% - 15%
Filtration velocity with one cell isolated:	• Maximum 0,022 m/s
Inlet dust concentration:	• 25 – 50 g/Nm <sup>3</sup>
Estimated number of starts per boiler:	• 50 per year
Mode of Operation:	• Load following and two shifting
Material Selection:	• PPS/PI
Exclusions from standard material standard:	• None
	•
Bag drawing number	• 25.15/36898
Bag length	• 8 meters
Bag diameter	• 127 mm equivalent (Howden Design)
Required operational hours (max number of bags failing during this period)	• 32 000 (3%)
Expected emission limits	• 30 mg/Nm <sup>3</sup>
Maximum emission limits	• 50 mg/Nm <sup>3</sup>
Maximum pressure drop	• 2.4 kPa (flange to flange @ MCR with one cell isolated)
<ul style="list-style-type: none"> <li>• The bag will conform to the requirements of the Hendrina bag drawing no. 25.15/36898 Revision latest.</li> <li>• The snap band joint is to be riveted.</li> <li>• The snap band seal will be an endless felt strip type.</li> <li>• The longitudinal seam of the bag shall be triple stitched.</li> <li>• The stitching thread will be compatible with PPS.</li> <li>• The stitching thread will be 100 % PPS (Procon, Torcon or Nexylene).</li> <li>• The cuff and base (foot/sock) material will be off 100% PPS (Procon, Torcon or Nexylene).</li> <li>• It is the <i>Supplier's</i> responsibility to ensure that the bags fit correctly into the tube plate and cages.</li> <li>• Before bag manufacturing will commence the <i>Supplier</i> will provide a sample bag to the <i>Purchaser</i> for his evaluation and acceptance.</li> <li>• No manufacturing of bags will commence prior to the Purchaser's representative receiving, analysing and releasing the fabric following fabric tests done by the Purchaser's RT&amp;D department.</li> </ul>	

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### 3.9.2 Hendrina Power Station

Continuous operating temperature:	• 100 °C to 150 °C
Temperature control set point:	• 125 °C (PAN units only)
Gas Volume at MCR:	• MCR 462 Am <sup>3</sup> / s
Filtration velocity (with all cells in services):	• Maximum 0,018 m/s
Filtration velocity (with one isolated):	• Maximum 0,021 m/s
Flue gas oxygen content:	• 3% - 8%
Inlet dust concentration:	• 25 – 50 g/Nm <sup>3</sup>
Estimate number of starts per boiler	• 30 per year
Mode of Operation	• Load following
Material Selection:	• PAN or PPS
Exclusions from standard material standard:	• No PI (First Surface layer – Dust Side): Material will not be blended with PI, only PAN or PPS.
Bag drawing number	• 25.15/36898
Bag length	• 8 meters
Bag diameter	• 127 mm equivalent (Howden Design)
Required operational hours (max number of bags failing during this period)	• 32 000 (3%)
Expected emission limits	• 30 mg/Nm <sup>3</sup>
Maximum emission limits	• 50 mg/Nm <sup>3</sup>
Maximum pressure drop	• 2.4 kPa (flange to flange @ MCR with one cell isolated)

#### Hendrina (PPS):

- The Filter Bag Style is of the Bateman Howden type.
- The *Supplier* manufactures the bag according to the details shown on the attached drawing no 25.15/36898.
- The snap band seal will be an endless felt strip type.
- The longitudinal seam of the bag shall be triple stitched.
- The cuff and base (foot/sock) material will be off 100% PPS (Procon, Torcon or Nexylene).
- The stitching thread will be 100 % PPS (Procon, Torcon or Nexylene).
- It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.
- Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
- No manufacturing of bags will commence prior to the Purchaser's representative receiving, analysing and releasing the fabric following fabric tests done by the Purchaser's RT&D department.

#### Hendrina (PAN):

- The Filter Bag Style is of the Bateman Howden type.
- The *Supplier* manufactures the bag according to the details shown on the attached drawing no 25.15/36898.
- The snap band seal will be an endless felt strip type.
- The longitudinal seam of the bag shall be triple stitched.

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- The cuff and base (foot/sock) material will be off 100% PAN (AKSA/Dolanit).
- The stitching thread will be 100 % PAN (AKSA/Dolanit).
- It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.
- Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
- No manufacturing of bags will commence prior to the *Purchaser's* representative receiving, analysing and releasing the fabric following fabric tests done by the *Purchaser's* RT&D department.

### 3.9.3 Majuba Power Station

- |                                                |                                     |
|------------------------------------------------|-------------------------------------|
| Continuous operating temperature range (FFP):  | • 100 °C to 150 °C                  |
| Temperature control set point:                 | • 125 °C                            |
| Gas volume:                                    | • Maximum 1 553 Am <sup>3</sup> / s |
| Flue gas oxygen content:                       | • 3% - 15%                          |
| Filtration velocity with one cell isolated:    | • Maximum 0,020 m/s                 |
| Filtration velocity with all cells in-service: | • Maximum 0,018 m/s                 |
| Inlet dust concentration:                      | • 25 – 50 g/Nm <sup>3</sup>         |
| Estimated number of starts per boiler          | • 150 per year                      |
| Mode of Operation                              | • Load following and two shifting   |
| Material Selection:                            | • PAN/PI                            |
| Exclusions from standard material standard:    | • None                              |
- 
- |                                                                            |                                                           |
|----------------------------------------------------------------------------|-----------------------------------------------------------|
| Bag drawing number                                                         | • 0.66/95371 (latest revision)                            |
| Bag length                                                                 | • 7 meters                                                |
| Bag diameter                                                               | • 127 mm equivalent (Howden Design)                       |
| Required operational hours (max number of bags failing during this period) | • 32 000 (5%)                                             |
| Expected emission limits                                                   | • 30 mg/Nm <sup>3</sup>                                   |
| Maximum emission limits                                                    | • 50 mg/Nm <sup>3</sup>                                   |
| Maximum pressure drop                                                      | • 2.3 kPa (flange to flange @ MCR with one cell isolated) |
- 
- The Filter Bag Style is of the Bateman Howden type.
  - The *Supplier* manufactures the bag according to the details shown on the attached drawing no 0.66/95371 sheet latest.
  - The snap band seal will be an endless felt strip type.
  - The longitudinal seam of the bag shall be triple stitched.
  - The cuff and base (foot/sock) material will be off 100% PAN (AKSA/Dolanit).
  - The stitching thread will be PAN (AKSA/Dolanit).
  - It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.
  - Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
  - No manufacturing of bags will commence prior to the *Purchaser's* representative receiving, analysing and releasing the fabric following fabric tests done by the *Purchaser's* RT&D department.

