

# Annex A - Statement of Work

22-198066 – Building Maintenance of the Chancery of the Embassy of Canada to Tunisia

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The Contractor will be responsible for preventive and corrective maintenance operations at the Chancery of the Embassy of Canada to Tunisia and provide various services in accordance with requirements, calling on internal or external experts to proceed with repairs or obtain the required specialized material. These services are subject to the approval of the Advisor (Management) and Consul upon presentation of a detailed estimate.

### **PART I – OBJECTIVES**

The Contractor agrees to meet the following objectives:

- Improving reliability and optimizing facility operations
- Developing the activity information network (ad-hoc and periodic reports)
- Implementing an energy-efficiency strategy
- Measuring services via relevant indicators
- Ensuring equipment sustainability
- Developing operating efficiencies
- Implementing a technical progress plan (recommendation and advice)
- Maintaining the safety and security of people and property
- Optimizing costs for services
- Implementing best practices
- Providing the tools needed to perform tasks

Meeting this objective will require the Contractor to:

1. Carry out a technical analysis of the chancery facilities
2. Implement a preventive maintenance plan
3. Perform curative maintenance
4. Manage, coordinate and monitor services
5. Procure the human resources required to perform the work
6. Monitor contracts and produce reports

#### **1. Technical analysis of Embassy facilities**

- 1.1. This must be done at the beginning of the contract. This comprehensive analysis of the technical facilities will make it possible to organize and define priority actions when taking control of the site.

#### **2. Implementation of a preventive maintenance plan**

- 2.1. The Contractor will establish the preventive maintenance plans for all of the site's technical facilities, specifying the contents of the preventive maintenance plans, their frequency and completion times in full compliance with the Request for Proposal (RP) specifications.

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- 2.2. The maintenance plans, thus established, must meet all of the requirements in the RP statement of work subject to this contract, forming an integral part of this RP and attached in PART II. Monthly, quarterly, semi-annual and annual reports must be submitted to the Embassy of Canada technical authorities, demonstrating the results of inspections, preventive maintenance follow-up and recommendations.
- 2.3. The Contractor will establish a monthly preventive maintenance schedule that must be submitted in advance to the Embassy's technical authority for approval. At the specified date, the technician(s) must be present to perform the preventive maintenance operations and will submit the tracking sheets or checklists after completing them together with a record of action containing notes on the operation.

### **3. Curative maintenance**

- 3.1. When a component requires curative maintenance, the Embassy will send a request with as much detail as possible about the defective equipment, and the Contractor will ensure that the information is processed through the headquarters' coordination service and that a technician is sent to perform the maintenance in coordination with the team leader. These operations will be documented in a report.
- 3.2. Upon receiving a request for action, the Contractor's coordination service must process the information and assign a technician based on the nature of the problem and the equipment required, in coordination with the team leader.
- 3.3. The response will be conducted as follows:
  - a. Secure the area or room (shut off power, electrical isolation, etc.)
  - b. Observe and diagnose malfunction (Contractor's most qualified technician must be present)
  - c. Assign and mobilize personnel for response
  - d. Take quick inventory of the parts required to repair and restore the equipment to proper working order. Establish procurement specifications for the parts if necessary
  - e. Restore the equipment to proper working order (after Embassy approves estimate)
  - f. Report and conclude response
- 3.4. If there are issues, the Contractor must implement all additional material means required to remedy the situation. These issues will be noted in the report, and technical analyses will be done to identify causes and take appropriate action.
- 3.5. For all outages/malfunctions of an urgent nature, the Embassy requires the situation to be addressed and resolved within 24 hours. Urgent situations are those in which the safety of personnel, information, documents, continuity of operations or Embassy property are endangered.

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### **4. Management, coordination and monitoring of services**

- 4.1. To ensure that the work performed can be tracked, the following documents must be prepared and maintained by the Contractor (identifying the team leader) and made available to the Embassy's technical service for verification:
- a. Request follow-up record
  - b. Logbook of interventions (curative and preventive)
  - c. Preventive maintenance plan (PMP)
  - d. Historical records of the main curative and preventive interventions on the equipment
  - e. Inventory of site material (to established upon commencement of contract)

### **5. Mobilization of human resources required to perform the work**

- 5.1. The Contractor will make available to the Embassy in a timely manner, depending on the nature of the work to be completed and the tasks assigned, all human resources required to complete the work and carry out the terms of the contract, specifically:
- a. A contract manager, who will be the Embassy authority's direct contact and will be responsible for contract management at the highest level.
  - b. A team leader who will be in charge of the technicians assigned to perform the work and liaise closely with the Embassy's technical authority.
  - c. Various technicians according to the nature of the work to be performed: plumbers, electromechanics, electricians, refrigeration technicians, etc.
  - d. A general supervisory technician on site daily Monday through Friday, 8:00 a.m. to 12:00 p.m. Aside from the daily preventive tasks, this technician will be in charge of a program of supervisory rounds to ensure the facilities are operating smoothly, in accordance with the standards and methodologies used by the Contractor at similar sites. The results of this supervision must be recorded in writing every day.
  - e. Various subcontractors to work on the generator, transformer station, portable fire extinguishers, UPS, elevator, fire alarm, sprinkler system, window cleaning, fumigation and computer system for building management (DESIGO software).
- 5.2. The people in these various roles must meet the safety requirements set out in Part I para. 3 of this RP. Other responders may be added to the personnel list, based on requirements, e.g., for curative maintenance. However, the Contractor agrees not to make any changes to the response team for which the list of names is indexed in the sections above. Should that prove impossible, or if a situation arises that requires a responder (natural or legal person) from the aforementioned list to be changed, the Contractor must then notify Embassy services well in advance and replace them with another equally qualified responder.
- 5.3. All of these responders must be bound to the Contractor through work contracts that conform to the applicable Tunisian work regulations. They must also have

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personal protective equipment that is compliant with the occupational health and safety regulations applicable in Tunisia (safety shoes, insulated gloves, helmets, protective glasses, etc.). The Embassy is obliged to comply with the *Canada Labour Code*; accordingly, the Contractor may need to adapt to certain restrictions to protect the safety of personnel. For more information, refer to:

<https://www.ccohs.ca/>

- 5.4. The workers responsible for carrying out the work subject to this RP depend solely on the Contractor for their remuneration, social security, insurance, safety wear and equipment, training, etc. This contract requires the Contractor to comply with Tunisian labour codes and any other local human resources regulations in respect of the employees who will perform the work required under this contract.

### 6. Contract monitoring and production of reports

- 6.1. To ensure better follow-up, periodic meetings between the Contractor and the Embassy will be scheduled at the convenience of both parties. The purpose of these meetings will be to report on work performed and services rendered and on any irregularities observed: corrective action will be determined jointly.
- 6.2. A summary of every meeting will be drawn up by the contract manager or the team leader. All of these elements will contribute to the preparation of the activity report submitted to the Embassy.
- 6.3. The report is a detailed document that consolidates key data relating to the performance of assignments. It presents the achievement of commitments over the time that has elapsed and includes recommendations for improvement.
- 6.4. The various items to be included in the activity report will be defined by both parties from the outset of their collaboration.

## PART II – MATERIALS AND MAINTENANCE SCHEDULE

This section provides the minimum applicable guidelines for the various equipment and facilities for which the Contractor will be required to perform preventive and corrective maintenance.

In order to meet its performance objectives, the Contractor will comply with all of the guidelines in respect of the following systems and equipment:

1. Central heating, ventilation and air conditioning (HVAC) system
2. Central split air conditioning system
3. Emergency power supply
4. Power distribution system
5. Central uninterrupted power supply (UPS)
6. Emergency lighting

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7. CDI alarm centre
8. Portable fire extinguishers
9. Plumbing, water pump and fire facilities
10. Sprinkler system
11. Various work and expertise
12. Various services and management of consumable inventory

Part II also specifies which monthly, quarterly, semi-annual and/or annual verifications are recommended for each system, facility or equipment to ensure proper operation. The Contractor must refer to Part II to perform routine maintenance verifications.

### Qualifications

The Contactor must ensure that the maintenance verifications for every system, facility or equipment are performed by qualified personnel with appropriate training to perform each task.

### Records

The Contractor must keep records of the inspection and test results on the maintenance report forms for every system, facility or equipment.

