

SCOPE OF WORK AND TECHNICAL SPECIFICATION

FOR CO-GENERATION EQUIPMENT SERVICE AND MAINTENANCE

AT

UNIVERSITY OF THE WITWATERSRAND

JOHANNESBURG

CO-GENERATION EQUIPMENT

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1. BACKGROUND AND PURPOSE

The University of Witwatersrand, Johannesburg ("the University") has three co-generation plants. These were installed at different times. They consist of one at Junction Campus, one at Three Sisters and one at Hall 29. The co-generation systems are used for electricity generation and hot water heating.

It is essential that these systems are maintained regularly to extend their lifespan. The university has therefore increased the service frequency according to the system manufacturer and number of operating hours.

For this reason, it is important for the University to procure the services of accredited and experienced Service Provider to perform preventative and corrective maintenance on the co-generation equipment.

2. SCOPE OF WORK

This specification covers the general repair, servicing and maintenance of co-generation plants, which include the following:

Item	Site	Current hours in operation
1	Junction	+28 623
2	Three Sisters	+9713
3	Hall - 29	+15034

This specification shall form an integral part of the repair and maintenance contract document. The bidders shall make all reasonable efforts to assess existing system and determine what is required to maintain it or make necessary upgrades to ensure that it operates efficiently. The cost of improvements or upgrades will be included in the BoQ as specified. The university will give bidders access to the existing system to allow them to assess the functionality of the current systems.

3. DEFINITIONS

Call Out	A request by the University for the Service Provider to act because of equipment or related failure, requiring the Service Provider to visit the site outside of scheduled preventative maintenance.
Down time	The period the equipment is not in operation due to equipment failure, breakdowns, unplanned repairs and periodic re-commissioning/re-adjusting of the equipment systems. This includes the response and repair time.
Emergency	Urgent situation as a result of any equipment part, system failure, or malfunction that results in downtime and impacts on the University's activities or is life threatening.

4. ABBREVIATIONS

Term / Acronym	Definition
AC	Alternating Current
BoQ	Bill of Quantities
BS	British Specification
CPS	Campus Protection Services
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety
SANS	South African National Standards

5. STANDARD SPECIFICATIONS

5.1 SANS SPECIFICATION

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall deemed to form part thereof.

SANS and other specifications and codes

SANS 10142-1	-	Wiring of Premises – Part 1: Low-voltage installations
SANS 10292	-	Energy efficiency in buildings
SANS 10400	-	The application of the National Building Regulations
SANS 347	-	Categorization and conformity assessment criteria for all pressure equipment
SANS 60034 series	-	Rotating electrical machines

5.2 OHS, MUNICIPAL AND MANUFACTURERS' STANDARDS

5.2.1 Occupational Health and Safety Act of 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act, 1993 (Act no 85 of 1993) shall be adhered to.

5.2.2 Manufacturers' specifications, codes of practice and installation instructions

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

5.2.3 Municipal regulations, laws and by-laws

All municipal regulations laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

6. CONTRACTUAL MATTERS

6.1 Contract Duration

The contract duration will be for 5 years.

6.2 Maintenance Reporting

The Service Provider shall submit two types of documents in writing to the University on an ongoing basis, namely:

- A service log, after every service or inspection.
- Quarterly reports

The service logs must highlight:

- Date and time of service.
- The equipment model and serial number being serviced.
- The maintenance tasks performed such as inspections, repairs, or replacements, and the like. This will include readings, test results and checklists.
- Issues that were encountered during the service and the actions taken to resolve them.
- Recommendations for future maintenance.
- Materials used, including quantity and cost.
- Record of the personnel involved in the maintenance activities.
- Faults found and their priority.

The service log must be submitted to the University, and the subsequent maintenance activities must factor in previous outcomes where required.

Monthly written reports will be required by the University which document all maintenance activities and incidents for that period. The reports are to be succinct and compiled with care. The reports referred to here are separate to the service logs but can be deemed to communicate a summary of events for the month.

6.3 House Keeping

All rubbish and waste arising from the services provided must be removed by the Service Provider at no cost to the University and the site and buildings are left in a clean and tidy condition.