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### 3.9.4 Duvha Power Station

Continuous operating temperature range (FFP):	• 100 °C to 150 °C
Gas volume:	• Maximum 1 553 Am <sup>3</sup> /s
Flue gas oxygen content:	• 3% - 15%
Filtration velocity with one cell isolated:	• Maximum 0,020 m/s
Filtration velocity with all cells in-service:	• Maximum 0,018 m/s
Inlet dust concentration:	• 25 – 50 g/Nm <sup>3</sup>
Estimated number of starts per boiler	• 150 per year
Mode of Operation	• Base load
Material Selection:	• PPS/PI
Exclusions from standard material standard:	• None
Bag drawing number	• 0.57/48834 (latest revision)
Bag length	• 8 meters
Bag diameter	• 135 mm
Required operational hours (max number of bags failing during this period)	• 32 000 (3%)
Expected emission limits	• 30 mg/Nm <sup>3</sup>
Maximum emission limits	• 50 mg/Nm <sup>3</sup>
Maximum pressure drop	• 2.4 kPa (flange to flange @ MCR with one cell isolated)
<ul style="list-style-type: none"> <li>• The <i>Contractor</i> manufactures the bag according to the details shown on the attached drawing No 0.57/48834 Revision latest</li> <li>• The double circular base and the 100 mm wide reinforcing strip will be off 100% PPS (Procon, Torcon or Nexylene).</li> <li>• The Filter Bag comprises of one end open with Stainless Steel snap band covered with an endless felt strips sewn into a 100% PPS (Procon, Torcon or Nexylene) woven false hem with 4 rows of stitching to fit cell plate. The other end is closed with double circular base with exterior base the filter fabric and the interior base 100% PPS (Procon, Torcon or Nexylene) plus 100 mm wide reinforcing strip also from 100% PPS treated side outside.</li> <li>• The snap band joint is to be riveted.</li> <li>• The longitudinal seam of the bag shall be triple stitched.</li> <li>• The sewing thread will be 100% PPS (Procon, Torcon or Nexylene).</li> <li>• It is the <i>Supplier's</i> responsibility to ensure that the bags fit correctly into the tube plate and cages.</li> <li>• Before bag manufacturing will commence the <i>Supplier</i> will provide a sample bag to the <i>Purchaser</i> for his evaluation and acceptance.</li> <li>• No manufacturing of bags will commence prior to the Purchaser's representative receiving, analysing and releasing the fabric following fabric tests done by the Purchaser's RT&amp;D department.</li> </ul>	

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### 3.9.5 Grootvlei Power Station

Continuous operating temperature range (FFP):	• 100 °C to 150 °C
Gas volume:	• Maximum 550 Am <sup>3</sup> /s
Flue gas oxygen content:	• 3% - 15%
Filtration velocity with one cell isolated:	• Maximum 0.020 m/s
Filtration velocity with all cells in-service:	• Maximum 0.015 m/s
Inlet dust concentration:	• 25 – 50 g/Nm <sup>3</sup>
Estimated number of starts per boiler	• 150 per year
Mode of Operation	• Load following and two shifting
Material Selection:	• PPS/PI
Exclusions from standard material standard:	• None
Bag drawing number	• 0.19.46445 (latest revision)
Bag length	• 8 meters
Bag diameter	• 150 mm equivalent
Required operational hours (max number of bags failing during this period)	• 32 000 (3%)
Expected emission limits	• 30 mg/Nm <sup>3</sup>
Maximum emission limits	• 50 mg/Nm <sup>3</sup>
Maximum pressure drop	• 2.4 kPa (flange to flange @ MCR with one cell isolated)

- The *Contractor* manufactures the bag according to the details shown on the attached drawing No 0.19.46445 Rev (latest)
- The double circular base and the 100 mm wide reinforcing strip will be off 100% PPS.
- The Filter Bag detail comprises of a 8040 mm x 146 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 155 mm diameter x 5 mm thick. 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 with the treated side on the outside.
- The snap band joint is to be riveted.
- The longitudinal seam of the bag shall be triple stitched.
- The sewing thread will be compatible with PPS.
- The stitching thread will be 100% PPS (Procon, Torcon or Nexylene)
- It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.
- Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
- No manufacturing of bags will commence prior to the *Purchaser's* representative receiving, analysing and releasing the fabric following fabric tests done by the *Purchaser's* RT&D department.

