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**TITLE SPECIFICATION FOR POWER
TRANSFORMER OIL ONLINE
FILTRATION PLANT FILTERS**

REFERENCE REV
CP_TSSPEC_360 1

DATE: SEPTEMBER 2023
PAGE: 1 OF 19

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FOREWORD

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The work group appointed by the Interim Study Committee, which, at the time of approval, comprised of the following members:

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1 INTRODUCTION

City Power has a number of Power transformers, containing excessive moisture, and it is necessary to manage the moisture content in these Power transformers with the aim of managing the short-term risk of power transformer failures due to excessive moisture and to extend the remaining life of power transformers. The Power transformer filtration plant CP_TSSPEC_209 requires the filter cartridge changed at approximately 100 litres of oil filtration

2 SCOPE

This specification covers City Power's requirements for a power transformer oil online filtration plant filters as to extend the remaining life of power transformers due to the effect moisture has on power transformer ageing process. It is also important to prevent the insulation of power transformers from being contaminated with moisture, thereby to continuously remove any moisture, which may form as a by-product of the ageing of both the liquid and solid insulating. These Oil Filtration Plants shall be used to help meet processing specifications where dissolved water sensitive dielectric breakdown voltage tested under ASTM D-1816 and SANS 60156 is used, or required. Insulating oil in storage tanks and tankers of oil that have accumulated a high level of dissolved water can be recirculated and dried to less than 10 ppm total water contained

3 NORMATIVE REFERENCES

The following documents contain provisions that through reference in the text constitute the requirements of this standard. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

IEC 60156: Insulating liquids - Determination of the breakdown voltage at power frequency - Test method

ASTM D -1816, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes

CP_TSSPEC_209: Specification for oil filtration plant for use on energised power transformers

CP_TSSPEC_116: Specification for insulating oil

CP_TSSPEC_155: Specification for oil sampling and analysis

ISO 9001: Quality management systems — Requirements

ISO 18001: Health and Safety --- Requirements

ISO 14001: Environmental management systems — Requirements with guidance for use

4 DEFINITIONS

The definitions and abbreviations in the above documents (Normative Reference) shall apply to this specification.

5 REQUIREMENTS

Nothing in this specification shall lessen the obligations of the supplier. The supplier shall be fully responsible for the design and supply of Power Transformer Online Oil Filtration Plant Filters. Approval by City Power shall not relieve the supplier of the responsibility for the adequacy of the design.

5.1. Service conditions

The requirements in this specification apply to equipment for use under the following conditions:

- 5.1.1. Outdoors or indoors;
- 5.1.2. at an altitude above sea level up to 1 800 m;
- 5.1.3. External Maximum Operating Temperature
 - 5.1.3.1 minimum -10 °C and maximum 40 °C
 - 5.1.3.2 daily average 35 °C
 - 5.1.3.3 yearly average 25 °C
 - 5.1.3.4 the average humidity: 30 % to 90 %;

5.2. General

- 5.2.1. The cartridge shall be able to remove dissolve water from industrial oils
- 5.2.2. The cartridge shall be different from heat and vacuum oil processing plants
- 5.2.3. The cartridge dehydrating oil to be used in the power transformer oil filtration plants

The Power Transformer oil online filtration filters shall have the following equipment to form part of a unit system:

- 5.2.4. The cartridge filters shall be designed for oil dehydration
- 5.2.5. The cartridge shall be of high capacity, able to process up to 100 000 litres of oil or more with a single cartridge

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5.2.6. The cartridge shall be efficient , to maintain a single pass water removal to less than 10 ppm total water , or better

5.2.7. The cartridge shall be versatile to fit the filtration plant tank

5.2.8. The cartridge shall be safe not to remove oxidation inhibitors

5.3. Technical consideration and cartridge requirements

The cartridge Power transformer online oil filtration plant filters shall have the following requirements:

5.3.1 Shall be designed for particulate solids removal , pre-filtering through is recommended if particle contamination is suspected

5.3.2 Shall be recommended for cost effective removal of free water in industrial oils

5.3.3 Collapse pressure rating shall be 75 PSID (PSID is psi differential, checks for delta-P across things like filters, pumps, etc. Is technically also psi-g), Psid is differential pressure between 2 sides of a system).