The Service Provider must provide an environmental management plan, that addresses aspects such as but not limited to: electronic waste disposal, gas leaks, and the like.

6.4 Response Times

The required response time for Call Outs and other events is as follows:

- Priority 1 (Emergencies) – within 1 hour. A failure that, for any reason, results in one or more of the pieces of Equipment not operating.
- Priority 2 (Urgent) – within 3 hours. A failure that does not stop a piece of Equipment from operating but may jeopardize people, the Customer's facilities or the Equipment.
- Priority 3 (General) – within 6 hours. A failure that does not stop a piece of Equipment from operating, however if the failure is not attended to in the medium or long term, it could cause a greater and/or more serious level of failure.

Any work / event requiring extended repair time shall be discussed and agreed between the University and the Service Provider.

6.5 Working Hours

All planned work should be carried out during normal working hours (7am to 5pm) on days and time agreed with the University.

The University shall issue the Service Provider with the Academic Calendar for each year. This document shall contain key dates that may limit the nature of the work that may take place.

6.6 Payment

The University does not allow upfront payments. All payments will be made within 30 (thirty) days of submitting an invoice. However, where an EME as per the B-BBEE Codes has been appointed as a successful service provider, shorter payments may be considered as part of supplier development, subject to prior written approval by the University.

The rates indicated in the bill of quantities must be adhered to when preparing the invoice. Works involving ad hoc replacement of parts shall be in line with the tendered rates, have sufficient detail provided, and pre-approved by the University.

6.7 Sub-Contracting

The University's preference is to contract directly with all service providers. Should specialised services be required that the appointed Service Provider is unable to perform in-house, the Service Provider may engage a subcontractor only with the prior written consent of the University's authorised representative.

6.8 Workmanship

Works with poor workmanship and unauthorized spares will not be accepted. Acceptance of the maintenance work shall be by means of review and approval of the submitted and fully completed service log by the University. The University may, from time to time, elect to oversee any of the tests or inspections relating to the maintenance activities or request a retest to satisfy the University personnel of satisfactory functioning of the equipment.

The University reserves the right to withhold payments until the quality of the Services is fit for purpose. The Service Provider must have a quality management system such as ISO 9001:2015 or similar in place, and proof of such is to be provided with the bid. The quality management system must encompass, but not be limited to:

- Structured record keeping and retrieval.
- Record keeping for an established duration.
- The Issuance of reviewed service logs by authorised personnel.

In addition to the services being fit for purpose, they should also meet the manufacturer's performance standards.

6.9 Failure to Comply

The Services will be monitored, and penalties will be imposed. Penalties will be imposed as follows:

If the service provider fails to adhere to the provisions of the priority levels described herein, the University reserves the right to levy a penalty fee against the services provider (in line with university policy). Continuous violation of these provisions will result in the contract being terminated.

6.10 Health and Safety

The Service Provider must maintain and submit a health and safety file every year for the duration of the contract to the University's authorised representative.

The Service Provider must ensure that:

- A second person is present during maintenance activities in the event of an accident, to ensure the emergency will be detected and help will be provided.
- Its personnel wear personal protective clothing and safety equipment.
- Suitably trained personnel perform the Services.

6.11 Qualified Personnel

The Service Provider must ensure that its personnel performing and overseeing the services be suitably qualified and accredited in the specific trade. The required key personnel for the Services are as follows:

The Service Provider must have at least one technician/artisan with at least 3 years' experience with gas generators and heat exchangers and another technician/artisan with electrical qualifications and at least 3 years' experience in cogeneration plants.

7 OPERATING AND MAINTENANCE MANUALS

The Service Provider shall be responsible for the compilation of an inventory list.

All information shall be recorded and reproduced in electronic format, as well as three sets of hard copies to be supplied to the University.

The Service Provider shall also be responsible for the compilation of the following:

- (a) Cataloguing of the co-generation equipment

All the co-generation equipment must be catalogued under the following headings:

- (i) Location and details of equipment
- (ii) Service date
- (iii) Service frequency
- (iv) Condition of equipment
- (v) History: Usage incidents, breaking, etc.