They must, based on the inspection schedule for each system, facility or equipment:

- Note the corrective action taken.
- Note the work orders initiated.
- Include the names of the maintenance personnel and inspector.
- Ensure that the forms are signed and dated by the maintenance personnel and inspector, and stored in the corresponding maintenance logbooks for each system, facility or equipment.

## 1. Central HVAC system

### Equipment

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The central HVAC system is composed of:

- Three air handling units
- 70 fan coil units
- Air-cooled liquid chiller and heat pump
- One control system

### References

- AERMEC brand air handling unit, ref.: ICTEPW 9905
- AERMEC brand fan coil unit, ref: FCXP
- CARRIER brand heat pump, ref.: 30RH160
- CARRIER brand air-cooled liquid chiller, ref.: 30 RB 302

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- SIEMENS brand GTC control system
- France-Air brand ventilation

### **Maintenance schedule**

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#### **1.1 Monthly**

##### **1.1.1 Air handling units**

- Check for particulate accumulation on filters. Clean or replace the filters if the particulate accumulation causes a drop in pressure or air circulation outside of the established operational limits.
- Check the air filter and the entire unit. Make corrections as needed.

##### **1.1.2 Roof-mounted air conditioners**

- Check for particulate accumulation on filters. Clean or replace the filters if the particulate accumulation causes a drop in pressure or air circulation outside of the established operational limits.
- Check the air filter and the entire unit. Make corrections as needed.

#### **1.2 Quarterly**

##### **1.2.1 Air handling units**

- Look for signs of malfunction in the control system and units. Adjust or replace the components to ensure proper operation as needed.
- Check the P-trap on the flow line. If applicable, apply a primer to ensure proper operation.
- Check fan belt tension. Check the alignment and wear on the belt. Replace the belt as needed to ensure proper operation.
- Make sure the variable frequency drive is working properly. Make corrections as needed.
- Make sure the cooling coil and heating coil are working properly. Clean or replace them as needed.
- Lubricate bearings for onsite maintenance.
- Check whether the unit is showing any signs of corrosion. As needed, apply rust protection.

##### **1.2.2 Roof-mounted air conditioners**

- Look for signs of malfunction in the control system and units. Adjust or replace the components to ensure proper operation as needed.
- Check the P-trap on the drip tray. If applicable, apply a primer to ensure proper operation.
- Check fan belt tension. Check the alignment and wear on the belt. Replace the belt as needed to ensure proper operation.
- Make sure the variable frequency drive is working properly. Make corrections as needed.
- Make sure the cooling coil and heating coil are working properly. Clean or replace them as needed.

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### **1.2.3 Air-cooled liquid chillers**

- Look for signs of malfunction in the control system and units. Adjust or replace the components to ensure proper operation as needed.
- Check fan belt tension. Check the alignment and wear on the belt. Replace the belt as needed to ensure proper operation.
- Clean the unit of any dust and debris.

### **1.3 Annually**

#### **1.3.1 Air handling units**

- Inspect the control box, looking for dirt, debris and/or loose connections. Clean and tighten as applicable.
- Look for signs of punctures or other damage on the engine contactor. Repair or replace it as needed.
- Check fan blades. Clean, repair or replace them as needed to ensure proper operation.
- Check pressure and/or temperature values in cooling system. If they are outside the recommended levels, identify the cause, make the repair and adjust the volume of cooling liquid to reach optimal levels for operation.
- Look for signs of dirt, corrosion or degradation. Clean or repair as needed.
- Check drive alignment, wear, reach and operation. Repair or replace it as needed.
- Check the integrity of all equipment panels. Replace fasteners as needed to ensure integrity and adequate equipment adjustment/finish.
- Lubricate quick maintenance bearings.
- Check the drip tray, flow line and coils to ensure that there is no organic growth. Clean as needed.
- Check the coil fins for traces of accumulation or dirt. Restore them to their initial condition, as needed. Replace the coil as needed to ensure proper operation.
- Check for traces of water droplets between the cooling coil and the drip tray. Make corrections or repairs as needed.
- Ensure the damper is working properly. Repair, replace or adjust it as applicable.
- Perform a visual inspection of areas with accumulated humidity to check for organic growth. Clean or disinfect as applicable.
- When performing a visual inspection, check the integrity of exposed piping, external insulation of piping and vapour barriers. Make corrections as needed.
- When performing a visual inspection, check the integrity of the piping with inner lining up to the first bend or up to 20 feet into the supply plenum from the air handling unit. Correct the situation if it is soiled or degraded.

#### **1.3.2 Roof-mounted air conditioners**

- Inspect the control box, searching for dirt, debris and/or loose connections. Clean and tighten as applicable.
- Look for signs of punctures or other damage on the engine contactor. Repair or replace it as needed.
- Check fan blades. Clean, repair or replace them as needed to ensure proper operation.



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- Check pressure and/or temperature values in cooling system. If they are outside the recommended levels, identify the cause, make the repair and adjust the volume of cooling liquid to reach optimal levels for operation.
- Check drive alignment, wear, reach and operation. Repair or replace it as needed.
- Check the integrity of all equipment panels. Replace fasteners as needed to ensure integrity and adequate equipment adjustment/finish.
- Lubricate quick maintenance bearings.
- Look for signs of accumulation or dirt on the surfaces of the heat exchanger. Clean it to ensure proper operation, as applicable.
- Check the drip tray, flow line and coils to ensure that there is no organic growth. Clean as needed.
- Check the coil fins in the evaporator. Restore them to their initial condition, as needed. Replace the coil as needed to ensure proper operation.
- Check for traces of water droplets between the cooling coil and the drip tray. Make corrections or repairs as needed.
- Make sure the damper is working properly. Repair, replace or adjust it as applicable.
- Inspect air-cooled condenser surfaces. Repair and clean them as needed.
- Check low ambient head pressure control sequence for proper operation. Repair or replace the components or change the software/algorithm to ensure proper operation.
- Check for excessive accumulation or tartar or debris on condenser surfaces. Clean as needed.
- Check the combustion chamber, burner and flue for signs of degradation, leaks, mold, condensation and products of combustion. Clean, test and adjust the combustion process as needed to ensure proper operation.
- Perform a visual inspection of areas with accumulated humidity to check for organic growth. Clean or disinfect as applicable.
- Check refrigerant oil levels for cooling systems using oil pressure/level controls. Adjust or replace them as needed to ensure proper operation.
- When performing a visual inspection, check the integrity of exposed piping, external insulation of piping and vapour barrier. Make corrections as needed.
- When performing a visual inspection, check the integrity of the piping with inner lining up to the first bend or up to 20 feet into the supply plenum from the air handling unit. Correct the situation if it is soiled or degraded.

### **1.3.3 Air-cooled liquid chillers**

- Inspect the control box, searching for dirt, debris and/or loose connections. Clean and tighten as applicable.
- Look for signs of punctures or other damage on the engine contactor. Repair or replace it as needed.
- Check the balance of the fan blades and particulate accumulation. Clean, repair or replace them as needed to ensure proper operation.
- Check pressure and/or temperature values in cooling system. If they are outside the recommended levels, identify the cause, make the repair and adjust the volume of cooling liquid to reach optimal levels for operation.

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- Look for signs of dirt, corrosion or degradation. Clean or repair as needed.
- Check drive alignment, wear, reach and operation. Repair or replace it as needed. For direct drive ventilator/engine assemblies, check the bearings and lubricate parts for onsite maintenance or replace the engine as applicable.
- Inspect air-cooled condenser surfaces. Repair and clean them as needed.
- Check low ambient head pressure control sequence for proper operation. Repair or replace the components or change the software/algorithm to ensure proper operation.
- Check refrigeration oil levels for cooling systems using oil pressure/level controls. Adjust or replace them as needed to ensure proper operation.

### 2. Split air conditioning system

#### Equipment

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The Chancery is equipped with ten (10) split air conditioning systems, composed of: Each split air conditioning system is composed of the following elements:

- An evaporator
- A condenser
- A compressor

#### Reference

- HITACHI brand air conditioner.