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### 3.9.6 Arnot Power Station

#### Process standards

Continuous operating temperature range (FFP):	• 110 °C to 175 °C
Gas volume per unit:	• Maximum 975 Am <sup>3</sup> /s
Flue gas oxygen content:	• 3% - 15%
Estimated number of starts per boiler	• 150 per year
Mode of Operation	• Base load
Inlet dust concentration:	• 25 – 50 g/Nm <sup>3</sup>

#### Performance requirements

Filtration velocity with one cell isolated:	• Maximum 0,020 m/s
Filtration velocity with all cells in-service:	• Maximum 0,018 m/s
Material Selection:	• PPS/PI
Exclusions from standard material standard:	• None
Bag drawing number	• 26.41.38198 (latest revision)
Bag length	• 8 meters
Bag diameter	• 135 mm
Required operational hours (max number of bags failing during this period)	• 32 000 (3%)
Expected emission limits	• 30 mg/Nm <sup>3</sup>
Maximum emission limits	• 50 mg/Nm <sup>3</sup>
Maximum pressure drop	• 2.4 kPa (flange to flange @ MCR with one cell isolated)

- The *Contractor* manufactures the bag according to the details shown on the attached drawing No 26.41.38198 Rev (latest)
- The double circular base and the 100 mm wide reinforcing strip will be off 100% PPS.
- The Filter Bag detail comprises of a 8040 mm x 146 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 155 mm diameter x 5 mm thick. 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.
- The snap band joint is to be riveted.
- The longitudinal seam of the bag shall be triple stitched.
- The sewing thread will be compatible with PPS.
- The stitching thread will be 100% PPS (Procon, Torcon or Nexylene)
- It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.
- Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
- No manufacturing of bags will commence prior to the *Purchaser's* representative receiving, analysing and releasing the fabric following fabric tests done by the *Purchaser's* RT&D department.

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### 3.9.7 Medupi and Kusile Power Station

#### Process standards

Continuous operating temperature range (FFP):

Gas volume per unit:

Flue gas oxygen content:

Estimated number of starts per boiler

Mode of Operation

Inlet dust concentration:

- 110 °C to 145 °C, controlled at 125 °C
- Maximum 1 175 Am<sup>3</sup> /s (excl. Attemperation air)
- 3% - 15%
- 150 per year
- Base load
- 25 – 70 g/Nm<sup>3</sup>

#### Performance requirements

Filtration velocity with one cell isolated:

Filtration velocity with all cells in-service:

Material Selection:

Exclusions from standard material standard:

Bag drawing number

Bag length

Bag diameter

Required operational hours (max number of bags failing during this period)

Expected emission limits

Maximum emission limits

Maximum pressure drop

- 
- Maximum 0,020 m/s
- Maximum 0,016 m/s
- PAN/PI
- None
- 
- Z0088504 (latest revision)
- 8.24 meters
- 160 mm
- 30 000 (3%)
- 30 mg/Nm<sup>3</sup>
- 50 mg/Nm<sup>3</sup>
- 2.2 kPa (flange to flange @ MCR with one cell isolated)

- The *Contractor* manufactures the bag according to the details shown on the attached drawing No Z0088504 Rev (latest) and the cage drawing No. Z0101050 Rev (latest).
- The double circular base and the 100 mm wide reinforcing strip will be off 100% PPS.
- The Filter Bag detail comprises of a 8240 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. The other end is closed with double circular base with exterior base the filter fabric and the interior base 100% PAN plus 100 mm wide reinforcing strip also from 100% PAN treated side outside.
- The snap band joint is to be riveted.
- The longitudinal seam of the bag shall be triple stitched.
- The sewing thread will be compatible with PAN.
- The stitching thread will be 100% PPS (Procon, Torcon or Nexylene)
- It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.
- Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
- No manufacturing of bags will commence prior to the *Purchaser's* representative receiving, analysing and releasing the fabric following fabric tests done by the *Purchaser's* RT&D department.

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### 3.9.8 Tutuka Power Station

#### Process standards

Continuous operating temperature range (FFP):	• 110 °C to 175 °C
Gas volume per unit:	• Maximum 1 359 Am <sup>3</sup> /s
Flue gas oxygen content:	• 3% - 15%
Estimated number of starts per boiler	• 150 per year
Mode of Operation	• Base load
Inlet dust concentration:	• 25 – 50 g/Nm <sup>3</sup>

#### Performance requirements

Filtration velocity with one cell isolated:	• Maximum 0,016 m/s
Filtration velocity with all cells in-service:	• Maximum 0,015 m/s
Material Selection:	• PPS/PI
Exclusions from standard material standard:	• None
Bag drawing number	• To be confirmed (latest revision)
Bag length	• 10 meters
Bag diameter	• 150 mm
Required operational hours (max number of bags failing during this period)	• 36 000 (3%)
Expected emission limits	• 30 mg/Nm <sup>3</sup>
Maximum emission limits	• 50 mg/Nm <sup>3</sup>
Maximum pressure drop	• 2.4 kPa (flange to flange @ MCR with one cell isolated)

- The *Contractor* manufactures the bag according to the details shown on the attached drawing No (to be confirmed) Rev (latest).
- The top collar is constructed of material similar to that of the filter bag. The term “similar” means a material that has equal or greater strength and emission control capability of that of the bag material. A dual bead band is provided within the top collar for sealing the bag to the tubesheet.
- The snap band is stainless steel material joined by spot weld or stainless steel rivets.
- Each bag has dual bottom disks constructed of like material as that of the bag.
- The inside surface of the bags are singed to facilitate cage removal from the bag.
- The double circular base and the 100 mm wide reinforcing strip will be off 100% PPS.
- The Filter Bag detail comprises of a 10 000 mm x 150 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 155 mm diameter x 5 mm thick. 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.
- The snap band joint is to be riveted.
- The longitudinal seam of the bag shall be triple stitched.
- The sewing thread will be compatible with PPS.
- The stitching thread will be 100% PPS (Procon, Torcon or Nexylene) or PTFE. The sewing thread for use in bag construction is PTFE/PPS. The vertical seams should be triple needle type 401. The horizontal seams should be double needle type 301.
- It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.

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- Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
- No manufacturing of bags will commence prior to the Purchaser's representative receiving, analysing and releasing the fabric following fabric tests done by the Purchaser's RT&D department.
- Should welded seams be considered, the following will apply. Welded seams includes a tensile pull test per DIN or ASTM demonstrating a failure of no less than the acceptance value of the non-welded seam area. A minimum of one sample is tested for each contract. This test is conducted prior to seaming any material on the project. Use of welded seam is not permitted without prior written acceptance from the Employer of the results of the tests.