5.3.4 Maximum Temperature shall be 107,222°C

5.3.5 Direction of flow shall be from outside to the inside of the filtration plant

5.3.6 Outer Diameter Top shall be 27.94 cm

5.3.7 Outer diameter bottom shall be 27.94 cm

5.3.8 Inner diameter Top shall be 5.78 cm

5.3.9 Inner diameter bottom shall be 5.78 cm

5.3.10 Length shall be 18.7325 cm

5.3.11 Shall have an handle

5.3.12 Shall have seal Material

5.3.13 Seal material , Buna-N

5.3.14 Type of adhesive , Epoxy

5.3.15 Shall have a type of endcap , plated steel

5.3.16 Shall have a centre tube , plated steel

5.3.17 Shall have a type of media , multimedia

5.3.18 Shall have plating , Electro Galvanised

5.3.19 Shall have a outer Jacket

5.3.20 Shall have a configuration ,double open end

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5.3.21 Cartridge Maximum Operating Temperature 71.1 °C and 120 °C for SD-1107HT and SD 1107RHT

5.4. Applications

5.4.1 These filters shall be designed for oil processing situations where dissolved water in industrial oil is a concern , and its removal is desirable

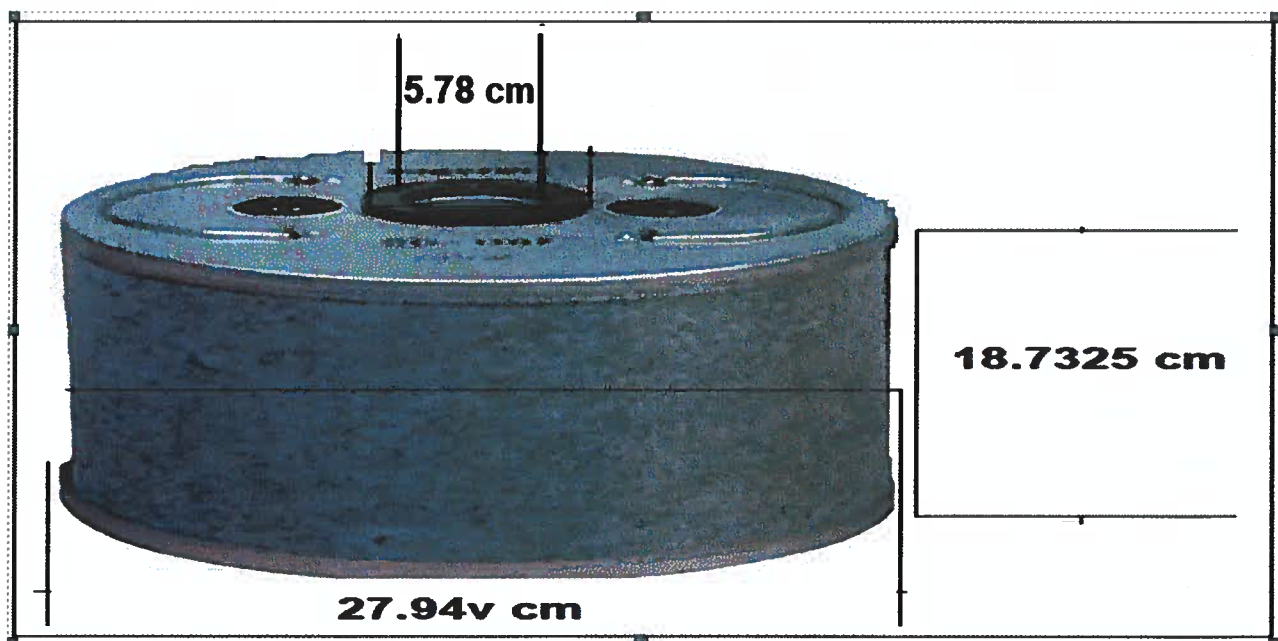
5.4.2 These filters shall be used for processing oil in other high voltage apparatus sensitive to dissolved water

5.5. Engineering Technical Specification, drawing and diagrams for a SD-1107

5.5.1 Velcon SD-1107 Technical Specifications table

Outside Diameter (inch)	11
Application	Transformer Oil Dehydration
Media	<u>Superdri</u>
End Cap Configuration	End Cap Configuration
Seal Material	Buna N
Length (inch)	7.375
Filter Type	Adsorbent

