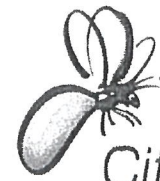




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City Power

Johannesburg

TITLE **STANDARD FOR THE
MAINTENANCE OF GIS**

REFERENCE
CP_TSSTAN_149
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FOREWORD

Recommendations for corrections, additions or deletions should be addressed to the:

Chief Engineer

Technical Support

City Power Johannesburg (SOC) Ltd

P O Box 38766

Booyens

2016

INTRODUCTION

The voltage level within City Power primarily ranges 11kV to 275kV as stipulated below:

(a) Medium Voltage (MV) (11kV to 44kV)

(b) High Voltage (HV) (44kV to 275kV)

Gas Insulated Switchgear (GIS) is widely used within City Power to open (under normal and / or fault conditions), isolate and earth sections of the power system.

This equipment is intended for outdoor or indoor application with controlled and secured access to the building and switching yards or housed within outdoor enclosures.

Maintenance of this equipment is crucial to ensure continued operational reliability as well as safety of personnel and public.

1. SCOPE

To provide routine and emergency maintenance as well as retrofit options, modification and condition monitoring systems and on-site service for City Power's medium and high voltage equipment at various transmission, distribution substations and load centres within its area of supply.

This equipment is of strategic importance in supplying electricity to City Power's customers. The on-site maintenance shall be done in accordance with the relevant original equipment manufacturer's standards where they exist.

2. NORMATIVE REFERENCES

The following documents contain provisions that, through reference in the text, constitute requirements of this specification. 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:

Occupational Health and Safety Act (Act 85 of 1993).

OHVRS – Operating High Voltage Regulations Standards.

Eskom task manuals that have been published for the maintenance of similar equipment specified in this specification.

City Power task manuals.

Original Equipment Manufacturer task manuals.

SANS 62271-100: High Voltage switchgear and control gear – Part 100: alternating current circuit breaker

CP_TSSPEC_006: 11kV RMU for type B MSS

CP_TSSPEC_017: Miniature Circuit Breaker

CP_TSSPEC_018: Moulded case Circuit Breaker

CP_TSSPEC_039: Free standing 11kV Metal Enclosed RMU

CP_TSSPEC_145: Specification for Post type circuit breaker up to 400kV

CP_TSSPEC_155: Specification for Oil Sampling and Analysis

CP_TSSTAN_014: Standard for the Management of Mineral Insulating Oil

CP_TSSTAN_022: Dry Ice Blasting Technology

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CP_TSCHEK_032: Checklist for detecting Partial Discharge on Transmission and Distribution Network

CP_TSCHEK_037: Pre-commissioning checklist for minisubs

CP_TSCHEK_041: Pre-commissioning checklist outdoor RMUs

CP_TSCHEK_052: Checklist for Indoor metalclad switchgear

CP_TSSPEC_040: Specification for Earth fault Indicators

CP_TSSPEC_173: Specification for the maintenance of high and medium voltage equipment and the supply of spare parts

3. DEFINITIONS AND ABBREVIATIONS

The definitions and abbreviations in the documents listed above shall apply to this standard. In addition, any reference to City Power shall mean City Power Johannesburg (Pty) Ltd.

HV – High Voltage

MV – Medium Voltage

GIS – Gas Insulated Switchgear

SHERQ – Safety Health Environmental Risk and Quality

PD – Partial Discharge

TEV – Transient Earth Voltage

OEM – Original Equipment Manufacturer

IED – Intelligent Electronic Device

LED – Light Emitting Diodes

PPE – Personal Protective Equipment

EFI – Earth Fault Indicator

GH – Group Head

VLF – Very Low Frequency

4. REQUIREMENTS

4.1 General

- 4.1.1 Resources dispatched to perform on-site maintenance should be competent and certified by the original equipment manufacturers (OEM) or proof of valid certified training to maintain GIS for the specified voltages.
- 4.1.2 Majority of the routine and emergency maintenance work shall be required to be done after normal working hours. All rates quoted should cater for this type of work. Provision for All required work, equipment (e.g. generators, lights, oil pumps etc..) should also be supplied by the contractor to perform the required maintenance.
- 4.1.3 During breakdowns it is imperative to arrive on site within the 90 minutes from notification. This work is performed on an "as and when" basis.
- 4.1.4 All spare parts must be purchased from the respective OEM if they still exist. In an event where the OEM is no longer manufacturing the switchgear type or its spares, a 5-years guarantee on all spare parts shall be provided