### 3.9.9 Kriel Power Station

#### Process standards

Continuous operating temperature range (FFP):

Gas volume per unit:

Flue gas oxygen content:

Estimated number of starts per boiler

Mode of Operation

Inlet dust concentration:

- 110 °C to 165 °C
- Units 1 – 3 Maximum 1024 Am<sup>3</sup>/s
- Units 4 – 6 Maximum 1054 Am<sup>3</sup>/s
- 3% - 15%
- 150 per year
- Base load
- 25 – 50 g/Nm<sup>3</sup>

#### Performance requirements

Filtration velocity with one cell isolated (Units 1-3):

Filtration velocity with all cells in service (Units1-3):

Filtration velocity with one cell isolated (Units 4-6):

Filtration velocity with all cells in service (Units4-6):

- Maximum 0,021 m/s
- Maximum 0,016 m/s
- Maximum 0.019m/s
- Maximum 0.014m/s

Material Selection:

Exclusions from standard material standard:

- PPS/PI
- None

Bag drawing number

Bag length

Bag diameter

Required operational hours (max number of bags failing during this period)

Expected emission limits

Maximum emission limits

Maximum pressure drop

- To be confirmed (latest revision)
- 10 meters
- 150 mm
- 36 000 (3%)
- 30 mg/Nm<sup>3</sup>
- 50 mg/Nm<sup>3</sup>
- 2.4 kPa (flange to flange @ MCR with one cell isolated)

- The *Contractor* manufactures the bag according to the details shown on the attached drawing No (to be confirmed) Rev (latest)
- The double circular base and the 100 mm wide reinforcing strip will be off 100% PPS.
- The Filter Bag detail comprises of a 10 000 mm x 150 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 155 mm diameter x 5 mm thick. The other end is closed with double circular

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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.

- The snap band joint is to be riveted.
- The longitudinal seam of the bag shall be triple stitched.
- The sewing thread will be compatible with PPS.
- The stitching thread will be 100% PPS (Procon, Torcon or Nexylene)
- It is the *Supplier's* responsibility to ensure that the bags fit correctly into the tube plate and cages.
- Before bag manufacturing will commence the *Supplier* will provide a sample bag to the *Purchaser* for his evaluation and acceptance.
- No manufacturing of bags will commence prior to the Purchaser's representative receiving, analysing and releasing the fabric following fabric tests done by the Purchaser's RT&D department.

### 3.10 FILTER BAG FABRICATION

#### 3.10.1 PPS/PI SPECIFICATATION FOR ARNOT, CAMDEN, DUVHA, GROOTVLEI, TUTUKA and KRIEL

##### 3.10.1.1 Needle Felt Standard and Cloth Construction

Fabric construction:	Scrim supported needle felt
Fibre chemical name:	Polyphenylene sulfide (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 sulfide (PPS) – Procon, Torcon or Nexylene
Snap band	Riveted/Welded Stainless Spring Steel (Diameter to fit tube plate)
Cuff Seal (if applicable)	Endless Rontex Ring (PPS) – Procon, Torcon or Nexylene
Cuff Material	Polyphenylene sulfide (PPS) – Procon, Torcon or Nexylene
Foot/Sock Material	Polyphenylene sulfide (PPS) – Procon, Torcon or Nexylene

##### 3.10.1.2 Scrim

Construction:	The scrim will be woven from Polyphenylene sulfide (PPS) yarns.
Material:	Polyphenylene sulfide (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

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**3.10.1.3 Batt – Cascade Construction****3.10.1.3.1 Surface Layer (First Surface Layer – Dust Side)**

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

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

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

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

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

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

**3.10.1.4 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

**3.10.1.5 Fabric Special Treatments**

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

**3.10.1.6 Fabric Properties**

Air permeability:	7.6 – 10 m <sup>3</sup> /m <sup>2</sup> /minute @ 125 Pa Arnot Only: 60 l/dm <sup>2</sup> /min (+/- 20%) at 200 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)	Warp: max. 1.5%
Dry heat for 24hrs)	Weft: max. 1.5%
Tensile strength:	Warp: min. 9 00 N/50mm Weft: min. 1 200 N/50mm

**CONTROLLED DISCLOSURE**

### 3.10.2 PAN/PI STANDARD FOR MAJUBA, MEDUPI AND KUSILE

#### 3.10.2.1 Needle Felt Standard and Cloth Construction

Fabric construction:	Scrim supported needle felt
Fibre chemical name:	Polyacrylonitrile (PAN – AKSA/Dolanit)
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:	Polyacrylonitrile (PAN – Dolanit/AKSA)
Snap band:	Riveted/Welded    Stainless    Spring    Steel (Diameter to fit tube plate)
Cuff Seal:	Endless Rontex Ring (PAN) – Dolanit/AKSA
Cuff Material:	Polyacrylonitrile (PAN) – Dolanit/AKSA
Foot/Sock Material:	Polyacrylonitrile (PAN) Dolanit/AKSA

#### 3.10.2.2 Scrim

Construction:	The scrim will be woven from Polyacrylonitrile (PAN – Dolanit/AKSA) yarns.
Material:	Polyacrylonitrile (PAN – Dolanit/AKSA)
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

#### 3.10.2.3 Batt - Cascade Construction

##### 3.10.2.3.1 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 multilobal
Weight:	45 - 55 g/m <sup>2</sup> (Before Needling)
Material 2:	Polyacrylonitrile (PAN – Dolanit/AKSA)
Fibre dimension:	1.7 dtex maximum
Weight:	55 - 45 g/m <sup>2</sup> (Before Needling)

##### 3.10.2.3.2 Support Batt (Second Inner layer – Dust Side)

Material:	Polyacrylonitrile (PAN – Dolanit or AKSA)
Fibre dimensions:	2.2 dtex
Weight:	120 - 130 g/m <sup>2</sup> (Before Needling)