#### Maintenance schedule

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##### 2.1 Monthly

- Inspect filters; replace the disposable filters and clean the reusable filters as needed.
- Make sure the cooling coil, air intake and exhaust are not obstructed.
- Check for excess vibration or noise from the following parts:
  - The compressor
  - The evaporator and condenser fans
- Make sure the compressor is not overheating.

##### 2.2 Quarterly

- Vacuum clean air dampers and vents.
- Clean cooling and evaporator coils.
- Clean the evaporator drip tray.
- Make sure the evaporator drip tray, fluid collection conduit and manifold are not obstructed.
- Make sure the volume of cooling liquid is appropriate.
- Make sure there are no leaks in the pipe connections and piping.
- Check fan belts for correct tension and excessive wear.
- Check operation and accuracy of thermostats and controls.

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### 2.3 Annually

- Check for damage on evaporator coil fins. If applicable, repair them using a “fin comb.”
- Make sure the assembly bolts are securely tightened.
- Make sure the drive trains are not loosened or damaged.
- Check drive train alignment.
- Clean the evaporator and condenser coils of any debris or dust.
- Clean the compressor of any debris or dust.
- Clean the flow line.
- Check for signs of corrosion on the outside unit. Apply or touch up corrosion resistant paint as needed.
- Lubricate compressor fans and engines as needed.
- Inspect electrical outlets, clean and tighten connections and apply dielectric coating as needed.
- Check for cooling liquid leaks using a leak detector.
- Check for air leaks in the conduits and joints.
- Check operation of temperature controls.

## 3. Emergency power supply

### Equipment

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The emergency power supply is composed of the following elements:

- Generator set
- Fuel tank
- Day tank
- Fuel transfer pump
- Batteries
- Battery charger
- Control panel
- Generator fan system
- Generator room ventilation system

### Reference

- Brand: SDMO. Serial No.: RG125H064414
- Power: 402KVA Type 61254 FO70.
- Engine: John Deere; Alternator: Leroy Somer; Type: J400K.

### Maintenance schedule

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#### 3.1 Weekly

##### 3.1.1 Consumables

- Inspect fuel levels in day tank and main storage tank. A quantity of fuel sufficient for two hours of operation at the generator’s full capacity is required.
- Look for signs of leaks in the fuel tanks.

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- If the fuel filter is equipped with a clear container, inspect it, looking for a source of contamination.
- If applicable, make sure the fuel transfer pump is working properly.
- Check diesel supply pressure if applicable.
- Look for signs of leaks in the diesel tanks.

#### **3.1.2 Batteries**

- Make sure the electrolyte level is adequate for all batteries. Add electrolytes according to manufacturer recommendations as required.
- Check all of the batteries to determine whether the electrolyte density is correct, in accordance with manufacturer recommendations.
- Check solidity, and look for signs of corrosion on electrical connections.
- Make sure the space between the battery terminals is clean and dry.
- Make sure the charger's electrical connections are clean and solid.
- Check charger operation under normal load and equilibrium load.

#### **3.1.3 Control panel**

- Check safety aspect of local and remote control panel.
- Make sure the warning lights are in good working order.
- Check control panel settings (ensure that the unit is ready for automatic start-up).
- Make sure the remote audio and visual signals are in good working order (on the building's inside alarm panel).
- Check or launch the control panel's self-diagnostics as applicable.

##### **3.1.3.1 Generator room**

- Check ventilation settings on ventilation control to ensure proper operation.
- Inspect the ventilation system belts.
- Ensure the room's emergency lighting is in good working order and its capacity to last for at least half an hour.
- Make sure the temperature in the room is above 10 °C.
- Make sure the room is clean and that all emergency components of the emergency power supply are accessible.

##### **3.1.3.2 Engine**

- Check the engine oil level; Add electrolytes according to manufacturer recommendations as required.
- Check engine coolant level. Add electrolytes according to manufacturer recommendations as required.
- Look for signs of leaks in the engine, generator and cooling systems.
- Inspect the fan belts for correct tension and no cracks or excessive wear.
- Check starter cleanliness, assembly and safety.

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### **3.2 Monthly**

#### **3.2.1 Automatic transfer switch**

- Perform the monthly maintenance verification of the automatic transfer switch.

#### **3.2.2 Engine**

- Perform a monthly system test.

#### **3.2.3 Monthly system test**

- Simulate an outage in the building's normal power supply system using the test feature on the automatic transfer switch at the same time as the monthly maintenance verification of the automatic transfer switch.
- Record the date and time of the simulated power outage.
- Record the time when the power was restored by the generator.
- Calculate the time (transfer) between when the simulated power outage started and the power was restored.
- Operate the system at a minimum of 30% of its nominal load for 1 hour.
- Run all automatic transfer switches during the load.
- Check whether the contacts cause sparks.
- Ensure the absence of leaks on the bearing seal.
- Verify operation of all auxiliary devices (e.g. radiator shutter controls, cooling pumps, fuel transfer pumps, oil coolers and ventilation controls in machine room).
- Record the time, hour meter reading, oil pressure, oil temperature, cooling liquid temperature, engine RPM, DC charger volts and amperes, AC readings and hertz after one hour of operation.
- End the simulated outage of the building's normal power supply after 1 hour using the test switch on the automatic transfer switch.
- Record the simulated outage's end time on the automatic transfer switch.
- Record the "return to usual" time on the automatic transfer switch.
- Note the time between the end of the simulated power outage and the return to usual.
- Note the generator stop time.
- Note the time between the return to usual and the generator stop.
- Drain the exhaust system condensate trap.
- Inspect block heater hoses and cables.

### **3.3 Quarterly**

#### **3.3.1 Batteries**

- Run two complete start cycles. Near the end of each cycle (and while it is still starting), measure the battery's lowest indicated voltage.
- Record the battery's lowest indicated voltage.

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- If the measured tension is less than 80% of the battery's rated voltage, replace the battery. Or, perform a battery load test using an appropriate device to perform load testing.
- Record the battery load before the test.
- Record the battery load after the test.

#### **3.3.2 Engine**

- Inspect and clean the engine breather vents.
- Inspect and clean the engine breather vents.
- Inspect protective devices for proper operation.
- Perform a monthly system test.

#### **3.4 Annually**

##### **3.4.1 Consumables**

- Perform a visual verification (clear and bright liquid) of the liquid fuel in the day tank and the main storage tank.
- If the liquid fuel fails the test, it must be:
  - Emptied, and the tank must be filled with new fuel, **OR**
  - Filtered and treated with adequate conditioner and stabilizer to reduce degradation and remove water, deposits, bacteria and oxidized gums/resins.
- Test (chemicals) at the bottom of the day tank and the main storage tank, looking for water.

##### **3.4.2 Batteries**

- Run two complete start cycles. Near the end of each cycle (and while it is still starting), measure the battery's lowest indicated voltage.
- Record the battery's lowest indicated voltage.
- If the measured tension is less than 80% of the battery's rated voltage, replace the battery. Or, perform a battery load test using an appropriate device to perform load testing.
- Record the battery load before the test.
- Record the battery load after the test.

##### **3.4.3 Control panel**

- Open all inspection covers and inspect all electrical connections.
- Check breakers for proper operation.
- Clean insulators and bushings.
- Check voltage regulators for proper operation.
- Operate all of the mobile parts to ensure they are moving freely.
- Adequately clean and prepare the contacts.
- Remove any dust from inside the panel.
- Recalibrate all of the gauges.

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### **3.4.4 Generator**

- Clean rotor and stator windings using clean compressed air.
- Tighten the coupling bolts and inspect alignment.
- Check duct sealing and solidity.
- Inspect windings at rotor and stator slots.
- If applicable, after an infrared radiation inspection of the engine and related controls, tighten all electrical connections.

### **3.4.5 Engine**

- Inspect and clean the engine breather vents.
- Clean and lubricate all engine connections.
- Clean and lubricate the speed limiter.
- Inspect protective devices for proper operation.
- Change the lubrication oil and engine filters.
- If applicable, check the oil pan and fuel pump.
- Check for leaks and exterior wear on the cooling liquid pumps.
- Test antifreeze concentration in cooling liquid and chemical protection level of coolant inhibitors.
- Change fuel filters, clean strainers, and make sure that the fuel supply valve is open.
- Inspect exhaust system. Check and record the back pressure of the exhaust system to ensure that it complies with the engine manufacturer's requirements, and compare with previous readings.
- Inspect air filters and replace them as needed.
- If applicable, after an infrared radiation inspection of the engine and related controls, tighten all electrical connections.
- Inspect and test all ignition system components and repair or replace them as needed.
- Inspect all external surfaces of heat exchangers and clean as necessary.
- Inspect all hoses and replace them as needed.
- Inspect the fan belts for correct tension and excessive wear.
- If applicable, lubricate the door locks and hinges, including exterior parts.
- Perform a vibration test.
- Perform an annual system test.