-
- 4.1.5 Any information furnished to the Service Provider by City Power shall be kept confidential at all times. If any information appears to be incorrect, erroneous or inaccurate, it shall be brought to the attention of the responsible City Power official.
- 4.1.6 The personnel employed by the Service Provider shall at all times carry valid relevant identification cards authenticating them as employees of the Service Provider in service of City Power.
- 4.1.7 City Power reserves the right, at its sole discretion, to award or not to award any contract, where it is not in the interest of City Power to do so, without furnishing any reasons.
- 4.1.8 Where an OEM uses a subcontractor to perform the required on-site maintenance, an employee of the OEM shall be on-site to supervise the subcontractor to verify work done and identify all potential issues that may occur. If the contractor is not an OEM, the authorised official accredited to work on the equipment shall be on-site all the time with their accreditation documents
- 4.1.9 City Power's tasks manuals shall be followed for all on-site maintenance work. Where these manuals don't exist, the OEM's task manual or Eskom's published task manuals shall be used prior to any work being executed on site. The responsible City Power official shall approve what work is to be carried out.
- 4.1.10 After completion of all maintenance work, the contractor shall perform on-site non-intrusive PD (ultrasonic and TEV) and infrared testing where applicable. The results shall be provided to the responsible City Power official prior to leaving the site.
- 4.1.11 All maintenance work and testing shall be always witnessed by a City Power official.
- 4.1.12 All contractors shall at all times wear City Power compliant PPE.

4.2 Quantities

There are approximately 191 high voltage GIS circuit breakers and approximately 12500 medium voltage GIS circuit breakers.

4.3 Ratings of the plant

Equipment differs in terms of various types of design and technologies that have been installed over a period of many years and it is therefore difficult to describe the plant in detail.

4.4 Installations

The equipment's insulating and interrupting medium in most cases is SF₆.

In some cases, two switches operate as one unit. In this case they will be priced as two separate switches, and individual reports shall be provided per switch. In the case of separate, free standing single pole units with individual operating mechanisms, they shall be classed as different switches. Installations may either be indoor or outdoor and all surrounding equipment is to be treated as alive at all times.

4.5 Inspection, maintenance and overhaul duties required for GIS (SF₆.)**4.5.1. Major overhauling of HV and MV circuit breakers**

Where major overhauling of circuit breakers is to be undertaken it shall include (but is not limited to) the following activities as detailed in Table 1 below:

Item	Description of task
1	Supply and replacement of gaskets/O-rings
2	Replacement of damaged/ brittle control wires
3	Inspection of contact wear
4	Degreasing and re-greasing of operating mechanism where applicable with a City Power's approved grease (See note 1)
5	Inspection of contact resistance test readings between main contacts
6	Inspection of insulation resistance of the switch (5kV/1 minute minimum) (See note 2)
7	Timing test – opening and closing (See note 3)
8	Inspection of SF ₆ and hydraulic pressures and refill if required to the correct specs (See note 5)
9	Replacing of SF ₆ explosion membranes and refill with new SF ₆ gas
10	Inspection of SF ₆ dew point and gas properties if required
11	Inspection operating mechanism for wear and damage, tighten where necessary and lubricate: a) Links and levers b) Tripping, closing and interlocking mechanism(s)
12	Inspection of auxiliary switches and secondary wiring for wear and damage, tighten connections where necessary, lubricate bearings and spray with a protective solution
13	Clean and inspect bushings for wear and damage and tighten where necessary
14	Inspect and where necessary repair or replace all ammeters and voltmeters on the panels. All ammeters are required to have maximum demand indicators.
15	After energizing perform non-intrusive Partial discharge testing after maintenance has been completed (Ultrasonic acoustic and TEV tests)
16	After energizing perform non-intrusive Infra-red testing after maintenance has been completed (Where possible)
17	Replacement of blown LV fuses

Table 1 – Major overhauling of HV and MV circuit breakers

NOTE 1: Full technical details of the grease to be used shall be submitted with the tender.

NOTE 2: The insulation resistance test shall be done for 1 minute at 5kV and shall be across each phase to earth, firstly with the main switch contacts closed and thereafter with the main switch contacts in the open position.