##### 3.10.2.3.3 Support Batt (Inner layer – Clean Side)

Material:	Polyacrylonitrile (PAN – Dolanit or AKSA)
Fibre dimension:	2.2 dtex
Weight:	190 - 200 g/m <sup>2</sup> (Before Needling)

### CONTROLLED DISCLOSURE

### 3.10.2.4 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

### 3.10.2.5 Fabric Special Treatments

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

### 3.10.2.6 Fabric Properties

Air permeability:	7.6 – 13 m <sup>3</sup> /m <sup>2</sup> /minute @ 125 Pa
Elongation:	Warp: max. 4% @ 50 N/cm Weft: max. 6% @ 50 N/cm
Bursting strength:	min. 2800 kPa
Dimensional stability: (Free shrinkage at 150 °C dry heat for 24hrs)	Warp: max. 1.5% Weft: max. 1.5%
Tensile strength:	Warp: min. 8 00 N/50mm Weft: min. 8 00 N/50mm

Note: The material standard for Medupi and Kusile Power Stations are in accordance with those of Majuba.

## 3.10.3 PAN STANDARD FOR HENDRINA UNITS 2 TO 5

### 3.10.3.1 Needle Felt Standard and Cloth Construction

Fabric construction:	Scrim supported needle felt
Fibre chemical name:	Polyacrylonitrile (PAN – AKSA/Dolanit)
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:	Polyacrylonitrile (PAN – Dolanit/AKSA)
Snap band:	Riveted/Welded Stainless Spring Steel (Diameter to fit tube plate)
Cuff Seal:	Endless Rontex Ring (PAN) – Dolanit/AKSA
Cuff Material:	Polyacrylonitrile (PAN) – Dolanit/AKSA
Foot/Sock Material	Polyacrylonitrile (PAN) Dolanit/AKSA

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### 3.10.3.2 Scrim

Construction:	The scrim will be woven from Polyacrylonitrile (PAN – Dolanit/AKSA) yarns.
Material:	Polyacrylonitrile (PAN – Dolanit/AKSA)
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

### 3.10.3.3 Batt - Cascade Construction

#### 3.10.3.3.1 Surface Layer (First Surface layer – Dust Side)

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

Material 1:	Polyimide (P84)
Fibre dimension:	1.7 dtex multilobal
Weight:	0 g/m <sup>2</sup> (Before Needling)
Material 2:	Polyacrylonitrile (PAN – Dolanit/AKSA)
Fibre dimension:	1.7 dtex maximum
Weight:	100 - 110 g/m <sup>2</sup> (Before Needling)

#### 3.10.3.3.2 Support Batt (Second Inner layer – Dust Side)

Material:	Polyacrylonitrile (PAN – Dolanit or AKSA)
Fibre dimensions:	2.2 dtex
Weight:	120 - 130 g/m <sup>2</sup> (Before Needling)

#### 3.10.3.3.3 Support Batt (Inner layer – Clean Side)

Material:	Polyacrylonitrile (PAN – Dolanit or AKSA)
Fibre dimension:	2.2 dtex
Weight:	190 - 200 g/m <sup>2</sup> (Before Needling)

### 3.10.3.4 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

### 3.10.3.5 Fabric Special Treatments

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

## CONTROLLED DISCLOSURE

### 3.10.3.6 Fabric Properties

Air permeability:	7.6 – 13 m <sup>3</sup> /m <sup>2</sup> /minute @ 125 Pa
Elongation:	Warp: max. 4% @ 50 N/cm Weft: max. 6% @ 50 N/cm
Bursting strength:	min. 2800 kPa
Dimensional stability: (Free shrinkage at 150 °C dry heat for 24hrs)	Warp: max. 1.5% Weft: max. 1.5%
Tensile strength:	Warp: min. 8 00 N/50mm Weft: min. 8 00 N/50mm

### 3.10.4 PPS STANDARD FOR HENDRINA UNITS 1, 6 to 10

#### 3.10.4.1 Needle Felt Standard and Cloth Construction

Fabric construction:	Scrim supported needle felt
Fibre chemical name:	Polyphenylene sulfide (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 sulfide (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 sulfide (PPS) – Procon, Torcon or Nexylene
Foot/Sock Material	Polyphenylene sulfide (PPS) – Procon, Torcon or Nexylene

#### 3.10.4.2 Scrim

Construction:	The scrim will be woven from Polyphenylene sulfide (PPS) yarns.
Material:	Polyphenylene sulfide (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

#### 3.10.4.3 Batt – Cascade Construction

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

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

Material 1:	Polyimide (P84)
Fibre dimension:	1.7 dtex Multilobal
Weight:	0 g/m <sup>2</sup> (Before Needling)
Material 2:	Polyphenylene sulfide (PPS) – Procon
Fibre dimension:	1.7 dtex trilobal
Weight:	100 - 110 g/m <sup>2</sup> (Before Needling)

### CONTROLLED DISCLOSURE

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

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

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

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

**3.10.4.4 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

**3.10.4.5 Fabric Special Treatments**

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

**3.10.4.6 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  
min. 2800 kPa  
Bursting strength: min. 2800 kPa  
Dimensional stability: (Free shrinkage at 180 °C Warp: max. 1.5%  
Weft: max. 1.5%  
Dry heat for 24hrs) Warp: min. 9 00 N/50mm  
Tensile strength: Weft: min. 1 200 N/50mm

**CONTROLLED DISCLOSURE**

### 3.10.5 GENERIC PAN/PI STANDARD FOR STATIONS TO BE RETROFITTED

**Note:** This is the generic standard for stations to be retrofitted where the flue gas temperature entering the FFP can be control to below 125 °C.