### **3.4.6 Annual system test**

- Apply a charging stand to the generator only in order to reach 100% of rated kW capacity.
- Simulate an outage in the building's normal power supply system using the test feature on the automatic transfer switch at the same time as the annual maintenance verification of the automatic transfer switch.
- Record the date and time of the simulated power outage.

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- Record the time when the power was restored by the generator.
- Calculate the time between when the simulated power outage started and the power was restored.
- Run the system at 100% of its rated load using the charging stand for two hours.
- Run all automatic transfer switches during the load.
- Check whether the contacts cause sparks.
- Ensure the absence of leaks on the bearing seal.
- Verify operation of all auxiliary devices (e.g. radiator shutter controls, cooling pumps, fuel transfer pumps, oil coolers and ventilation controls in machine room).
- Record the time, hour meter reading, oil pressure, oil temperature, cooling liquid temperature, engine RPM, DC charger volts and amperes, AC readings and hertz at the beginning, after 5 minutes, after 15 minutes and every 15 minutes after start time.
- If, at any point during the two-hour run time, the generator is unable to run at its full kW rated payload capacity, stop the test, investigate the cause and take relevant corrective action.
- **Repeat the test with a charging stand until the generator shows it can run for two consecutive hours at full rated capacity.**
- Perform an infrared inspection of all electrical connections in the control panel and generator to identify any connections with high resistance.
- End the simulated outage of the building's normal power supply after 2 hours using the test switch on the automatic transfer switch.
- Record the simulated outage's end time on the automatic transfer switch.
- Record the "return to usual" time on the automatic transfer switch.
- Note the time between the end of the simulated power outage and the return to usual.
- Note the generator stop time.
- Note the time between the return to usual and the generator stop.
- Drain the exhaust system condensate trap.
- Inspect block heater hoses and cables.

### 3.5 Every five (5) years

#### 3.5.1 Generator

- Inspect and isolate the bearings using a Megger metre.
- If the Megger metre resistance results are lower than expected, dry the isolation using the auxiliary drying process and repeat the test.

#### 3.5.2 Engine

- Drain and flush the cooling system. Fill the system with new coolant in accordance with manufacturer recommendations.
- Clean the radiator hoses and cooling fins according to manufacturer recommendations.
- Replace cooling system thermostats.



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- Perform an annual system test.

### 4. Power distribution system

#### Equipment

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The power distribution system is composed of the following elements:

- Switchboards
- Transformers
- Supply lines and branch wiring
- Grounding systems
- Condenser batteries
- Branch distribution panels

#### References

- 4 core transformer 630 kVA and 30 kV
- COMPTON brand, FLUOKIT M36 type MV Cell
- Alpes Technologies brand 150 kVA condenser battery
- MERLIN GERIN brand, NS, C60N type electrical units
- Rigid copper/aluminium cables. PRC insulated. NF C32-321, NT88.199.

#### Maintenance schedule

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##### 4.1 Monthly

##### 4.1.1 General

- Inspect electrical and mechanical rooms and units to ensure they are clean and accessible to the power distribution system.
- Look for signs of malfunction in the power distribution system, specifically unusual alarms, sounds, smells or temperatures.
- Ensure there are no water or chemical leaks into the rooms.
- If applicable, make sure the ventilation system is in good working order.
- Inspect all fasteners to ensure that the electrical components are properly secured to the walls and floors.
- Inspect the busway and make sure the supports for the supply lines and mounting systems are properly secured to the walls or ceilings.
- As applicable, check the ground fault indication. Check the lamps and audio devices are in good working order.
- Check the grounding systems on peripheral steel equipment in the rooms, such as doors and/or fences.
- Make sure the lighting in the room is in good working order. If applicable, replace the lights.
- Make sure there is at least 1 metre of space for access to all electrical components.

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- Ensure the room's emergency lighting is in good working order and its capacity to last for at least half an hour.

#### **4.1.2 Switchboards**

- Check the building's actual voltage and amperage load on the digital counters, or extract a voltage and amperage log for the previous month from the digital counter, if applicable.
- Note any discrepancy and consult a qualified contractor as needed.

#### **4.1.3 Transformers**

- Inspect the pressure-relief device as applicable. If the device is activated, find the cause of the excessive pressure.
- If applicable, make sure the temperature gauge is in good working order. Record the temperature.
- If applicable, check the oil gauge level. Take note of the level.

### **4.2 Annually**

#### **4.2.1 General**

- Perform the monthly maintenance verification for the power distribution system.
- Check the unit housing the ventilation flaps and electrical equipment grates:
  - Make sure there is no dirt or dust;
  - Clean or vacuum as needed; and
  - If applicable, replace the air filters.
- Perform an infrared inspection of all electrical connections in the equipment to identify any connections with high resistance. Repair or replace the components as needed and record the results of the inspection and work.
- Recalibrate the gauges on all measuring devices.

#### **4.2.2 Transformers**

- Check the maximum load relative to the rated load at the maximum temperature for the transformer. Reduce the load if necessary.
- Check cooling flaps, cooling fins, tubes and radiators:
  - Make sure there is no dirt or dust
  - Clean or vacuum where necessary, and
  - Replace air filters where necessary

#### **4.2.3 Grounding systems**

- Ensure that the grounding subsystem is not loosened, that there is no evidence of corrosion, and that it is not physically damaged. Clean and fix where necessary.
- Check the conductor (green wire) of the ground-fault subsystem protecting the system. Ensure that the connections and joints are tight, that there is no evidence of corrosion or physical damage. Clean and fix where necessary.

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- Where necessary, ensure that the lighting protection subsystem is not loosened, that it does not exhibit any signs of corrosion, and that it is not physically damaged. Clean and fix where necessary.

#### **4.2.4 Electric motors**

- Inspect motor windings and airways. Remove the dirt and debris. Clean and varnish the windings where necessary.
- Perform an insulation resistance test on the windings.
- Inspect DC motor switches and brushes. Remove any dirt or dust. Adjust or replace them where necessary.

#### **4.3 Every five (5) years**

##### **4.3.1 Switchboards**

- Open all the panel lids and make sure they are clean. Vacuum up excess dust and remove mould with a clean rag.
- Ensure that busbars are not loosened, discoloured or damaged. Replace or tighten them where necessary, following an infrared inspection.
- Inspect all power lines and connections. Where necessary, clean and tighten them after an infrared inspection.
- Where necessary, ensure that the end boxes do not have any leaks or cracks. Replace where necessary.
- Inspect all signal and control connections. Where necessary, clean and tighten them after an infrared inspection.
- Check the entire insulation. Clean and replace where necessary.
- Service all power circuit breakers as per the manufacturer's procedures, including:
  - Inspection
  - Cleaning and lubrication of mechanical parts, springs, mechanisms, and contacts
  - The electric arc insulation testing
- Test all power circuit breakers as specified by the manufacturer and during coordination studies, including shutdown time, open time, and close-open time.
- Where necessary, test to make sure the main power breaker's ground fault indicator is functioning as specified by the manufacturer.
- Inspect and grease standard circuit breakers and moulded case circuit breakers and disconnect switches. Test each circuit breaker and switch according to the instructions to ensure that they function properly.
- Inspect all fuses for signs of discolouration, including on the terminals and clips:
  - Clean and tighten fuse door connections following an infrared inspection
  - Clean and test for proper contact with fuse clips
  - Replace fuse clips if necessary
- Inspect the instrument's transformer connections:
  - Clean and tighten them following an infrared inspection where necessary

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- Check the insulation
- Clean and replace insulation where necessary
- Following an infrared inspection, inspect meter connections and tighten them where necessary. Test the moving parts and check the correct operation of the meters.