NOTE 3: Electronic tripping and closing coil profile graphs such as those obtained from "Programa" are preferred. Preference in awarding the contract shall be given to Tenderer's who have the ability to provide these timing curves.

NOTE 4: Correct oil management procedures to be followed at all times for the hydraulics.

NOTE 5: Refilling of SF6 and hydraulic pressures shall be done with the correct filling equipment.

- 4.5.1.1 The tenderer shall submit copies of all test result forms currently used by them. City Power reserves the right to either provide the forms to be used or to change the tenderer's forms to suit City Power's needs.
- 4.5.1.2 The following details are required per switch and shall be submitted on separate pages for each switch:
- a) Substation or satellite name;
 - b) Feeder board and distributor name;
 - c) Manufacturer of the switch;
 - d) Manufacturer's code e.g. 3AC XXXXXXXX;
 - e) Serial number of the switch; and
 - f) Bar coding of the switch will be introduced in the near future. Where fitted, the code shall be used to identify the switch as well.
- 4.5.1.3 The following tests shall be provided after the switch has been overhauled:
- a) Contact resistance test readings between main contacts;
 - b) Insulation resistance to earth and between phases;
 - c) Timing tests: on opening, the trip signal is issued until the main contacts open, and on closing, the closing signal is issued until main contacts close fully. (The maximum acceptable tripping times are given in 4.6.1.4 below);
 - d) Where used, SF6 pressures, dew points, properties, etc.
 - e) Non-intrusive partial discharge testing after maintenance has been completed (Ultrasonic acoustic and TEV tests)
 - f) Non-intrusive Infrared testing after maintenance has been completed (where possible)
- 4.5.1.4 After the overhaul of any switch the maximum acceptable tripping time will be 70ms for SF6.
- 4.5.1.5 If the trip time test results of three consecutive tests do not comply with the above tripping time even after further adjustment, this shall be brought to the attention of the Responsible City Power official for further action before the switch is returned to service.
- 4.5.1.6 Where indoors, the breakers shall be dusted prior to being worked on and wiped down upon completion of the work.
- 4.5.1.7 Where outdoors, the skirts on the circuit breakers shall be cleaned and all pollution, birds' nests, etc. shall be removed.
- 4.5.1.8 If an urgent problem is discovered during maintenance that requires immediate attention, it shall be brought to the Responsible City Power official's attention immediately. The recommended remedial actions to resolve the urgent problem shall be discussed and appropriate actions shall be taken before leaving site.
- 4.5.1.9 The results of all tests carried out on any switch shall be sent to City Power within a period of 48 hours after completion of the test.

4.5.2. Maintenance of switchgear panels and related secondary equipment

The maintenance on the switchgear panels with which the circuit breaker is associated will be scheduled for maintenance at specified intervals. The following maintenance/inspection tasks shall be performed (but is not limited to) (see Table 2 below):

Item	Description of task
1	Tighten all connections to manufacturer's specified torque
2	Inspect the condition and clean all cable and busbar insulators and bushings
3	Test and ensure availability of DC voltage for protection and SCADA purposes
4	Verify the protection relays condition and status. (Alarms to be reported)
5	Ensure that all auxiliary wiring is intact and numbered as per the wiring diagrams. Replace if required.
6	Inspect and test racking mechanisms of circuit breaker and panel
7	Replace missing or broken operating and charging handles, bolts and panel covers if required
8	Inspect panel interlocks for correct operation where installed
9	Inspect and where necessary repair, restore or replace all ammeters and voltmeters on the panels. All ammeters are required to have maximum demand indicators
10	Inspect and where necessary repair or install, restore or replace all indication lamps, LEDs and panel heaters
11	General cleaning of panels, switchgear, CT and VT, busbars and cable terminations, etc. (carbon discharge from previous faults, dust, grease, moisture, etc.)
12	Repainting of panels with the OEMs recommended paints where required. Busbar end plates and shutters shall be painted red and cable shutters shall be painted yellow
13	Inspect and where necessary repair, restore or replace AC and DC time lag fuses
14	Clean circuit breaker position indications to ensure visibility
15	Verify all CT ratios and wiring condition
16	Inspection of all earthing systems and replace where missing
17	Replacing of designation labels where required to be in line with updated operational line diagrams
18	Before energizing perform over voltage pressure withstand testing at $2U_0$ for 5mins per phase of all MV busbars with AC or VLF source test equipment (no DC testing is permitted)
19	After energizing perform non-intrusive partial discharge testing after maintenance has been completed (Ultrasonic acoustic and TEV tests)
20	After energizing perform non-intrusive Infrared testing after maintenance has been completed (Where possible)