8.0 LOGGING AND RECORDING PROCEDURES

The Service Provider shall under this maintenance contract institute a logging and recording system as part of his maintenance control plan. This shall consist of a log and record book, which shall be utilised to log and record all service records, system checks, breakdowns, maintenance visits, inspections, etc.

The logbook shall be stored in a safe place as agreed with the University. Copies of the monthly entries and recordings into the logbook shall be submitted by the Service Provider together with his monthly report to the University or the University's representative.

The logbook shall be structured to include at least the following:

- (a) Service records
- (b) Inspection and maintenance actions
- (c) Breakdown reports
- (d) Inspection and test comments and reports.

9.0 REPAIR WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

9.1 CO-GENERATION EQUIPMENT

9.1.1 GENERAL

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve. The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all applicable additional specifications included in this document.

All new equipment, materials and systems shall be furnished with a written guarantee of a defects liability period of 12 months. These guarantees shall be furnished in favour of the University.

9.1.2 REPAIR WORK OF EXISTING CO-GENERATION SYSTEMS

The Service Provider shall at the start of the maintenance contract inspect, record and report on all the existing co-generating units listed in this specification.

This inspection and report shall comprise the following:

- (a) Establishing the condition of all systems,
- (b) Reporting all defects to systems,
- (c) Compliance of systems in respect of the governing regulations at the time of the start of the Contract,
- (d) Recording all systems with an identifying system,
- (e) Details of all systems,
- (f) Listing of latest service.

The Service Provider shall report on the above in writing to the University and/or University's Representative.

9.1.3 SITE ASSESSMENT AND INSPECTION

Site assessments shall include but not be limited to the following:

- (a) Conduct a detailed inspection of the co-generation units.
- (b) Identify any damaged, faulty, or non-working equipment.

9.1.4 FAULT-FINDING & DIAGNOSTICS

- a) Fault-finding and diagnostics of the co-generation units shall include but not be limited to the following:
Use appropriate test equipment and procedures to trace system faults. The Service Provider shall, when servicing or any other approved work, have available (on site) sufficient plant, tools and test equipment in sound working condition and of the required capacity for carrying out the work in an efficient and workmanlike manner. All tools / equipment should be appropriately marked.
- b) Should the University be of the opinion that the plant tools or test equipment used by the Service Provider are inefficient, inadequate or otherwise unsuitable for use on the works, he will have the right to instruct the Service Provider to provide such additional or approved plant, tools and test equipment which he considers necessary for carrying out the work in a satisfactory manner. Under no circumstances may tools / equipment be borrowed from the University.

9.1.5 REPAIR WORKS

Repair work to the co-generation units shall include, but not be limited to the following:

- a) Mechanical Repairs
- b) Electrical Repairs
- c) Instrumentation and Controls Repair
- d) Fuel Systems Repair
- e) Structural Repairs
- f) Safety and Compliance Related Repairs
- g) General Repairs

The Service provider to be paid as per the rate that is to be priced for in the Bill of Quantities.

9.1.6 TESTING & COMMISSIONING

Testing and commissioning to the co-generation units shall include, but not be limited to the following:

- (a) Conduct full functional testing of the repaired system.

9.1.7 REPORTING & HANDOVER

Reporting of the co-generation units repair work shall include, but not be limited to the following:

- (a) Provide a detailed service and fault report.
- (b) Submit a system restoration confirmation.
- (c) Provide maintenance recommendations.

9.1.8 DELIVERABLES

Deliverables shall include, but not be limited to the following:

- (a) Fault report and recommendations.
- (b) List of replaced components

10. MAINTENANCE TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

10.1 CO-GENERATING UNITS

10.1.1 GENERAL

Annual maintenance responsibilities for each installation including all units and components as specified, shall commence with access to the site.

This service shall include:

- (a) Routine preventative maintenance,
- (b) Corrective maintenance, and
- (a) Breakdown maintenance,

All maintenance work shall be executed in accordance with the relevant codes of practice, statutory regulations, standards, regulations, municipal laws and by-laws and the manufacturers' specifications and codes of practice.

All new equipment, components and materials supplied and installed under the maintenance contract shall be furnished with a prescribed manufacturer's guarantee.