#### 3.10.5.1 Needle Felt Standard and Cloth Construction

Fabric construction:	Scrim supported needle felt
Fibre chemical name:	Polyacrylonitrile (PAN – AKSA/Dolanit)
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:	Polyacrylonitrile (PAN – Dolanit/AKSA)
Snap band:	Riveted/Welded Stainless Spring Steel (Diameter to fit tube plate)
Cuff Seal:	Endless Rontex Ring (PAN) – Dolanit/AKSA
Cuff Material:	Polyacrylonitrile (PAN) – Dolanit/AKSA
Foot/Sock Material:	Polyacrylonitrile (PAN) Dolanit/AKSA

#### 3.10.5.2 Scrim

Construction:	The scrim will be woven from Polyacrylonitrile (PAN – Dolanit/AKSA) yarns.
Material:	Polyacrylonitrile (PAN – Dolanit/AKSA)
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

#### 3.10.5.3 Batt - Cascade Construction

##### 3.10.5.3.1 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 multilobal
Weight:	45 - 55 g/m <sup>2</sup> (Before Needling)
Material 2:	Polyacrylonitrile (PAN – Dolanit/AKSA)
Fibre dimension:	1.7 dtex maximum
Weight:	55 - 45 g/m <sup>2</sup> (Before Needling)

##### 3.10.5.3.2 Support Batt (Second Inner layer – Dust Side)

Material:	Polyacrylonitrile (PAN – Dolanit or AKSA)
Fibre dimensions:	2.2 dtex
Weight:	120 - 130 g/m <sup>2</sup> (Before Needling)

### CONTROLLED DISCLOSURE



**3.10.5.3.3 Support Batt (Inner layer – Clean Side)**

Material:	Polyacrylonitrile (PAN – Dolanit or AKSA)
Fibre dimension:	2.2 dtex
Weight:	190 - 200 g/m <sup>2</sup> (Before Needling)

**3.10.5.4 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

**3.10.5.5 Fabric Special Treatments**

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

**3.10.5.6 Fabric Properties**

Air permeability:	7.6 – 13 m <sup>3</sup> /m <sup>2</sup> /minute @ 125 Pa
Elongation:	Warp: max. 4% @ 50 N/cm Weft: max. 6% @ 50 N/cm
Bursting strength:	min. 2800 kPa
Dimensional stability: (Free shrinkage at 150 °C dry heat for 24hrs)	Warp: max. 1.5% Weft: max. 1.5%
Tensile strength:	Warp: min. 8 00 N/50mm Weft: min. 8 00 N/50mm

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### 3.10.6 GENERIC PPS/PI SPECIFICATATION FOR STATIONS TO BE RETROFITTED

**Note:** This is the generic standard for stations to be retrofitted where the flue gas temperature entering the FFP cannot be control to below 125 °C.

#### 3.10.6.1 Needle Felt Standard and Cloth Construction

Fabric construction:	Scrim supported needle felt
Fibre chemical name:	Polyphenylene sulfide (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 sulfide (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 sulfide (PPS) – Procon, Torcon or Nexylene
Foot/Sock Material	Polyphenylene sulfide (PPS) – Procon, Torcon or Nexylene

#### 3.10.6.2 Scrim

Construction:	The scrim will be woven from Polyphenylene sulfide (PPS) yarns.
Material:	Polyphenylene sulfide (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

#### 3.10.6.3 Batt – Cascade Construction

##### 3.10.6.3.1 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 Multilobal
Weight:	45 - 55 g/m <sup>2</sup> (Before Needling)
Material 2:	Polyphenylene sulfide (PPS) – Procon
Fibre dimension:	1.7 dtex trilobal
Weight:	55 - 45 g/m <sup>2</sup> (Before Needling)

##### 3.10.6.3.2 Support Layer (Second Inner Layer – Dust Side)

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

##### 3.10.6.3.3 Support Batt (Inner Layer – Clean Side)

Material:	Polyphenylene Sulfide (PPS) – Procon, Torcon or Nexylene
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### CONTROLLED DISCLOSURE

Fibre dimension: 2.2 dtex  
Weight: 190 - 200 g/m<sup>2</sup> (Before Needling)

### 3.10.6.4 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

### 3.10.6.5 Fabric Special Treatments

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

### 3.10.6.6 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 Warp: max. 1.5%  
Dry heat for 24hrs) Weft: max. 1.5%  
Tensile strength: Warp: min. 9 00 N/50mm  
Weft: min. 1 200 N/50mm

## 3.11 TESTING AND INSPECTION REQUIREMENTS AND SAMPLE BAG MATERIALS

### 3.11.1 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.

### 3.11.2 Bag Testing Requirements

#### 3.11.2.1 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.

## CONTROLLED DISCLOSURE

### **3.11.2.2 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.

### **3.11.2.3 Bag Manufacture**

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

### **3.11.3 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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## 3.11.4 Typical QCPs/ITPs

		<b>FILTER BAG TEST &amp; INSPECTION REPORT</b>				<b>Contract No</b> 4600022655		
<b>Title of the Contract</b>		The Manufacturing and Supply of Complete Set of Fabric Filter Bags for <u>Duvha Unit 3</u> .				<b>Filter Bag Drawing No.</b>		
						0.57/48834 Rev 2		
						BA Internal Product Code: 44181034-1		
						BA ORDER No. 4500906504		
<b>Control Codes</b>		(*) Y = Acceptance / X = Reject.				(**) Measure		