#### **4.3.2 Transformers**

- Open all the panel lids and make sure they are clean. Vacuum up excess dust and remove mould with a clean rag.
- Check the air moving fans and replace them or repair them as needed.
- Inspect all power lines and connections. Clean and tighten them after an infrared inspection where necessary.
- Perform an off-grid insulation resistance test to check the condition of the insulation.

#### **4.3.3 Power lines and bypass wiring**

- Inspect conduits, wiring, and shielding for signs of corrosion, cracking, and other physical damage. Check for any signs of overheating or burning. Replace or repair where necessary.
- Perform off-grid insulation resistance tests to check the condition of primary and secondary power lines. Repair or replace power lines where necessary.
- Inspect the busway busbars for signs of stress or overheating, including discolouration. Replace sections as needed.
- Inspect the insulators and busway barriers for signs of stress, including cracks and arc tracking. Replace as needed.
- After an infrared inspection, tighten the busway's mounting bolts. Adjust the springs where necessary.

#### **4.3.4 Grounding systems**

- Perform a ground resistance test on the ground fault subsystem. Repair or replace it where necessary.
- Perform connection probe resistance tests on the ground fault subsystem. Repair or replace it where necessary.
- Perform probe resistance test on multiple receptacles to check for stray currents. Repair or replace it where necessary.
- Perform connection probe resistance tests on several connections on the lighting protection subsystem. Repair or replace it where necessary.

#### **4.3.5. Capacitor banks**

- Open all the panel lids and make sure they are clean. Vacuum up excess dust and remove mould with a clean rag.
- Check the air moving fans and replace them or repair them as needed.

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- Ensure that busbars are not loosened, discoloured or damaged. Replace or tighten them where necessary, following an infrared inspection.
- Inspect all power lines and connections. Where necessary, clean and tighten them after an infrared inspection.
- Inspect all signal and control connections. Where necessary, clean and tighten them after an infrared inspection.
- Inspect and test all capacitors, insulation, and fuses as recommended by the manufacturer. Replace components where necessary.
- Inspect and test reactors, surge suppressors, and switches as recommended by the manufacturer. Repair or replace where necessary.

#### 4.3.6 Bypass panels

- Open all the panel lids and make sure they are clean. Vacuum up excess dust and remove mould with a clean rag.
- Ensure that busbars are not loosened, discoloured or damaged. Replace or tighten them where necessary, following an infrared inspection.
- Inspect all power lines and connections. Where necessary, clean and tighten them after an infrared inspection.
- Inspect main and branch circuit breakers. Test each circuit breaker three times to ensure they are functioning properly.
- Inspect the GFI circuit breakers. Test and reset each circuit breaker's ground fault circuit interrupter three times to ensure they are functioning properly.

## 5. Uninterruptible Power Supply (UPS)

### Equipment

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The uninterruptible power supply system consists of the following components:

- UPS
- Batteries
- UPS room ventilation system

### Reference

- POWERWARE brand 60KVA power inverter.
- POWERWARE brand battery, SWL series SWL2500\*.

### Maintenance schedule

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#### 5.1 Weekly

##### 5.1.1 Batteries

- Inspect the cleanliness of the exterior of the batteries and the space with respect to other equipment.

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- Look for signs of battery malfunction, including cracks, corrosion, deformation, swelling, sounds, odours or unusual temperatures.
- Replace batteries as per manufacturer's procedures when necessary.
- Verify that the space between the battery terminals is clean and dry.
- Ensure that the annunciators are working properly.
- Verify that the measuring instruments are operating and calibrated properly. Calibrate where necessary.
- Record the readings of the measuring instruments, input and output voltage, current, and frequency.

#### **5.1.2 UPS room**

- Check the ventilation control's ventilation settings to ensure it is functioning properly.
- Ensure that the emergency lighting devices in the room are functioning properly and that they can last for at least half an hour.
- Ensure that room temperature and humidity are maintained within the specified parameters.
- Inspect the cleanliness of the room and its accessibility to all components of a central, uninterruptible power supply system.

#### **5.1.3 UPS**

- Inspect the cleanliness of the exterior of the UPS and the space with respect to other equipment.
- Look for signs of poor UPS functioning conditions, including unusual sounds, odours, or temperatures.
- Ensure that the UPS fans and filters are clean and that the openings are not obstructed.
- Check the proper operation of the UPS fans.
- Check the UPS self-diagnostics for proper operation. Print the diagnostic reports where necessary.

### **5.2 Monthly**

#### **5.2.1 Batteries**

- For all batteries, check to see if the electrolyte level is adequate. Add as recommended by the manufacturer where necessary.
- Check the solidity and for any signs of corrosion on electrical connections.
- Clean the battery ends, poles, terminals, and connectors between the batteries as recommended by the manufacturer.
- Where necessary, apply a non-oxidizing grease to the terminals and connectors between the batteries.

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- Ensure that there is no excessive battery vibration, reposition batteries to reduce vibration, check for potential damage (plates and sediment on the tray), and replace batteries as needed.
- Choose a control battery for each of the six batteries on a logical monthly basis.
- Measure and record the control battery voltage, electrolyte density, and electrolyte-specific temperature of the control battery of a ventilated acid lead battery.
- Correct the temperature density reading as recommended by the manufacturer.
- Measure and record the voltage of the control battery and the temperature of the negative terminal of the control battery for a lead battery with a control valve.
- Check for any potential leakage at ground level.

#### **5.2.2 UPS**

- Record the input and output voltage of the UPS, the current and frequency, the regulated voltage of the battery and the charge current. Where necessary, adjust the UPS settings according to the manufacturer's procedures.
- Record the critical load of the current on the UPS and check that it matches the UPS rated load.
- Record the output voltage and the current of the rectifier/charger.

#### **5.3 Biannually**

##### **5.3.1 Batteries**

- Where necessary, after an infrared inspection of the motor and the linked controls, tighten all battery and holder connections.
- Calibrate the measuring instruments.
- Measure and record the battery voltage, electrolyte density, and electrolyte-specific temperature of all vented acid-lead batteries.
- Correct density readings taking temperature into account as recommended by the manufacturer.
- Check the resistance between batteries and terminal connections using battery sampling as recommended by the manufacturer.
- If the sample shows an increase in resistance, check the strength of all connections.

##### **5.3.2 UPS room**

- Where necessary, check all vibration protection devices and systems.
- Check whether the emergency shutdown device is functioning properly.
- Check whether all alarm and signal devices are functioning properly.
- Check whether all grounding connections are solid and clean.

##### **5.3.3 UPS**

- Open all doors and lids and inspect all internal components for foreign objects, signs of overheating, leaks, worn insulation, damaged seals, and corrosion.

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- Ensure that the capacitors are not distorted or discoloured and replace them as needed.
- Clean the internal components as recommended by the manufacturer.
- Replace the air filters as recommended by the manufacturer.
- Check or run all UPS self-diagnostics, print diagnostic reports (where necessary), or record the information, and correct the diagnostic problems.
- Clean and tighten electrical connections at input and output terminals, rectifier terminals, inverter terminals, and protective devices.
- Check whether the protective devices are functioning properly.
- Check whether all grounding connections are solid and clean.

#### **5.3.4 Biannual system test**

##### **5.3.4.1 Transfer**

- Apply a charging stand along with the UPS with a critical current load to reach 50% of the UPS' rated load in kW.
- Create a UPS AC input outage through the normal power supply circuit breaker or a disconnect.
- Note the date and time of the AC input failure.
- Record the elapsed time (transfer) between the AC input failure and the reactivation of the AC output.
- Operate the system under transfer at 50% of the rated load for the manufacturer's recommended duration for this UPS class.
- Record the input and output voltage, as well as the current, input current balance, output frequency and output voltage regulation.

##### **5.3.4.2 Maintenance bypass**

If applicable:

- Activate the maintenance bypass disconnecting switch to transfer the load to an alternate AC source.
- Record the elapsed time (bypass) between the change in the maintenance bypass and the reactivation of the alternate AC output.
- Reset the maintenance bypass to retransfer the load to the UPS.
- Record the elapsed time (re-transfer) between the static disconnect bypass and the reactivation of the alternate AC output.

##### **5.3.4.3 Static bypass**

If applicable:

- Activate the static disconnect switch to bypass the load transferred to an alternate AC source.
- Record the elapsed time (bypass) between the static disconnect bypass and the reactivation of the alternate AC output.
- Reset the static switch to retransfer the load to the UPS.