10.1.2 ROUTINE PREVENTATIVE MAINTENANCE

The routine maintenance work to be performed and executed shall include but not be limited to the items listed below under the respective headings.
These actions and findings shall be logged and reported on the relevant approved schedules and reports.

Junction

The unit must be maintained every 500 hours of operation in accordance to the table below with an estimated operating hour of 8000 hours.

Year 1	
Item	Operating Hours
1	30 000
2	31 500
3	33 000
4	34 500
5	36 000

Three Sisters

The unit must be maintained for every 500 hours of operation in accordance to the table below with an estimated operating hour of 7500 hours. The 16 000-hour maintenance is a major service involving assessments of components.

Year 1	
Item	Operating Hours
1	10 000
2	10 500
3	11 000
4	11 500
5	12 000
6	12 500
7	13 000
8	13 500
9	14 000
10	14 500
11	15 000
12	15 500
13	16 000
14	16 500
15	17 000
16	17 500

Hall 29

The unit must be maintained for every 500 hours of operation in accordance to the table below with an estimated operating hour of 7500 hours. The 16 000 hour maintenance is a major service involving assessments of components.

Year 1	
Item	Operating Hours
1	15 000
2	15 500
3	16 000
4	16 500
5	17 000
6	17 500
7	18 000
8	18 500
9	19 000
10	19 500
11	20 000
12	20 500
13	21 000
14	22 000
15	22 500
16	23 000

10.1.3 CORRECTIVE MAINTENANCE

The Service Provider shall inspect and check all equipment, materials, systems and installations for any pending breakdowns, maladjustments or anomalies of equipment.

Any deficiencies identified shall be promptly reported and appropriate corrective actions shall be undertaken by the Service Provider.

10.1.4 BREAKDOWN MAINTENANCE

All breakdown maintenance shall be done in accordance with the relevant specifications, standards, regulations and codes.

The Service Provider shall provide the necessary spares, equipment and tools required to attend to any possible breakdowns.

- a) The Service Provider shall provide a standby phone that is always attended to – twenty-four (24) hours a day, seven (7) days per week, for the duration of the contract.
- b) All costs related to the standby service are for the Service Provider account i.e. procurement of the devices (this includes mobile phone, chargers and battery banks), airtime and data purchases, shall be at the cost of the Service Provider.
- c) The standby service shall be carried out at the cost as specified in the BoQ under Corrective Maintenance. Standby staff shall be equipped with adequate communication equipment to ensure a minimum delay in the response to emergency call-backs.
- d) In the event of faults or other events requiring urgent attention, the Service Provider shall guarantee attending to the request within 1 hour. Any work/event requiring extended repair time shall be discussed and agreed between the University.

SCHEDULE OF CO-GENERATION PLANT

The plants requiring maintenance and servicing are as follows:

Building	Code	Campus	Location	System	Alternator	M o d e l	Serial No	KVA	Engine	M o d e l	Serial No	Year	Controller		Supply
3 Sisters (Highfield)	4541	Education Campus	Highfield Boiler House	Grid tied 400v	Mecc Alte	ECO382L4	218709	300	Quantum ES	Q6.13TWSI	W000199E	2019	IntelliVision 5	Meter	Gas Line supply
Wits Junction	6024	Wits Junction	Block 24- Hot water Plant	Grid tied 400v	Mecc Alte	ECP322MA	1986358	63	KTV Gas	42-PRG10003	10019997	2017	IntelliVision 5	Meter	Gas Line supply
Hall 29	2239	West Campus	Hall 29 Plantroom	Grid tied 400v	Mecc Alte	ECO383S4	2126573	225	Scania	40BNT	2634639	2019	IntelliVision 5	Meter	Gas Line supply

Note: Tenderers are encouraged to conduct a site visit before submitting the quotation

