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TITLE	**SPECIFICATION FOR MOBILE OIL REGENERATION AND FILTRATION PLANT**	REFERENCE **CP_TSSPEC_211**	REV **1**
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		PAGE: **1**	OF **15**

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FOREWORD

This specification was prepared by the following Work Group members:

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2016

INTRODUCTION

City Power has a need for a mobile oil regeneration and filtration plant for the purification of transformer oil that contain impurities, and it has become necessary to manage these impurities in these units with the aim of contributing to the environment management standards.

1 SCOPE

This specification covers City Power's requirements for a mobile oil regeneration and filtration plant, to remove impurities from the transformer oil, which could be caused by the ageing process. It is also important to prevent the insulation of transformers from becoming contaminated and thereby continuously remove any impurities which may be formed by both the liquid and solid insulating material.

2 NORMATIVE REFERENCES

The following documents contain provisions that through reference in the text constitute 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.

CP_TSSPEC_097; *Specification for 10MVA and 20MVA Power transformers*

CP_TSSPEC_116: *Specification for insulating oil*

CP_TSSPEC_132: *Specification for silica gel*

CP_TSSPEC_147: *Specification for 315MVA Power transformers*

CP_TSSPEC_155: *Specification for oil sampling and analysis*

CP_TSSPEC_156: *Specification for Power transformer active fire protector*

CP_TSSPEC_163: *Specification for 250MVA Power transformer*

CP_TSSPEC_179: *Specification for dissolve gas analysis monitoring equipment*

CP_TSSPEC_209: O*il filtration plant for use on energised transformers*

CP_TSSPEC_116: *Specification for new and regenerated mineral insulating oil*

SANS/IEC 555: *Mineral insulating oil for transformers and switchgear (uninhibited)*

EN 10088-2:2008: *Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

SANS 9001: *Quality management systems — Requirements*

SANS 14001: *Environmental management systems — Requirements with guidance for use*

3 DEFINITIONS

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

4 GENERAL REQUIREMENTS

Nothing in this specification shall lessen the obligations of the supplier. The supplier shall be fully responsible for the design and supply of a mobile oil regeneration and filtration plant; and its satisfactory performance in service. Approval by City Power shall not relieve the supplier of the responsibility for the adequacy of the design.

4.1 Service conditions

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

4.1.1 Outdoors or indoors;

4.1.2 at an altitude above sea level up to 1 800 m;

4.1.3 at ambient air temperatures:

- minimum -10 ºC and maximum 40 ºC
- daily average 35 ºC
- yearly average 25 ºC

4.1.4 the average humidity: 30 % to 90 %;

4.2 Electrical requirements

4.2.1 The unit shall be a three phase unit, rated voltage at 400Vac and operating at 380Vac.

4.2.2 The frequency shall be 50Hz.

4.2.3 All electrical pumps and heaters shall be rated at 400Vac.

4.2.4 Overload protection shall be designed into the unit.

4.2.5 Local distribution board with internal & external light switches and socket outlets (2).

4.2.6 Light fitting shall be of spark proof type.

4.3 Performance

The mobile oil regeneration and filtration plant shall reduce the impurities as to comply with SANS/ IEC 555 and CP_TSSPEC_116 requirements for regenerated oil.

4.4 Filtration

4.4.1 Vacuum system shall consist of a rotary vane backing pump with a minimum capacity 60m^3/hour with a vacuum booster 250m^3/hour capacity.

4.4.2 Outlet pump from vacuum chamber shall be centrifugal capacity 2000 liters/hour.

4.4.3 Installed filter shall be rated at 0.2 micron, pleated paper design able to handle 2000litres/hour.

4.4.4 Piping shall be flanged where possible with minimum screwed joints.

4.4.5 Vacuum chamber shall include low, medium and high foam alarms. These shall be integrated in to the PLC and SCADA system.

4.4.6 Local pressure gauge (0-4Bar) shall be installed across the filter and -100 to 0Kpa for the vacuum system.

4.4.7 High vacuum gauge barometrically compensating 0 – 50 mbar shall be supplied as well.

4.4.8 Mobile oil regeneration and filtration shall have coalescing filters for water separation.

4.4.9 Shall have an activated carbon or chemical scrubbers for odor and acid removal

4.5 Capacity

The unit shall be capable of processing ± 2000 liter per hour and the capacity of each stage stated in schedule B on **Annexure C**.

4.6 Steel work

All tanks and pipes shall be made of stainless steel (3CR12).

4.7 Control System

The control system shall have the following requirements:

4.7.1 A monitoring and control unit (hardware) with a Programmable Logic Control (PLC) automation touchscreen with Human Machine Interface (HMI) unit.