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- Record the elapsed time (re-transfer) between the resetting of the static disconnect switch and the reactivation of the AC output.

### 5.3.4.4 Return transfer:

- Restore the UPS input AC through the normal power supply circuit breaker or disconnecting switch.
- Note the date and time when the AC input restoration took place.
- Note the elapsed time (return transfer) between the restoration of the AC input and the reactivation of the AC output.
- Record the input and output voltage as well as the current and impedance balance of the input current, the output frequency and output voltage regulation.

## 5.4 Annually

### 5.4.1 Batteries

- Complete a full battery discharge once a year to the point where the UPS stops due to low battery voltage if:
  - the batteries have reached 85% or more of their expected life, **OR**
  - the capacity of the batteries in the previous discharge test is 90% less than the value specified by the manufacturer, **OR**
  - the batteries are under two years old and have not yet undergone a discharge test.
- Otherwise, perform the full discharge test every three years to avoid excessive testing and shortening the battery life.
- Recharge the system as recommended by the manufacturer. You must also measure and record the battery capacity. If capacity has dropped by more than 20%, replace the batteries according to the manufacturer's procedures.

### 5.4.2 UPS

- Contact the manufacturer for recommended hardware components, software updates, and revisions. If necessary, apply system updates and revisions as per the manufacturer's procedures.
- Perform an annual system test.

### 5.4.3 Annual system test

#### 5.4.3.1 Transfer

- Apply a charging stand along with the UPS with a critical current load to reach 100% of the UPS' rated load in kW.
- Create a UPS AC input outage through the normal power supply circuit breaker or a disconnect.
- Note the date and time of the AC input failure.
- Record the elapsed time (transfer) between the AC input failure and the reactivation of the AC output.

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- Operate the system under transfer at 100% of the rated load for the manufacturer's recommended duration for this UPS class.
- Record the input and output voltage, as well as the current and impedance balance of the input current, the output frequency and output voltage regulation.

#### **5.4.3.2 Output voltage impedance balance**

- Apply symmetrical loads to the UPS from 0% to 100% of the rated load.
- Measure and record the phase-phase and simple inverter three-phase network voltages, and the phase angles for each symmetrical load.
- Apply unbalanced loads to the UPS from 0% to 100% of the rated load.
- Measure and record the phase-phase and simple inverter three-phase network voltages, and the phase angles for each unbalanced load.

#### **5.4.3.3 Harmonics**

- Apply linear loads to the UPS from 0% to 100% of the rated load.
- Measure and record the harmonic residue in the output voltage for each linear load.
- Apply non-linear loads to the UPS from 0% to 100% of the rated load.
- Measure and record the harmonic residue in the output voltage for each non-linear load.

#### **5.4.3.4 Synchronization**

If applicable:

- Apply a reference frequency to the inverter and decrease the frequency.
- Measure and record the output voltage and the inverter's frequency slippage rate.

#### **5.4.3.5 Maintenance bypass**

If applicable:

- Activate the maintenance bypass disconnecting switch to transfer the load to an alternate AC source.
- Record the elapsed time (bypass) between the change in the maintenance bypass and the reactivation of the alternate AC output.
- Reset the maintenance bypass to retransfer the load to the UPS.
- Record the elapsed time (re-transfer) between the static disconnect bypass and the reactivation of the alternate AC output.

#### **5.4.3.6 Static bypass:**

If applicable:

- Activate the static disconnect switch to bypass the load transferred to an alternate AC source.
- Record the elapsed time (bypass) between the static disconnect bypass and the reactivation of the alternate AC output.
- Reset the static switch to retransfer the load to the UPS.

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- Record the elapsed time (re-transfer) between the resetting of the static disconnect switch and the reactivation of the AC output.

### 5.4.3.7 Return transfer

- Restore the UPS input AC through the normal power supply circuit breaker or disconnecting switch.
- Note the date and time when the AC input restoration took place.
- Note the elapsed time (return transfer) between the restoration of the AC input and the reactivation of the AC output.
- Record the input and output voltage, as well as the current and impedance balance of the input current, the output frequency and output voltage regulation.

## 6. Emergency lighting

### Equipment

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Emergency lighting includes all lighting panels and lights that illuminate the building in the event of a power outage.

### Maintenance schedule

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#### 6.1 Monthly

- Ensure that the emergency lighting devices identified on the plans are in place.
- Perform a manual test by using the test button or disconnecting the device to verify it is functioning.
- If the device tests automatically, check the lights for the status.
- Check the direction of the lighting heads to ensure they are pointing in the right direction.

#### 6.2 Annually

- Create a power failure and confirm that the lights are operating on emergency power or batteries.
- Ensure that devices provide emergency lighting for the duration specified in their specifications.
- After completing the test, the load, voltage and current conditions and the recovery period must be tested to ensure that the load system operates in accordance with the manufacturer's specifications.

## 7. CDI alarm system

### Equipment

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The alarm system consists of the following:

- Control equipment
- Starting devices

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- Alarm notification devices
- Monitoring position
- Public alarm sounding network

### **Reference**

- SIEMENS brand alarm system, FS20 Standard

### **Maintenance schedule**

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#### **7.1 Daily**

##### **7.1.1 Public fire alarm sounding network**

- Ensure that the fire alarm panel is properly powered.
- Ensure that the main indicators and defect indicators are working properly.

##### **7.1.2 Weekly**

- Check the fuses and replace them as needed.
- Ensure that the interfaced equipment is not damaged.
- Check the lamps and indicator lamps; replace them as needed.
- Ensure that the primary power supply is not damaged.
- Ensure that the fire alarm control unit defect signals are working properly.

##### **7.1.3 Monthly**

- Check the reception of the starting signals at the monitoring position.
- Test monitoring position receivers.
- Ensure that current signals for audible and visual defects are working properly.
- Where necessary, perform monthly battery tests and monthly motor-powered standby generator test.

#### **7.2 Quarterly**

- Inspect radiant energy fire detectors.
- Inspect supervisory signal device..
- Inspect water flow devices.

#### **7.3 Semi-annually**

To ensure functionality, check each control unit and transponder, including the following:

- Visual indicator
- Common visual trouble signal
- Common audible trouble signal
- Trouble signal silence switch
- Main power supply failure trouble signal
- Alert signal operation
- Alarm signal operation
- Automatic transfer from the alert signal to the alarm signal

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- Manual transfer from the alert signal to the alarm signal
- Function to cancel the automatic transfer of the alert signal to the alarm signal in a two-stage system
- Silencing function of alarm signal
- Manual silencing of alarm signal
- Visual indication of alarm signal silence
- Alarm signal, once silenced, automatically resets on subsequent alarm
- Automatic shut-off timer for alarm silencing signal
- Audible and visual alert and alarm signals programmed and operated according to design and specification
- Operation of the input circuit, alarm and supervision, including audible and visual indications
- Input circuit monitoring failure resulting in a fault indication
- Output circuit alarm indicators function properly
- Visual indicator test (lamp test)
- Coded signal sequences do not operate for less than the required number of times and the proper alarm signal subsequently operates
- Coded signal sequences are not interrupted by a subsequent alarm
- Bypass of the auxiliary circuit will result in a trouble signal
- Operation of the input circuit to the output circuit
- Reset operation
- Transfer from main to backup power
- Confirmation of status change has been checked
- Receipt of alarm transmission to the fire alarm receiving centre
- Receipt of supervision transmission at the fire alarm receiving centre
- Receipt of failure transmission at the fire alarm receiving centre
- Note the name and telephone number of the fire alarm receiving centre.
- Operation of the means of disconnecting from the fire alarm receiving centre causes a trouble indication to the control unit or transponder and subsequent transmission of a trouble signal to the fire alarm receiving centre
- Evacuation signals and auxiliary functions (outputs)
- Open circuits and ground fault detection
- Power monitoring to detect loss of AC power
- Disconnection of secondary batteries
- Check the value and status of all fuses..
- Check circuits providing an interface between two or more control units.
- Test interface equipment connections by running or simulating the operation of the equipment being monitored.
- Ensure that signals from the interface equipment are transmitted to the control unit.
- Ensure that LED lamps and indicators are lit.
- Disconnect any secondary (standby) power. Test main power supply at maximum load, including all alarm devices requiring simultaneous operation. Reconnect secondary power supply at the end of the test.
- Inspect control equipment transponders.