Table 2 – Switchgear panels and related secondary equipment routine maintenance

4.5.3 Maintenance of MV RMU and compartment for GIS (SF6)

The maintenance of this equipment will be at scheduled intervals, in line with recommended practice. The following maintenance/inspection tasks shall be performed (but is not limited to) (see Table 3 below):

Item	Description of task
1	Inspect and ensure the correct operation of the mechanisms and all interlock where applicable
2	Inspection of insulating medium levels or pressures and refill to the correct levels or pressures as required
3	Inspection of insulating medium leaks and repair if possible
4	Inspection for the signs of partial discharge and tracking activity
5	Inspection of the condition of insulators and replace where necessary and possible
6	Inspection of the condition of fixed contacts and moving blades and replace where necessary
7	Inspection of the condition of the cable terminations and cable clamping arrangements and rectify if possible during maintenance period
8	Clean cable terminations and ensure shrouds are installed correctly
9	Replace missing or broken operating and charging handles, bolts and panel covers if required
10	Test and ensure the voltage indicating systems are working correctly
11	Retrofit cable testing earthing facility on all functions where required to ensure the safety of operating staff. All connections to be tightened to the correct torque settings of the OEM recommendations
12	Replacing of designation labels where required
13	Inspection of the earthing and replace if broken or missing
14	Test earth fault indicator (EFI) if installed in the MV compartment
15	Replace defective EFI if necessary
16	General cleaning of MV compartment and insulating components.
17	Replace locks on MV compartment if required
18	Reinstate vermin proofing if necessary
19	After energizing perform non-intrusive Partial discharge testing after maintenance has been completed (Ultrasonic acoustic and TEV tests)
20	After energizing perform non-intrusive Infra red testing after maintenance has been completed (Where possible)

Table 3 – MV RMU and compartment routine maintenance

4.5.4 Major overhauling maintenance of HV Gas Insulated Switchgear (GIS) bays

The maintenance of this equipment will be at scheduled intervals, in line with recommended practice. The following maintenance/inspection tasks shall be performed (but is not limited to) (see Table 4 below):

Item	Description of task – Circuit Breakers
1	Record all circuit breaker data on the service report per GIS Bay.
2	Test and record the SF6 gas pressure using a test manometer.
3	Test calibration of the Circuit breaker Pressure gauges against the Test Manometer.
4	Test and record functions of the SF6 gas density monitor.
5	Inspection of the condition of the Rupture diaphragm and rubber seal.
6	Measure the SF6 gas dew point and Gas purity and record.
7	Drain the SF6 gas using the City Power SF6 (an appropriate) gas recovery and handling unit.
8	Process the SF6 gas until it meets OEM specifications.
9	Open the interrupter unit and clean all surfaces.
10	Carry out a visual inspection of the contact assembly, note any irregularities.
11	Inspection of the silver plating of the contact area.
12	Inspection of the Arcing Rings and arc quenching nozzles for burn off, note excessive burn off. The following are the acceptable limits - pitting of 3mm Diameter and depth of 0.5mm.
13	Inspection of the moving parts inside the Gear head, clean and regrease as specified.
14	Clean the interior of the interrupter unit.
15	Replacement of all filter medium, note quantity and location.
16	Reseal the chamber using new seals as supplied.
17	Draw vacuum to OEM specification and monitor for leaks.
18	Refill with SF6 gas that complies with the OEM specification.
19	Inspection of all opened seals for leaks using an SF6 detector.
20	Measurement of the SF6 gas dew point and Gas purity.

Item	Description of task – Hydraulic Systems
1	Visual inspection of the hydraulic system and inspection for leakage on pipe and hose connections.
2	Visually inspect the valves and driving mechanisms for leaks or abnormalities.
3	Inspect the internal leak (blowback) at rated pressure using a test manometer.
4	Release the Hydraulic pressure and inspection function of alarms and lockouts.
5	Sample the Oil in the Hydraulic reservoir; Clear red oil = pass Turbid or milky oil = fail
6	Drain and clean the hydraulic tank and intake filter.

7	Replacement of the pump hose and fill with new oil.
8	Venting of the hydraulic System at all vent points.
9	Inspection of the operation of the oil pressure switches.