5.5.2 Velcon SD-1107 filter dimensions



5.5.3 Chart A: determination amount of water in oil.

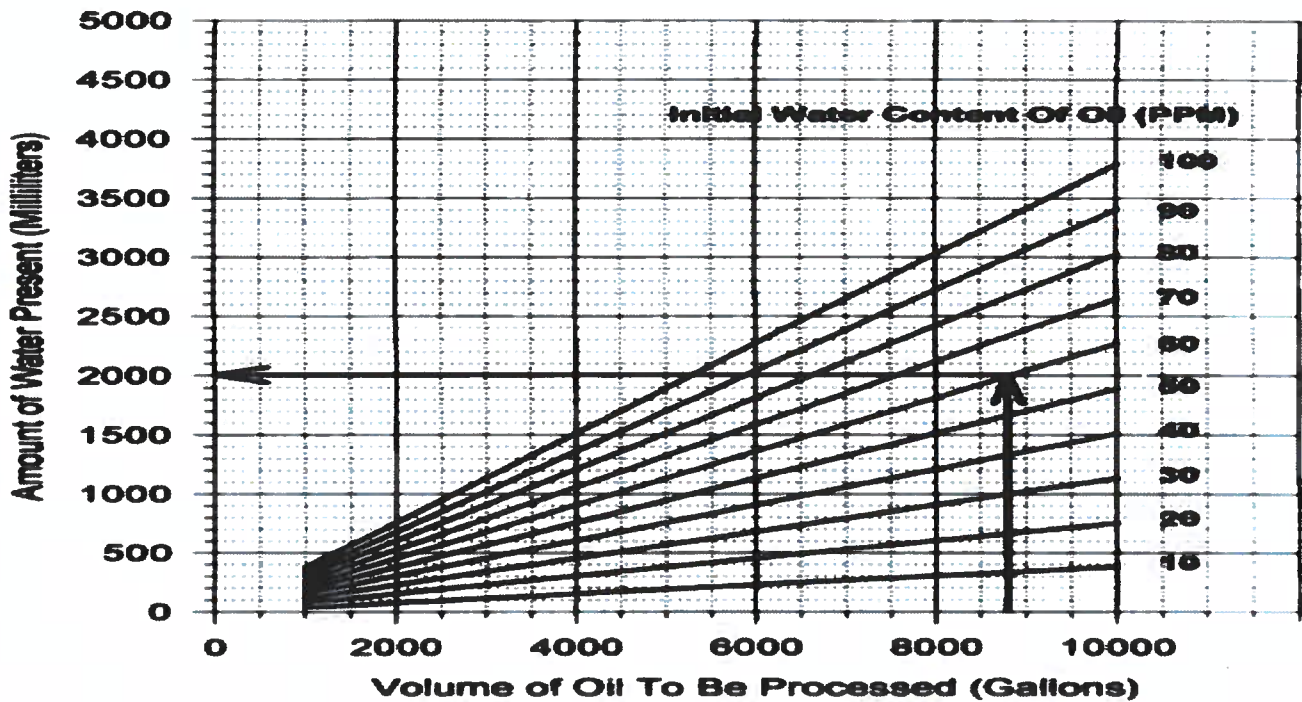


CHART A

5.5.4 Chart B: determination amount of water a single cartridge will remove.

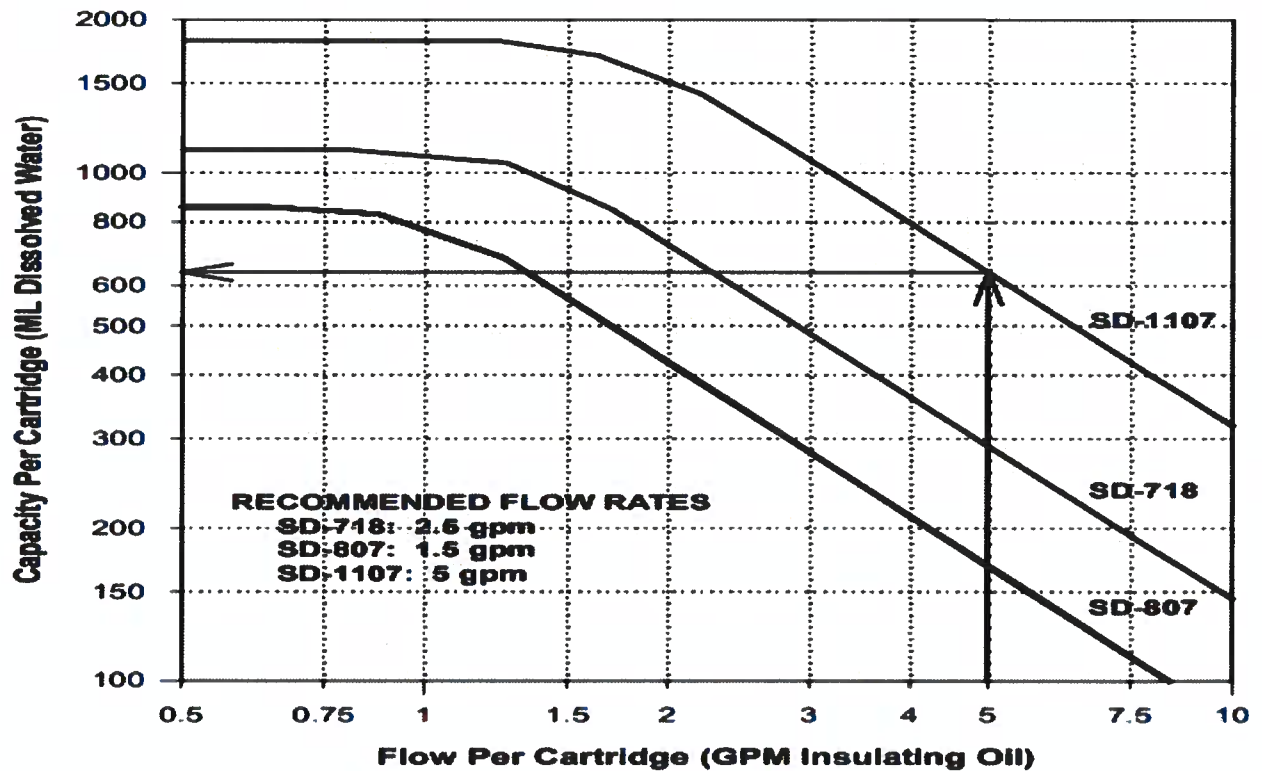


CHART B

1. Using Chart A: Determine amount of water in soil
 2. Using Chart B: Determine amount of water a single cartridge will remove
 3. Divide results from (1) by results from (2)
- Example 2000ML to be removed /required 620 ML capacity =3.2 cartridges

6 TESTS

Describes an empirical test procedure intended to indicate the presence of contaminants such as water and solid suspended matter, and the advisability of carrying out drying and filtration treatment. Standardized testing procedures and equipment are essential for the unambiguous interpretation of test results. Specifies the method for determining the dielectric breakdown voltage of insulating liquids at power frequency. The test procedure performed in a specified apparatus, where the oil sample subjected to an increasing AC electrical field until breakdown occurs. The method applies to all types of insulating liquids of nominal viscosity up to 350 mm²/s at 40 °C. It is appropriate for both acceptance testing on unused liquids at the time of their delivery and for establishing the condition of samples taken in monitoring and maintenance of equipment. Both Type Tests and Routine Tests shall be performed in accordance with ASTM D – 1816 and IEC 60156

6.1 Type Tests

- 6.1.1 Insulation test
- 6.1.2 Mechanical test

6.2 Routine Tests

- 6.2.1 Oil dielectric breakdown test

7 DOCUMENTATION

- 7.1 Technical product catalogue and two operating manuals shall be provided.
- 7.2 Full detailed dimensions drawings shall be provided.
- 7.3 A copy of all test reports shall be provided.