4.7.2 Present programs for different oil types and contamination levels.

4.7.3 Process data from the unit shall be uploaded to a dedicated server from where they can be accessed by the controller via internet in a graphical or report format.

4.7.4 The machine can be started & stopped locally and remotely as well as switched between modes.

4.7.5 Licenses for Microsoft (Windows 11) software programs shall be submitted.

4.7.6 Alarm notifications shall be via e-mail and (Short Message System) SMS.

4.7.7 The software shall consider the capacity of the unit and the level of impurities.

4.7.8 Back-up power supply shall be provided.

4.8 Screen display

The control system shall be capable of displaying the following functions;

4.8.1 Plant overview(Pump/valve/level:-status indication),

4.8.2 Oil processing overview,

4.8.3 Plant reactivation section,

4.8.4 Report generation section,

4.8.5 Plant selection mode and

4.8.6 Alarm display and buzzer.

4.9 Mobile trailer

The trailer construction shall comprise of the following:

4.9.1 Outside floodlighting,

4.9.2 Reflectors and reflective tape,

4.9.3 License, registration and number plate,

4.9.4 Working station,

4.9.5 Equipment storage compartment with gas lifts and

4.9.6 One 50 mm JOST king pin (or equivalent) and secured with castellated nut and split pin;

4.9.7 Two landing legs, braced to withstand loading from any angle and suitable for kerb side operation. Gravity legs are not acceptable;

4.9.8 Single axis suspension to fit the axle together with fabricated hangers, rubber bushes and radius rods (only one shall be adjustable). The hanger brackets are to be welded to the main beam frames;

4.9.9 Axle journals with interchangeable inner and outer bearings and “s”cam brakes to meet brake regulations;

4.9.10 A twin airline brake system with ABS assist; suitable wheel chocks;

4.9.11 Double red and double amber truck lights per side with DIN 7 pin socket for a 24 volt DC system;

4.9.12 Fourteen ply tyres and standard mud flaps. A spare wheel must be supplied in a carrier, which in turn is mounted in the trailer.

4.9.13 A stainless steel drip tray shall be fitted around the plant. The tray shall be large enough to catch a drip from any part of the plant;

4.9.14 The plant compartment shall be slip proof and.

4.9.15 a ladder to access the engine shall be provided;

4.10 IOT and Remote monitoring

4.10.1 Mobile oil regeneration plant shall have sensors for real-time data on oil quality (tan delta, dielectric strength, interfacial tension).

4.10.2 Shall have a remote access via cloud dashboard or mobile app.

4.11 Predictive maintenance alerts

4.11.1 The plant shall have AI-driven analytics to predict filter saturation, pump wear, and oil degradation.

4.12 Vacuum degasification and dehydration

4.12.1 shall use vacuum technology to efficient removal of dissolved gases and moisture.

4.12.2 Shave a real-time monitoring of gas content and moisture levels.

4.13 Thermal regeneration

4.12.3 The plant shall have a controlled heating system to break down sludge and regenerate oil properties.

4.12.4 The plant shall have sludge separation and disposal system.

4 DOCUMENTATION

5.1 Technical product catalogue and two operating manuals shall be provided.

5.2 Full detailed dimensions drawings shall be provided.

5.3 A copy of all test reports shall be provided.

5.4 A copy of proposed maintenance schedules shall be provided.

5 TRAINING

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

6.1.1 Operating, and

6.1.2 Maintenance.

6.2 The associated costs for an approved training course in 6.1 shall be given per person.

6 QUALITY MANAGEMENT

A quality management system shall be set up in order to assure the quality of mobile oil regeneration and filtration plant for use on energised transformers during design, development, production and servicing. Guidance on the requirements for a quality management system may be found in the following standards: ISO 9001. The details shall be subject to agreement between the purchaser and supplier.

7 ENVIRONMENTAL MANAGEMENT

An environmental management system shall be set up in order to assure the environmental compliance of mobile oil regeneration and filtration plant for use on energised transformers throughout its entire life cycle (i.e. during design, development, production, installation, operation and maintenance, decommissioning and disposal phases). Guidance on the requirements for an environmental management system may be found in SANS ISO 14001 and City Power Policy. The details shall be subject to agreement between the purchaser and supplier.

8 HEALTH AND SAFETY

A health and safety certificate shall be set up in order to ensure proper management of mobile oil regeneration plant and compliance of the queuing system during installation, operation, maintenance, and decommissioning phases. Guidance on the requirements of a health and safety plan may be found in SANS ISO 45001:2018 standards. This is to ensure that the asset conforms to standard operating procedures and City Power SHERQ Policy. The details shall be subject to agreement between City Power and the Supplier.