Item	Description of task – Nitrogen Pressure Accumulator
1	Measure the nominal priming pressure and record.
2	Measure the indirect reading of rising hydraulic pressure.
3	Recharging of nitrogen if required, measure and record pressure.
4	Replacements of limit switch S2.
5	Replacement of the hydraulic motor cam gearbox coupling.
6	Inspection of all solenoids for tightness and signs of wear.
7	Inspection of all locking elements.
8	Inspect the operation of the anti-condensation heaters.
9	Inspect the signs of corrosion or defective paint work, repair as required.
10	Inspect the operation of the oil pressure switches.

Table 4 – GIS bay major overhauling maintenance

4.6 Access and responsibility

- 4.6.1 The contractor shall sign a permit to work before being allowed to work on any equipment.
- 4.6.2 At no time shall the contractor's personnel be allowed to be on the premises or worksite without a responsible person from City Power being on site. Any violation of the above will mean instant cancellation of the contract and of any work being undertaken.
- 4.6.3 The contractor shall sign City Power's standard contractors' responsibilities form that will be provided to the successful tender.
- 4.6.4 On being awarded the tender, the contractor shall provide City Power with a safe working procedure for every job to be undertaken.
- 4.6.5 Before commencing any work on site, the contractor shall be required to complete a standard City Power workplace risk assessment form, which shall be returned with the invoices and paperwork.
- 4.6.6 All materials and test equipment required to maintain City Power's switchgear shall be supplied by the contractor.
- 4.6.7 Whilst every effort is made to isolate the equipment as early as possible, City Power takes no responsibility for delays in or cancellation of the proposed isolation due to network constraints.
- 4.6.8 Most work shall be undertaken either after normal working hours or over weekends.

4.7 Ad-hoc / additional work

Ad-hoc spares that may be required shall be provided on this tender. All spare parts shall be new and shall be purchased from the original equipment manufacturers. In a case the OEM does not exist anymore, spare parts to be purchased shall be agreed between the Service Provider and City Power responsible official.

A detailed list of possible spares and pricing shall be provided with the tender submission.

Proof of purchase of all spare parts from the original equipment manufacturers shall be made available if requested so by City Power (Price must also be included on the proof of purchase).

4.8 Experience of contractors

4.8.1 Extensive details of relevant work previously undertaken shall be provided together with contactable references. Full details shall be provided with the tender submission.

4.8.2 Recent written approval from the original equipment manufacturers (not older than 3 years) shall also be supplied to prove relevant competence to adequately maintain the respective switchgear for the respective capabilities provided in the above experience.

4.9 A 24-hour emergency service

4.9.1 A 24-hour emergency service, to address any problems that may arise, is required.

4.9.2 A dedicated contact number with 24/7/365 availability shall be supplied to City Power by the Service Provider.

4.9.3 It is important to note that the number being unavailable or unreachable by City Power personnel at any time will be viewed in an extremely serious light and may lead to penalties or cancellation of the contract.

4.10 Reports

The reports shall be submitted via email with a hard copy issued later (within one week) to the responsible City Power official concerned.

4.11 Roster

City Power shall supply the contractor with the list of equipment that needs to be overhauled with the exception of emergency work. Every effort shall be made to group this work (routine maintenance) in geographical areas.

4.12 Compulsory City Power training courses

All contractor staff shall attend compulsory City Power induction, OHVRS (regulations) and SHERQ training courses before being allowed into any substation.

Contractors who have not attended these training courses shall not be permitted to enter any work site or carry out any work for, or on behalf of, City Power.

4.13 Special considerations and performance measurement

- 4.13.1 All contractors shall ensure that the Occupational Health and Safety Act is strictly adhered to. Environmental legislation impacting on the work to be carried out shall also be adhered to.
- 4.13.2 Performance shall be measured according to response on requests by City Power after work completion to submit relevant paperwork, documents and reports within 7 working days
- 4.13.3 A monthly meeting will be held with the responsible City Power official at the premises of City Power at Reuven (or as otherwise agreed to by both parties) to evaluate the Contractor's performance.
- 4.13.4 City Power reserves the right to inspect all the aspects of performance measurements at any time, without the approval of, or informing, the contractor.
- 4.13.5 City Power has the right to any information as required by any City Power officials.
- 4.13.6 City Power reserves the right to award or split the contract in whichever way, at its sole discretion.