- 7.4 A copy of proposed maintenance schedules shall be provided.

8 TRAINING

The following training courses, for City Power's staff, shall be provided:

- 8.1 Operational
- 8.2 Maintenance

The associated costs for an approved training course in 0 and 7.2 shall be provided per person. This training shall be at the Original Equipment Manufacturers cost.

9 QUALITY MANAGEMENT

A quality management system shall be set up in order to assure the quality during manufacture, installation, removal, transportation and disposal of power transformer Online oil filtration plant filters .Guidance on the requirements for a quality management system found in the following standards: ISO 9001:2015. The details shall be subject to agreement between the purchaser and supplier.

10 HEALTH AND SAFETY

A health and safety plan shall be set up in order to ensure proper management and compliance during manufacture, installation, removal, transportation and disposal of power transformer Online oil filtration plant filters. Guidance on the requirements of a health and safety plan found in OHSAS 18001:2007/ ISO 45001:2018 standards. The details shall be subject to agreement between City Power and the Supplier.

11 ENVIRONMENTAL MANAGEMENT

An environmental management plan shall be set up in order to ensure the proper environmental management and compliance is adhered to during manufacture, installation, removal, transportation and disposal of power transformer Online oil filtration plant filters Guidance on the requirements for an environmental management system shall be found in ISO 14001:2015 standards. The details shall be subject to agreement between City Power and the Supplier. This is to ensure that the asset created conforms to environmental standards and City Power SHERQ Policy.