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- Ensure that the signal from the high or low air pressure control switch is correct and that it is operating at the proper pressure level.
- Ensure that the room temperature switch is operating within an acceptable range.
- Ensure that the water level switch signal is received at the control unit and that the device is functioning properly.
- Ensure that the water temperature switch signal is received at the control unit and that the device is functioning properly.
- If applicable, perform quarterly battery tests.

#### **7.3.1 Control equipment**

- Inspect surge protectors (lighting protection equipment).
- Inspect annunciators.
- Inspect interface equipment.
- Inspect suppression system monitoring devices and systems.

#### **7.3.2 Alarm notification devices**

- Inspect voice communication and emergency alarm equipment.
- Inspect supervised alarm notification devices.

#### **7.3.3 Priming devices**

- Inspect smoke detector air sampling initiators.
- Inspect priming devices of tube detectors.
- Inspect electromechanical initiators.
- Where applicable, inspect fire suppression or protection system devices..
- Inspect fire alarms.
- Inspect heat detectors.
- Inspect smoke detectors.
- Inspect carbon monoxide detectors and systems.

#### **7.3.4 Supervisory room**

- Inspect the supervisory station's alarm system transmitters.
- Inspect the supervisory station's alarm system receivers.

#### **7.3.5 Initiating devices**

- Test the sensitivity and functionality of radiant energy fire detectors.
- Ensure that the water flow device is operating at an adequate rate.
- Check signal reception from the control valve switch.

#### **7.3.6 Public fire alarm system**

- Operate publicly accessible fire alarms and master boxes. Verify reception of signal pulses.

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### **7.3.7 Power supply boxes**

- If applicable, perform semi-annual battery tests.

### **7.4 Annually**

#### **7.4.1 Control equipment**

To ensure functionality, check each control unit and transponder including the following items:

- Visual run indicator
- Common visual trouble signal
- Common audible trouble signal
- Trouble signal silence switch.
- Main power supply trouble signal
- Alert signal operation
- Alarm signal operation
- Automatic transfer from the alert signal to the alarm signal
- Manual transfer from the alert signal to the alarm signal
- Function to cancel the automatic transfer from the alert signal to the alarm signal in a two-stage system
- Function to silence the alarm signal
- Manual alarm signal silencing
- Visual indication of alarm signal silence
- Alarm signal, once silenced, automatically resets on subsequent alarm
- Automatic shut-off timer for alarm silencing signal
- Audible and visual alert and alarm signals programmed and operated according to design and specifications
- Input circuit, alarm and supervision operation, including audible and visual indications
- Input circuit monitoring failure results in a fault indication
- Output circuit alarm indicators function correctly
- Visual indicator test (lamp test)
- Coded signal sequences do not operate for less than the required number of times and the proper alarm signal subsequently works
- Coded signal sequences are not interrupted by a subsequent alarm
- A bypass of the auxiliary circuit will result in a failure (trouble) signal
- Operation of the input circuit to the output circuit
- Reset operation
- Transfer from main to backup power
- Confirmation of status change has been checked
- Receipt of alarm transmission to the fire signal receiving centre
- Receipt of supervision transmission at the fire alarm receiving centre
- Receipt of failure transmission at the fire alarm receiving centre
- Note the name and telephone number of the fire alarm receiving centre.

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- Operation of the means of disconnecting from the fire alarm receiving centre causes a trouble indication to the control unit or transponder and subsequent transmission of a trouble signal to the fire alarm receiving centre.
- Evacuation signals and auxiliary functions (outputs)
- Open circuits and ground fault detection
- Power monitoring to detect loss of AC power
- Disconnection of secondary batteries

### **7.4.2 Power supply boxes**

For alarm systems using maintenance-free or nickel-cadmium batteries:

- Check battery terminals for corrosion or leakage.
- Check connections for soundness; if necessary, clean and coat battery terminals.
- Perform annual battery tests.
- Ensure that main power fuses for the control unit or transponder are installed according to the manufacturer's requirements.
- Inspect fibre optic cable connections.

### **7.4.3 Voice communication tests**

Each control unit or transponder, and display and control centre, shall be tested to confirm operability of the following voice communication functions:

- Power on indicator
- Common visual trouble signal
- Common audible trouble signal
- Trouble signal silence switch
- All voice paging, including visual indication
- Output circuits for selective voice paging, including visual indication
- Output circuits for selective voice paging trouble, including visual indication
- Microphone, including press-to-talk switch
- Operation of voice paging does not interfere with initial inhibit time or alarm signal
- All-call voice paging operation (on emergency power supply)
- Upon failure of one amplifier, system automatically transfers to back-up amplifier(s)
- Circuits for emergency telephone call-in-operation, including audible and visual indication
- Circuits for emergency telephones for operation, including two-way voice communication
- Circuits for emergency telephone trouble operation, including visual indication
- Emergency telephone verbal communication, and
- Emergency telephone operable or in-use tone at handset

### **7.4.4. Control unit or transponder inspection**

As applicable, the following elements of each control unit or transponder shall be inspected:



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- Input circuit designation correctly identified in relation to connected field devices
- Output circuit designation correctly identified in relation to connected field devices
- Designations for common control functions and indicators
- Plug-in components and modules securely in place
- Note the date, the revision and the version of the firmware and software program
- Clean and free of dust and dirt
- Fuses in accordance with manufacturer's specifications
- Control unit or transponder lock functional
- Termination points from wiring to field devices secure
- The zone of each alarm initiating device is correctly printed and rated voltage is present.
- Check the value and status of all fuses.
- Check circuits providing an interface between two or more control units.
- Test interface equipment connections by running or simulating the operation of the equipment being monitored.
- Ensure that signals from the interface equipment are transmitted to the control unit.
- Ensure that LED lamps and indicators are lit.
- Disconnect any secondary (standby) power. Test main power supply at maximum load, including all alarm devices requiring simultaneous operation. Reconnect secondary power supply at the end of the test.
- Inspect control equipment transponders.
- Test interface equipment connections and check control unit signal reception
- Test fire safety functions, such as fan control, smoke damper function, elevator recall, elevator power shutdown, door unlocking, etc.
- Test extinguisher system monitoring.

### **7.4.5 Annunciators and remote trouble signal units**

Each annunciator shall be inspected and tested to confirm operability, including:

- Power-on indicator
- Ensure that each alarm and supervisory zone is clearly indicated and designated separately
- Individual alarm and supervisory zone designation labels are properly identified
- Common trouble signal
- Visual indicator test (lamp test)
- Input wiring from control unit or transponder is supervised
- Alarm signal silence visual indicator
- Switches for ancillary functions operate in accordance with design and specifications
- Ancillary function visual indicators
- Manual activation of alarm signal and indication
- Screens are visible in areas where they are installed
- Function on backup power
- Each remote trouble signal unit must be inspected and tested to confirm operation, including the following functions:
  - Input wiring from control unit or transponder is supervised

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- Visual trouble signal
- Audible trouble signal
- Audible trouble signal silence

### 7.4.6 Priming devices

- Test ventilation system tube detectors to ensure that the device will sample the airflow in accordance with manufacturer instructions .
- Check the operation of electromechanical release devices and lubricate as needed.
- Mechanically or electrically operate switches for the fire protection or extinguishing system and check fire alarm control unit signal reception.
- Conduct a heat test on the following types of heat detectors: thermostatic, rate-of-rise, rate-compensated, spot.
- Perform a functionality test on linear heat detectors by operating them mechanically or electrically.
- Manually set off fire alarms.
- Test smoke detectors to ensure that smoke enters the detection chamber and triggers the alarm.
- Check smoke detectors for cleanliness.
- Test carbon monoxide detectors.

### 7.4.7 Alarm devices

- Test the sound level of audible devices.
- Note the maximum sound level produced when the emergency evacuation audible alarm sounds.
- Inspect visual alarm devices and ensure that they are flashing.
- Check the location and ratings (in candela) of visual alarm devices.
- Test audible alarm devices marking exits.