4.14 City Power's responsibilities

- 4.14.1 To provide the Service Provider, to the best of its ability, with current information relevant to the execution of the required maintenance.
- 4.14.2 To advise the Service Provider in terms of this contract, of any changes to the working environment and/or responsible personnel nominated by City Power.
- 4.14.3 City Power shall audit the Service Provider on a regular basis to ensure that work has been executed to the high standards of the original equipment manufacturers.
- 4.14.4 To process legitimate invoices as early as possible.
- 4.14.5 Responsible for switching, earthing and the issuing of permits. Under no circumstances shall any contractor work on City Power's network without a valid permit.

4.15 Service provider's responsibilities

The following are deemed some of the most pertinent responsibilities of the Service Provider. The responsibilities are not definitive or exhaustive and the responsibilities of the Service Provider are not limited to those listed below:

- 4.15.1 Conformance to and compliance with the standards and policies of City Power and to familiarize themselves with all such standards and policies.
- 4.15.2 To carry out all instructions issued by City Power, in respect of the contract, and to ensure that all deadlines and criteria are met.
- 4.15.3 To communicate any information gained or findings to the responsible City Power official made during the execution of this contract that may be beneficial to City Power.
- 4.15.4 All sub-contractors requirements remains the full responsibility of the Service Provider.
- 4.15.5 The contractor will also ensure that all equipment and tools are maintained and in good order so as to comply with City Power's safety standards.
- 4.15.6 All staff shall be employed by the Service Provider and shall not be staff of City Power.
- 4.15.7 City Power customers shall be treated with respect whilst contractors are engaged in performing duties in and around their premises.

- 4.15.8 The contractor shall also ensure that all staff wear the correct PPE at all times, so as to comply with City Power's safety standards. Safety of staff and public cannot be compromised at any time, and should there be safety concerns, the Service Provider shall inform the City Power responsible official

4.16 Dry ice cleaning of equipment

- 4.16.1 Dry ice cleaning is a technology that is acceptable for cleaning of switchgear panel and other electrical and insulating equipment.
- 4.16.2 Dry ice cleaning is only permitted on completely isolated and earthed equipment.
- 4.16.3 Before and after dry ice cleaning the respective carbon and dust residue shall be removed from all panels with a vacuum cleaner and with a cloth.
- 4.16.4 Extractor fans shall be utilized during the dry ice clean process.
- 4.16.5 Before energizing perform over voltage pressure withstand testing at $2U_0$ for 5mins per phase of all MV busbars with AC or VLF source test equipment (no DC testing is permitted).
- 4.16.6 After energizing perform non-intrusive partial discharge testing after maintenance has been completed (Ultrasonic acoustic and TEV tests).
- 4.16.7 Dry ice cleaning shall be per panel inclusive of the circuit breaker and all compartments.

4.17 Type tested remote switches for retrofit circuit breaker

- 4.17.1 To ensure safety of operators, the Service Provider shall provide details of remote operating pendant controls on medium voltage panels. These remote switches shall ensure that no operator stand in front of any medium voltage panels to open and close any medium voltage circuit breaker.
- 4.17.2 The design of the remote switches shall require the preparation of installed medium voltage panels to be rewired and make provision for a plug-in remote control unit.
- 4.17.3 A suitable, self-retaining panel connector shall be supplied. The plug-in position of the panel connector shall be at the front of the switchgear panel.
- 4.17.4 The umbilical lead of the pendant control shall be minimum length of 20m in so as to achieve electrical opening and closing from outside the substation. The pendant control box shall have an ingress protection.
- 4.17.5 The Service Provider shall inform City Power responsible official on any monitoring device found during maintenance and the City Power official shall advise the Service Provider to proceed with the maintenance or not.

4.18 On site GIS asset inspection and condition assessment services and computerized tools

To ensure reliability of supply the service provider shall provide details of available on-site GIS inspection and condition assessment services and computerized tools.

5. TESTS

All routine tests as required in terms of this specification and any additional recommended original equipment manufacturer shall be performed.

6. MARKING, LABELING AND PACKAGING

Where no proper designation labels exist on switchgear being maintained, they shall be replaced by the contractor in conjunction with approval from the responsible City Power official.

7. TRAINING

Training shall be given to City Power personnel during maintenance intervals for the duration of the contract and the cost shall be built into the pricing structure. No extra costs in this respect shall be entertained.