ANNEXURE A - BIBLIOGRAPHY

None

ANNEXURE B - REVISION INFORMATION

DATE	REV. NO.	NOTES
April 2022	0	First issue
August 2023	1	General Editing 5.3.8 Inner diameter Top from 5.385 cm to 5.78 cm 5.3.9 Inner diameter bottom from 5.385 cm to 5.78 cm

**ANNEXURE C - Item No. 1 – POWER TRANSFORMER OIL ONLINE FILTRATION
PLANT FILTERS**

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_360	Description	Unit	Schedule A	Schedule B
1		Manufacturer		Required	
2		Location		Required	
3	5	Requirements			
		Obligation to the supplier		Note	
4	5.1	Service condition			
	5.1.1	Outdoors or indoors		both	
	5.1.2	Altitude	m	1800	
	5.1.3	External Maximum operating Temperature			
	5.1.3.1	Ambient temperature	°C	-10 to +40	
	5.1.3.2	Daily average	°C	35	
	5.1.3.3	Yearly average	°C	25	
	5.1.4	The average humidity	%	30 to 90	
5	5.2	General			
	5.2.1	Remove dissolved water from oil	Yes/No		
	5.2.2	Different from heat and vacuum	Yes/No		
	5.2.3	For use in power transformer oil filtration processing plants	Yes/No		
	5.2.4	Designed for oil dehydration	Yes/No		
	5.2.5	Process 100 000 litres of oil per cartridge	Yes/No		
	5.2.6	Removal of less than 10 ppm total water or better	Yes/No		
	5.2.7	Versatile to fit the filtration plant tank	Yes/No		
	5.2.8	Safe not to remove oxidation inhibitors	Yes/No		

Note: Ticks, Cross [√, X], Asterisk [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted.

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

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Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub clause of CP_TSSPEC_360	Proposed deviation

Note: Ticks, Cross [✓, X], Asterisk [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted.

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Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_360	Description	Schedule A	Schedule B
6	5.3	Technical special consideration		
	5.3.1	For particulate solids removal, pre- filtering for particle contamination	Yes/No	
	5.3.2	Cost effective removal of water in industrial oils	Yes/No	
	5.3.3	Collapse pressure rating	PSID	75
	5.3.4	Maximum Temperature shall be	°C	107.2
	5.3.5	Direction of flow from outside to inside	Yes/No	
	5.3.6	Outer Diameter Top 27.94 cm	Yes/No	
	5.3.7	Outer Diameter Bottom 27.94 cm	Yes/No	
	5.3.8	Inner Diameter Top 5.78 cm	Yes/No	
	5.3.9	Inner Diameter Bottom 5.78 cm	Yes/No	
	5.3.10	Length 18.7325 cm	Yes/No	
	5.3.11	Handle Yes		Required
	5.3.12	Seal Material , Yes	Yes/No	
	5.3.13	Seal Material , Buna-N	Yes/No	
	5.3.14	Type of adhesive , Epoxy	Yes/No	
	5.3.15	Type of endcap , plated steel	Yes/No	
	5.3.16	Centre tube, plated steel	Yes/No	
	5.3.17	Type of media , multimedia	Yes/No	
	5.3.18	Plating, Electro Galvanised	Yes/No	
	5.3.19	Outer Jacket, Yes	Yes/No	
	5.3.20	Configuration	Yes/No	Double open end
	5.3.21	Max Operating Temperature	°C	71.1 to 120

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Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_360	Description	Schedule A	Schedule B
7	5.4	Applications		
	5.4.1	Designed for oil processing situations where dissolved water in industrial oil is a concern , and its removal desirable Yes/No		
	5.4.2	These units shall be used for processing oil in other high voltage apparatus that is sensitive to dissolved water Yes/No		
8	6	TESTS		
	6.1	Type tests		
	6.1.1	Insulation test	Required	
	6.1.2	Mechanical test	Required	
	6.2	Routine test	Required	
9	6.2.1	Oil dielectric breakdown test	Required	
	7	Documentation		
	7.1	Technical product catalogues and operating manuals Yes/No		
	7.2	Full detailed dimensional drawings Yes/No		
	7.3	Copy of test report Yes/No		
10	7.4	Copy of proposed maintenance schedules Yes/No		
	8	Training (Provision)		
	8.1	Operating Yes/No	Yes	
11	8.2	Maintenance Yes/No	Yes	
	9	Quality Management		
12		ISO 9001 accreditation certificate Yes/No	Yes	
	10	Health and Safety		
13		ISO 18001 Accreditation Yes/No	Yes	
	11	Environmental Management		
		ISO 14001 accreditation certificate Yes/No	Yes	

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ANNEXURE D – STOCK ITEMS

Material Group:

Item	SAP No.	SAP Short Description	SAP Long Description
1.	4731	OIL FILTRATION PLANT FILTERS	POWER TRANSFORMER OIL ONLINE FILTRATION PLANT FILTERS. SPECIFICATION REF. CP_TSSPEC_360