Junction

Activity	50	1500	3000	4500	6000	7500	9000	10500	12000	13500	15000	16500	18000	19500	21000	22500	24000	48000
Oil change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oil filter change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check, log & adjust tappets/bridge pieces	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Test protection systems	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sparkplugs - change		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cylinder head - borescope					X				X				X					
Cylinder head - change																	X	X
Clean crankcase breather & foam element		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Replace element breather		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check oxygen in exhaust gas - no load		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check NOx in exhaust gas - full load		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check exhaust back pressure		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Airfilter - change (under normal conditions)		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Venturi - Inspect & Clean					X				X				X				X	X
Magnetic pick ups - clean and adjust					X				X				X				X	X
Piston rings and liners - replace																	X	X
Piston Change																	X	X
Starter motor brushes - inspect		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Governor actuator - overhaul																	X	X
Big end bearings - replace																	X	X
Big end bolts - replace																		X
ZPR diaphragm- replace																	X	X
Camshaft - replace																		X
Cam followers - replace																		X
Water coolant pump replace (where fitted)																	X	X
Front & rear oil seals - replace																	X	X
Oil pump - replace																	X	X
Pushrods - check for wear & straightness																	X	X
Main Bearings - replace																	X	X
Cylinder head bolts - replace																	X	X
Butterfly valve - overhaul																	X	X
Ignition coils - replace																	X	X
Oil cooler element - overhaul																	X	X

3 Sisters and Hall 29

Q-Series NATURAL GAS ENGINE- Maintenance Schedule

Activity	Engine running hours								
	Initial	Every 500	Every 1000	Every 2000	Every 4000	Every 8000	Every 16000	Every 24000	Every 32000
Check Engine Control System, check for diagnostic errors and rectify	x	x	x	x	x	x	x	x	x
Oil & filter changes. Recommend oil sampling required at every 500 hrs	x	x	x	x	x	x	x	x	x
Rocker box cover joints - replace	x		x	x	x	x	x	x	x
Check, log & adjust bridge pieces / tappets	x		x	x	x	x	x	x	x
Clean and adjust spark plugs	x								
Spark plug change Q6.71-Q6.72-Q5.9-Q6.13		x	x	x	x	x	x	x	x
Borescope the engine to assess the condition						x	x	x	x
Breather element – replace if fitted			x		x	x	x	x	x
Air filter – Replace (Subject to environment conditions)				x	x	x	x	x	x
Check tension and condition of the drive, fan alternator bolts	x	x	x	x	x	x	x	x	x
Change fan/ alternator belts					x	x	x	x	x
Cylinder head change							x	x	x
Cylinder head bolts- replace after 2 uses							x	x	x
Charge cooler/radiator-check and clean						x	x	x	x
Replace engine Thermostat							x	x	x
Check coolant antifreeze/inhibitor strength			x	x	x	x	x	x	x
Replace coolant						x	x	x	x
Check Hoses & replace if required						x	x	x	x
Check emissions- (Adjust if necessary)	x					x	x	x	x
Oil cooler assy- clean and overhaul if necessary						x	x	x	x
Turbocharger- Replace							x		x
Clean and inspect Gas Mixer and train					x	x	x	x	x
Gas Mixer and regulator diaphragm replace – if fitted							x		x
Magnetic pick-ups – clean & adjust					x	x	x	x	x
Check & calibrate ignition timing					x	x	x	x	x
Remove 1 piston, inspect liner and ring water						x	x		x
Small End bearing- inspect & replace if required							x		x
Inspect Piston cooling jets						x	x	x	x
Pistons and ring - replace								x	
Replace piston cooling jets								x	
Big end bearings and bolts - replace									x
Thrust washers - Replace									x
Main bearing and crank inspect and replace if required									x
Small end bearings and bolts replace								x	
Camshaft, camshaft bushes & cam follower assy – inspect and replace if required									x
Starter Motor – inspect/replace if required							x		x
Front & rear oil seals – inspect & replace if necessary							x		x
Pushrods – check for wear & straightness & replace if necessary							x		
Valve train gear – clean and inspect, replace if necessary							x		x
Spark plug HT leads replace							x	x	x
Oil pump replace								x	
Jacket Water Pump replace if fitted								x	
Connecting rod assembly replace									x
Clean centrifugal – if fitted				x					

WARRANTY

The Service Provider must provide at a minimum a twelve (12) month OEM warranty on the equipment after installation. Equipment that fails and is found to be defective in workmanship or materials shall be replaced by the supplier at its own cost with equipment carrying the same guarantee as the original offer. All workmanship shall be required to carry a twelve-month warranty