8. DOCUMENTATIONS

4.8.1 Documentation as detailed in this specification shall be submitted with the original tender submission.

4.8.2 The onus is on the tenderer to ensure that they meet the requirements and is conversant therewith.

9. QUALITY MANAGEMENT

A quality management plan/system shall be set up to assure the proper quality management of the maintenance of gas insulated switchgear and supply of spare parts during design, development, production, installation and servicing phases. Guidance on the requirements for a quality management certificate may be found in the ISO 9001:2015 standard. The details shall be subject to agreement between City Power and the Service Provider.

10. ENVIRONMENTAL MANAGEMENT

An environmental management plan/system shall be set up in order to assure the proper environmental maintenance of gas insulated switchgear and supply of spare parts 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 ISO 14001:2015 standard. The details shall be subject to agreement between City Power and the Service Provider. This is to ensure that the asset created conforms to environmental standards and City Power SHERQ Policy.

11. HEALTH AND SAFETY

A health and safety plan/system shall be set up to ensure proper management and compliance of the maintenance of gas insulated switchgear and supply of spare parts during installation operation, maintenance, and decommissioning phases. Guidance on the requirements of a health and safety certificate may be found in ISO 45001:2018 standard. 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 Service Provider.

ANNEX A - BIBLIOGRAPHY

None

ANNEX B - REVISION INFORMATION

DATE	REV. NO.	NOTES
June 2021	0	First issue
February 2025	1	General editing Added new workgroup committee Under introduction: Changed High Voltage range from (HV) (44kV to 220kV) to (44kV to 275kV) Moved paragraphs from scope to general requirements

ANNEX C - PRICE SCHEDULES**Section 1: Inspection, maintenance and overhaul of high voltage circuit breakers**

Item	Sub-clause of CP_TSSPEC_149	Description	
1		Name of the switchgear	
2		Type of switchgear	
3		Voltage rating of the switchgear	
5	4.6.2	Inspection of all contacts and arc quenching devices	
6		Washing and cleaning of all components, including tanks or switch chamber	
7	4.6.1	Wiping of the inside of the tank with lint-free cloths (e.g. chamois)	
8	4.6.1	Supply and replacement of gaskets/ o-rings	
9		Fitting of contacts	
10	4.6.1	Inspection of contact wear	
11	4.6.1	Replace damaged/brittle control wires	
14	4.6.1	Degreasing and re-greasing of operating mechanism with a City Power approved grease	
15		Inspection of ductor reading between main contacts	
16	4.6.1	Inspection of insulation resistance of the switch (5 kV/1 minute minimum) (See note 2)	
17	4.6.1	Timing test – opening and closing (See note 3)	
18	4.6.1	Inspection of SF ₆ and hydraulic pressures and refill if required	
NOTE: TICKS [✓×], ASTERISK [*], WORD [NOTED], OR TBA [TO BE ADVISED] SHALL NOT BE ACCEPTED.			

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Full name of company: _____

SCHEDULES (CONTINUED)

Section 1: Inspection, maintenance and overhaul of high voltage circuit breakers (continued)

Item	Sub-clause of CP_TSSPEC_173	Description	
19	4.6.1	Replacing of SF ₆ explosion membranes and refill with new SF ₆ gas	
20	4.6.1	Inspection of SF ₆ dew point and gas properties if required	
22	4.6.1	Inspection auxiliary switches and secondary wiring for wear and damage, tighten connections where necessary, lubricate bearings and spray with a protective solution	
23	4.6.1	Clean and inspection bushings for wear and damage and tighten where necessary	
25	4.6.1	Inspection of all ammeters and voltmeters	
26	4.6.1	Replace all ammeters and voltmeters on the panels. All ammeters are required to have maximum demand indicators	
27	4.6.1	Inspect and test all indication circuits	
28	4.6.1	Repair all indication circuits	
29	4.6.1	Inspect all CT ratios	
30	4.6.1	Inspection for corona discharge on CTs	
31	4.6.1	Replace blown LV fuses	
NOTE: TICKS [✓×], ASTERISK [*], WORD [NOTED], OR TBA [TO BE ADVISED] SHALL NOT BE ACCEPTED.			