#### 7.4.7.1 Supervision station

- Check priming device signal reception at the supervision station (transmitters).
- Test supervision station transmitters.

#### 7.4.7.2 Public fire alarm system

- Test each circuit of the secondary alarm and verify reception of signal pulses.

## 8. Portable extinguishers

### Equipment

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A total of 34 portable extinguishers are installed throughout the Chancery.

### Reference

- CO2 extinguishers, 5 kg

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- Powder extinguishers (ABC), 6 kg
- Powder extinguishers (ABC), 9 kg

### Maintenance schedule

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#### 8.1 Monthly

- Ensure that the extinguishers indicated on the floor plans are in place.
- Ensure that the extinguishers are installed in their brackets.
- Ensure that the extinguishers are easy to access.
- Check that the pressure indicated on the gauge is acceptable.
- Ensure that the pin and the seal are in place.
- Sign the tag.

#### 8.2 Annually

- Complete verification and certification.

#### 8.3 Every five (5) years

- Conduct a hydrostatic test, which must include a visual inspection of the interior and exterior of the cylinder.
- Extinguishers removed temporarily for maintenance must be replaced with extinguishers of the same type.

## 9. Plumbing and water pumps

### Equipment

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Systems to be maintained range from water supply to water collection. Plumbing systems are made up of the following equipment:

- Intake equipment for city water and fire extinguishing water
- Equipment for producing domestic hot water and treating water

### Reference

- WILO pump, type: COR-2MVIE406-2G/VR-EB.

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## Maintenance schedule

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### 9.1 Weekly

#### 9.1.1 Weekly pump inspection

- Ensure that pump suction and discharge, as well as bypass valves, are fully open.
- Ensure that there are no leaks in the piping.
- Ensure that the suction line gauge reading is within the acceptable range.
- Ensure that system line gauge reading is within the acceptable range.
- Ensure that the suction reservoir is full.
- Ensure that the wet pit suction screens are unobstructed and in place.
- Check the state of the flexible hoses connecting the pump to the sprinkler.

#### 9.1.2 Weekly pump test

- Conduct a weekly test of the fire pump assembly with no water flow, starting the pump automatically. Run the electrical pump for at least 10 minutes. Qualified personnel must be present during the weekly pump test.
- When the pump is running, make the following observations and adjustments:
- Note the system suction and discharge pressure gauge readings.
- Check the pump sealing rings for discharge; as needed, adjust the male nut.
- Check the pump glands, bearings, or casing for signs of overheating.
- Note the starting pressure of the pump.

### 9.2 Monthly

- Ensure that there are no leaks in the piping or connections.
- Note the intake pressure reading and ensure that it is within the acceptable range.
- Note the discharge pressure reading and ensure that it is within the acceptable range.
- Check for excessive vibration or noise.

### 9.3 Annually

#### 9.3.1 Annual pump maintenance

- Inspect and clear the suction screens of any debris or obstruction.
- Lubricate pump bearings as required.
- Check pump shaft end play..
- Check accuracy of pressure gauges and sensors; recalibrate as needed.
- Check pump shaft alignment.
- Lubricate shaft alignment as needed.
- Lubricate motor bearings as needed.
- Lubricate right angle gear drive as needed.
- Check the motor contactor for signs of pitting or other damage; as needed, repair or replace.
- Inspect electric terminals, clean and tighten connections and apply dielectric coating if necessary.

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- Check wear and compliance of drive seals and replace as needed.
- Check the control box for dirt, debris and loose connections.
- Check for proper fluid flow; as needed, clean and repair to re-establish appropriate flow.

#### 9.3.2 Annual pump test

- Conduct an annual test of each pump assembly based on minimum, nominal and maximum (150% of flow rate) flow for the fire pump, controlling the quantity of water discharged using approved test devices.
- Make visual observations, and take the following measurements while the pump is operating and water is running in accordance with the specified flow conditions:
  - No flow:
  - Check that the relief valve is releasing water (as necessary)
  - Check that the pressure relief valve is working correctly
  - Continue the test for half an hour
- For each flow condition:
  - Record the voltage and current of the electric motor (all lines)
  - Record the pump speed in RPM
  - Record the simultaneous readings of pump suction and discharge pressures and pump discharge flow
- Check the relief valve (if installed) to determine whether the pump discharge pressure exceeds the normal operating pressure of the system components.
- Check the relief valve (if installed) to determine whether the relief valve closes at the proper pressure.

## 10. Sprinkler system

### Equipment

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The Chancery is equipped with a sprinkler system.

### Maintenance schedule

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#### 10.1 Weekly

##### 10.1.1 Local sprinkler

- Check the valve positions against the schematic
- Check the electrical cabinet:
  - Voltage
  - Switches set to: In service
  - Indicator light test
- Check the power pump electrical cabinet:
  - Voltage
  - Switches set to: In service
  - Indicator light test

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### 10.1.2 Control station

- Check the valve positions against the schematic
- Pressure on gauges

### 10.1.3 Tests

- Jockey pump tests
  - Check starting pressure
  - Check shutoff pressure
- N 1 pump tests:
  - Check pressure gauges
  - Control valve position and water levels
- N 2 pump tests:
  - Check pressure gauges
  - Control valve position and water levels
- Control station tests:
  - Check pressure before and after testing
  - Check the position of switches on auto
  - Control valve position

### 10.2 Semi-annually

- Close and open the shutter.
- Check that the gland is in good condition.

### 10.3 Annually

#### 10.3.1 Alarm valve

- Flush the system.
- Dismantle the control station façade.
- Clean the water outlets and the seal surface.
- Change the seal.

#### 10.3.2 Alarm bell:

- Clean the filter injector..
- Lubricate moving parts..

### 10.4 Every three (3) years

#### 10.4.1 Check valve

- Dismantle and clean the seal surface.

#### 10.4.2 Shutter

- Dismantle and clean the seal surface..

## 11. Various work and expertise

### Equipment

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This section describes various maintenance work to be performed and expertise to be provided. The work includes:

- Anchor point test
- Fumigation
- Terrace inspection
- DESIGO software maintenance
- Maintenance and cleaning of interior and exterior panes and windows

#### Maintenance schedule

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##### 11.1 Monthly

###### 11.1.1 Anchor points

- Test the anti-intrusion anchor points installed around the perimeter of the Chancery.

###### 11.1.2 Fumigation

- Inspect the building, including offices, service shafts, security stations, mechanical rooms, washrooms, kitchen, garage and garden for insects and vermin.
- As needed, conduct disinsection and deratization operations. Fumigation must be carried out using modern techniques, and all necessary precautions must be taken to protect the health of Canadian Embassy personnel and avoid any inconvenience. All products used must be approved by the Department of Public Health.

###### 11.1.3 Terrace inspection

- Inspect the terraces to check for any water accumulation that could lead to leaks.

###### 11.1.4 Maintenance of the building management system

- Check that the DESIGO software is up to date, and update as necessary.
- As needed, provide technical assistance to the Facilities Manager in using the software.

##### 11.2 Semi-annually

###### 11.2.1 Maintenance and cleaning of interior and exterior panes and windows

- Use lifts to inspect the joints of the building's glass walls and exterior windows; as needed, replace damaged seals to prevent infiltration.
- Use scaffolding to inspect the glass walls of the atrium as well as the glass ceiling, check anchors and screws and tighten as needed; wash the glass walls of the atrium.
- From the roof, inspect the glass ceiling of the atrium; as needed, replace damaged seals.
- Wash the glass walls and the interior and exterior windows of the building .

### III – VARIOUS SERVICES

Various services include the purchase of consumables, repairs, and work identified as part of preventive and corrective maintenance of the facilities in accordance with the maintenance schedules described in Part II.

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Various services will be invoiced upon completion of repairs or work, or upon purchase and delivery of consumables approved in advance by the Advisor (Management) and Consul.

### **1. Consumables management**

- Regularly check inventory of small consumables (bulbs, sprinkler parts, doorknobs, ceiling tiles, salt for the softener, etc.) and prepare detailed specifications for the approval of the Advisor (Management) and Consul.

### **2. Repairs and work**

- Identify and report repairs or work that are required to keep the facilities in good working order but that are not included in the maintenance schedules.
- Prepare detailed specifications and plans for work and repairs for the approval of the Advisor (Management) and Consul.