Ref. No.	Control Description	Control Code	Spec	Bag 1	Bag 2	Bag 3	Bag 4	Remarks
1	BAG IDENTIFICATIN TAG		Sketch					
2	RIVET POSITION (TO BE OPPOSITE CUFF SEAM)	(*)	✓					
3	TOP CUFF WIDTH	(**)	110mm +/- 2mm					
4	DISTANCE FROM EDGE TO 2nd ROW OF STITCHING (top cuff)	(**)	45 - 50 mm					
5	TOP CUFF FIT - SNAP BAND	(*)	✓					
6	TOP CUFF SEAM RUN OFF - VISUAL	(*)	✓					
7	SEAM RUN-OFF - ALONG LENGTH - VISUAL	(*)	✓					
8	DISTANCE FROM EDGE TO SEAM - ALONG LENGTH	(*)	min 2mm					
9	FLAT MEASURE	T	(**)	209 +/- 3mm				
		M	(**)					
		B	(**)					
10	LONGTITUDINAL SEAM OVERLAP	T	(**)	13-17mm				
		M	(**)					
		B	(**)					
11	BOTTOM REINFORCEMENT CUFF WIDTH	(**)	140 +/- 3mm					
12	BOTTOM CUFF - BOTTOM EDGE TO 2nd ROW OF STITCHING	(**)	min 10mm					
13	BOTTOM CUFF - 2nd ROW TO 3rd ROW OF STITCHING	(**)	8 -10mm					
14	BOTTOM CUFF - SNAPBAND	(**)	20mm +/- 2mm					
15	LENGTH AT 50 N (5kg)	(**)	8085 - 8115					
16	CAGE FITMENT - PENETRATION INTO BOTTOM CUFF	(**)	40 - 70mm (for info only)					

<b>Person conducting inspection:</b>		<b>Date of inspection:</b>	
<b>Suppliers Name:</b>		<b>Suppliers signature:</b>	
<b>Notes / Remarks:</b>			

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				QUALITY PLAN												PROJECT : Duvha				
CLIENT : ESKOM DUVHA Unit 3				1 = Supplier				V = Verify				Quality Plan Reference : Duvha 2009 Rev # : 0								
CLIENT ORDER # :				2 = Eskom				H = Hold				Page # : Page 1 of 6								
ITEM DESCRIPTION : FABRIC FILTER BAGS				3 =				W = Witness				Drawing # : 0.57/48834 Rev. 2								
PRODUCT CODE :				4 =				S = Surveillance				CONTRACT # :								
SUPPLIER # :				5 =				R = Record												
				Hold or Witness by				Inspection Required												
Op #	Operation Description			Reference Document	1	2	3	4	5	V	D	S	P	E	M	D	Accept Signature	Reject Signature	Date	Remarks
										I	I	T	E	L	A	O				
										S	M	R	R	O	S	C				
										N	E	M	N	S						
1	RECEIVING INSPECTION :			MCP																
	RECEIPT OF MATERIAL :																			
	Delivery documents are compared with Purchase Documents for compatibility .									X						X				
	Raw Material is visually checked for :																			
	~ Type									X										
	~ Quantity									X										
	~ Transit damage									X										
	Certificates of Conformance / Inspection and test reports are checked				W	V										X				
1.2	SCRM																			
	Certificates of Conformance / Inspection and test reports are checked				W	V										X				
1.3	NEEDLEFELT																			
	Web pass : check grams per square metre every roll				W	V					X					X				
	Dry pass : check grams per square every roll				W	V					X					X				
	Calendaring				W	V					X					X				
	Singeing : visual inspection				W	V				X										
	Heatsetting				W	V					X					X				
SUPPLIER APPROVAL :				DATE				ESKOM APPROVAL								DATE				

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[illegible]

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				QUALITY PLAN												PROJECT : Duvha				
CLIENT : ESKOM DUVHA Unit 3				1 = Beier Albany				V = Verify				Quality Plan Reference : Duvha 2009 Rev # : 0								
CLIENT ORDER # :				2 = Eskom				H = Hold				Page # : Page 3 of 6								
ITEM DESCRIPTION : FABRIC FILTER BAGS				3 =				W = Witness				Drawing # : 0.57/48834 Rev. 2								
PRODUCT CODE :				4 =				S = Surveillance				CONTRACT # :								
SUPPLIER # :				5 =				R = Record												
				Hold or Witness by				Inspection Required												
Op #	Operation Description			Reference Document	1	2	3	4	5	V	D	S	P	E	M	D	Accept Signature	Reject Signature	Date	Remarks
										I	I	T	E	L	A	O				
										S	M	R	R	O	S	C				
										N	E	M	N	S						
4	RECEIVING INSPECTION :			MCP																
	RECEIPT OF MATERIAL :																			
	Delivery documents are compared with Purchase Documents for compatibility .									X						X				
	Material is visually checked for :																			
	~ Type									X										
	~ Quantity									X										
	~ Transit damage									X										
	Certificate of Conformance are required for :			Eskom																
	~ Pre-Slit Needlefelt			Spec	W	V										X				
	~ Snapband Stainless Steel				W	V										X				
	~ Thread				W	V										X				
	~ Seals				W	V										X				
	~ Rivets				W	V										X				
	~ Assembled Snapbands				W	V										X				
SUPPLIER APPROVAL :				DATE								ESKOM APPROVAL				DATE				

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				QUALITY PLAN												PROJECT : Duvha			
CLIENT : ESKOM DUVHA Unit 3				1 = Supplier				V = Verify				Quality Plan Reference : Duvha 2009				Rev # : 0			
CLIENT ORDER # :				2 = Eskom				H = Hold				Page # : Page 4 of 6							
ITEM DESCRIPTION : FABRIC FILTER BAGS				3 =				W = Witness				Drawing # : 0.57/48834 Rev. 2							
PRODUCT CODE :				4 =				S = Surveillance				CONTRACT # :							
SUPPLIER # :				5 =				R = Record											
				Hold or Witness by				Inspection Required											
Op #				Reference Document				1 2 3 4 5				V I T S P E M D S M R R O S C N E M N S				Accept Signature Reject Signature Date Remarks			
5 CONTINUOUS TUBER				MCP															
5.1 PILOT BAG																			
The very first bag of production to be approved				H H				X X				X							
At the start of every shift the first tube seamed is sent through the entire manufacturing process and is subjected to critical inspection at every manufacturing stage .				H V				X X				X							
Should any problems be identified , immediate effective																			
Corrective Action will be taken prior to manufacturing continuing .																			
All foregoing details will be recorded in the CT Diary and the QA Diary .																			
5.2 IN PROCESS INSPECTION																			
Every tube is inspected by the Operator for :																			
~ Flat width				Drawing				S V				X				X			
~ Seam form and stitching				Drawing				S V				X X				X			
~ Length				Drawing				S V				X				X			
~ Tube fabric appearance				S V				X											
Tubes that pass inspection are stamped with the roll identification # to so signify .				MCP				S V											
5.3 TOP CUFF																			
Every Top Cuff is inspected by the Operator for :																			
~ Fabric appearance				S V				X											
~ Seam Form and Stitching				S V				X X											
~ Stitching Dimensions from the edge				S V				X											
~ Stitching Identity Tag				S V				X											
SUPPLIER APPROVAL :				DATE								ESKOM APPROVAL				DATE			