ANNEXURE A - Bibliography

GE Energy: City Power operating & maintenance manual for transformer oil regeneration and filtration plant version RPA4

ANNEXURE B - Revision information

DATE	REV. NO.	NOTES
March 2014	0	First issue
August 2025	1	Inclusion of 4.10
		Inclusion of 4.11
		Inclusion of 4.12
		Inclusion of 4.13
		Study committee member amended
		General editing

ANNEXURE C - Item No. 1 – MOBILE OIL REGENERATION AND FILTRATION PLANT

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_211	Description		Schedule A	Schedule B
1		Manufacturer		XXXX	
2		Location		XXXX	
3	4	**General Requirements**			
		Obligation to the supplier		**Note**	
4	4.1	**Service condition**			
		1. Altitude	m	1800	
		2. Ambient temperature	ºC	-10 to +40	
		3. Daily average	ºC	35	
		4. Yearly average	ºC	25	
		5. Average humidity	%	30 - 90	
5	4.2	**Electrical requirements**			
		1. Rated voltage	Vac	400	
		2. Operating voltage	Vac	380	
		3. Frequency	Hz	50	
		4. Pumps and heaters voltage	Vac	400	
		5. Type of overload protection	.	XXXX	
		6. DB according to clues 4.2.5	Yes/No	Yes	
		7. Lighting type		Spark proof	
6	4.3	**Performance**			
		1. Complies to standard		SANS/IEC 555	
		2. Complies to Specification		CP_TSSPEC_116	

Note: Ticks, Cross [√, X], Astrick [*], 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: _____

Item	Sub clause of CP_TSSPEC_211	Description		Schedule A	Schedule B
7	4.4	**Filtration**			
		1.Vacuum pump	m^3/h	60	
		2.Vacuum booster pump	m^3/h	250	
		3.Outlet capacity	l/h	2000	
		4.Filter	µm	0.2	
		5.Selection option(L/M/H)		Required	
		6.Local pressure gauge	Bar	0 – 4 and -100 - 0	
		7.High vacuum gauge	mBar	0 - 50	
8	4.5	**Capacity**			
		Oil volume per cycle	Litre/hour	± 2000	
9	4.6	**Steel work**			
		Type of stainless steel		3CR12	
10	4.7	**Control System**			
		1. Monitoring and control unit		Required	
		2. Process data		Required	
		3. Start and Stop locally and remotely		Required	
		4. Licenced Software		Windows 8	
		5. Alarm notification (E-mail and SMS)		Required	
		6. Software consideration of unit		Required	
		7. Back-up power supply		Required	
11	4.8	**Screen display**			
		1. Plant overview		Required	
		2. Oil processing overview		Required	
		3. Plant reactivation section		Required	
		4. Report generation section		Required	
		5. Plant selection mode		Required	
		6. Alarm display and buzzer		Required	
12	4.9	**Mobile trailer (According to sub-clues 4.8)**			

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Tender Number: _____

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Name in block letters Signature

Full name of company: _____

Item	Sub clause of CP_TSSPEC_211	Description	Schedule A	Schedule B
		1. Outside floodlights	Required	
		2. Reflectors and reflective tape	Required	
		3. License/Registration and number plates	Required	
		4. Working station	Required	
		5. Storage compartment	Required	
		6. JOST king pin mm	50 or equivalent	
		7. Two landing legs	Required	
		8. Single axis suspension	Required	
		9. Axle journals with interchangeable inner and outer bearings	Required	
		10. Twin airline brake system	Required	
		11. Stainless steel spill trays	Required	
13	5	**Documentation**		
		1. Technical product catalogues and operating manuals	2	
		2. Full detailed dimensional drawings	Required	
		3. Copy of test report	Required	
		4. Copy of proposed maintenance schedules	Required	
14	6	**Training (Provision)**		
		1. Operating	Required	
		2. Maintenance	Required	
		3. Costing for training per person	XXXX	
15	7	**Quality Management**		
		ISO 9001 accreditation certificate	Required	
16	8	**Environmental Management**		
		ISO 14001 accreditation certificate	Required	

Note: Ticks, Cross [√, X], Astrick [*], 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: _____

Item No. 1 – ENERGISED MOBILE OIL REGENERATION AND FILTRATION PLANT

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_211**	**Proposed deviation**

Tender Number: _____

Tenderer's Authorised Signatory: _____

Name in block letters Signature

Full name of company: _____

ANNEXURE D – Stock Items

It is not intended that City Power should keep stock of these items.