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Full name of company: _____

ANNEX C - SCHEDULES**Section 2: Inspection, maintenance and overhaul of medium voltage circuit breakers**

Item	Sub-clause of CP_TSSTAN_149	Description	
1		Name of the switchgear	
2		Type of switchgear	
3		Voltage rating of the switchgear	
5	4.6.1	Inspection of all contacts and arc quenching devices	
6	4.6.1	Washing and cleaning of all components, including tanks or switch chamber	
7	4.6.1	Wiping of the inside of the tank with lint-free cloths (e.g. chamois)	
8	4.6.1	Supply and replacement of gaskets/ O-rings	
9	4.6.1	Fitting of contacts	
10	4.6.1	Inspection of contact wear	
11	4.6.1	Replace damaged/brittle control wires	
12	4.6.1	Test oil for moisture and dielectric strength if required	
14	4.6.1	Degreasing and re-greasing of operating mechanism with a City Power approved grease	
15	4.6.1	Inspection of ductor reading between main contacts	
16	4.6.1	Inspection of insulation resistance of the switch (5 kV/1 minute minimum) (See note 2)	
17	4.6.1	Timing test – opening and closing (See note 3)	
18	4.6.1	Inspection of SF ₆ and hydraulic pressures and refill if required	
NOTE: TICKS [✓×], ASTERISK [*], WORD [NOTED], OR TBA [TO BE ADVISED] SHALL NOT BE ACCEPTED.			

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Full name of company: _____

SCHEDULES (CONTINUED)

Section 2: Inspection, maintenance and overhaul of medium voltage circuit breakers (Continued)

Item	Sub-clause of CP_TSSTAN_149	Description	
19	4.6.1	Replacing of SF ₆ explosion membranes and refill with new SF ₆ gas	
20	4.6.1	Inspection of SF ₆ dew point and gas properties if required	
	4.6.1	Inspection operating mechanism for wear and damage, tighten where necessary and lubricate:	
21		a) Links and levers	
		b) Tripping, closing and interlocking mechanism(s)	
22	4.6.1	Inspection auxiliary switches and secondary wiring for wear and damage, tighten connections where necessary, lubricate bearings and spray with a protective solution	
23	4.6.1	Clean and inspection bushings for wear and damage and tighten where necessary	
25	4.6.1	Inspection of all ammeters and voltmeters	
26	4.6.1	Replace all ammeters and voltmeters on the panels. All ammeters are required to have maximum demand indicators	
27	4.6.1	Inspect and test all indication circuits	
28	4.6.1	Repair all indication circuits	
29	4.6.1	Inspect all CT ratios	
30	4.6.1	Inspection for corona discharge on CTs	
31	4.6.1	Replace blown LV fuses	
NOTE: TICKS [✓*], ASTERISK [*], WORD [NOTED], OR TBA [TO BE ADVISED] SHALL NOT BE ACCEPTED.			

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Full name of company: _____

SCHEDULES (CONTINUED)**Section 3: SF₆ panel routine maintenance**

Item	Sub-clause of CP_TSSTAN_149	Description	
1		Name of switchgear	
2		Type of switchgear	
3		Voltage rating of switchgear	
4	4.6.2	Inspect the condition of bus bars, its insulation and bolts	
5	4.6.2	Clean the bus bars and tighten the bolts	
6	4.6.2	Tighten all connections to manufacturer's specified torque	
7	4.6.2	If busbar end plates have faded, repaint (Signal Red)	
8	4.6.2	If DC supply exists for protection, test and ensure availability of correct voltage	
9	4.6.2	Inspection condition of all cable and busbar orifices	
10	4.6.2	Ensure that all auxiliary wiring is intact	
11	4.6.2	Inspection and test racking mechanisms	
12	4.6.2	Inspection springs and spring mechanisms	
13	4.6.2	Replace broken or missing ammeters/voltmeters	
14	4.6.2	General cleaning of switchgear	
15	4.6.2	Inspect condition of time lag fuses and replace where necessary	
16	4.6.2	Replace missing/broken operating/charging handles	
17	4.6.2	Clean circuit breaker position indications to ensure visibility	
18	4.6.2	Inspection earthing and replace where missing	
NOTE: TICKS [✓x], ASTERISK [*], WORD [NOTED], OR TBA [TO BE ADVISED] SHALL NOT BE ACCEPTED.			

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Full name of company: _____

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.

Section and Item No.	Sub-clause of CP_TSSTAN_149	Proposed deviation

Tender Number: _____

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

Full name of company: _____

ANNEX D - STOCK ITEMS

Not applicable