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### 3.12 DEVIATIONS FROM BAG MATERIAL STANDARD

Based on project specific requirements, the project engineer in consultation with the Senior Consultant – Air Pollution Control and Senior Advisor – Polymers and Filtration may make informed material selections which differ from those in sections 3.1 and 3.2. This may only be done if required guarantee requirements are still met and thorough testing has been completed.

Eskom has over the years tested a number of fabric configurations which include coated material, self-supporting scrim-less material, finer denier surface blended fabric and alternate fibres etc. The results of these tests are document in research reports indicating either suitability or not. In a number of these instances, these alternate fabrics contain proprietary supplier information and as such cannot be included in a standard. Should these fabrics be offered as alternates in any tender submission, they need to be evaluated on the merits of each submission in consultation with the Senior Consultant – Air Pollution Control and Senior Advisor – Polymers and Filtration.

### 3.13 PRE-COATING OF BAGS

All complete cells/compartments or units that are fully rebagged must be coated with hydrated lime.

The minimum amount of hydrated lime required is based on 1 kg per 1 m<sup>2</sup> of fabric.

High Calcium Hydrated Lime Specifications:

Chemical Properties	Average (%)	Min. (%)	Max. (%)
Free Calcium Oxide (CaO)	0.16	-	1.00
Magnesium Oxide (MgO)	1.01	-	1.20
Silica	0.50	-	0.98
Ferric Oxide (Fe <sub>2</sub> O <sub>3</sub> )	0.15	-	0.60
Alumina (Al <sub>2</sub> O <sub>3</sub> )	0.08	-	0.35
Calcium Hydroxide (CaOH <sub>2</sub> )	94.8	90.0	-
Carbon Dioxide (CO <sub>2</sub> )	0.60	-	1.5
Free Moisture (H <sub>2</sub> O)	0.64	0	2.00
Colour / Texture	Brown / Fine Powder		

High Calcium Hydrated Lime Particle Size:

Size Parameter	Typical	Units
< 850 micron	100	%
< 300 micron	99.5	%
< 100 micron	99.0	%
< 75 micron	85	%

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### 3.14 SPARES

Stations are advised to keep stock of spare bags for routine/periodic failures that occur in the course of operation. The recommended minimum stock level is 3% of total installed number of bags per station and the material should comply with the standards detailed in this document.

## 4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
MM Mthembu	Senior Manager (Acting) – Production Engineering Integration Coal (Group Technology)
KB Naicker	Senior Manager (Acting) – Production Engineering Integration Coal (Group Technology)
H Grobbelaar	Senior Consultant – Air Pollution Control (Group Technology)
RA Van Rensburg	Senior Consultant – Air Pollution Control (Group Technology)
N Haripersad	Resources & Integrity Manager – CCECT, ERID (Sustainability)
I Phiri	Senior Advisor – Polymers & Filtration, ERID (Sustainability)
J Bembe	Manager – Condition Monitoring, Polymers & Filtration, ERID (Sustainability)
NB Mkhize	Engineering Manager – Arnot (Generation)
J Moolman	Engineering Manager (Acting) – Camden (Generation)
N Toerien	Engineering Manager – Duvha (Generation)
S Nxumalo	Engineering Manager – Grootvlei (Generation)
NM Msibi	Engineering Manager – Hendrina (Generation)
Y Ngcashi	Engineering Manager – Majuba (Generation)
P Khumalo	Engineering Manager – Medupi (Generation)
N Mhlungu	Engineering Manager – Kusile (Generation)
P Mhlongu	Supplier Assessment Advisor – Quality Management (Group Technology)
L Van Wyk	Air Quality Manager (Acting) – Boiler Auxiliary Plant (Group Technology)
J Mchunu	Project Manager – FFP Bags, OU 3 (Generation)
A Hart	Boiler Auxiliary Manager – Boiler Auxiliary Group (Group Technology)
EM Patel	SCOT: Particulate Care Group Chairperson
Y Singh	SCOT: AQC SC Chairperson
ZT Mathe	SCOT: Power Plant TC Chairperson

## 5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2012	0	E.M. Patel	Draft to Replace 474-274
August 2013	1	E.M. Patel	Final Document for Authorisation
December 2015	1.3	E.M. Patel	General Update
December 2015	1.4	E.M. Patel	Draft Document for Comments Review
February 2016	2	E.M. Patel	Final Document for Authorisation and Publication

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## **6. DEVELOPMENT TEAM**

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

- Leon Van Wyk
- Irish Phiri
- Hendre Grobbelaar
- Robbie Van Rensburg
- Nomathemba Mpulo
- Charlene Naicker
- Moloko Radipabe
- Charmaine Ntanzu
- Bino Ngwenya
- Lindani Madonsela
- Lerato Moira Chauke
- Christo Holtshausen
- Paul Malomane
- Pieter Swart
- Jeanne Fourie
- Riana Nieuwoudt
- Hendrik Van Riel
- Spinola Baloyi

## **7. ACKNOWLEDGEMENTS**

None

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