SFG20
Core

Endorsed By
IHEEM

HTM 06-12 Power Generation (Standby Generator) with Life Safety System Duties

Date: 20 Mar 2024
Version: 5
Unit of Measure: Nr

Summary	
Frequencies	**Tasks**
1D (Day) 5 mins	2
1W (Week) 10 mins	3
1M (Month) 150 mins	10 4 5 6 7 8 9
3M (Months) 35 mins	11 13 14 12
6M (Months) 240 mins	15 16 17 18 19 20 21 22 23 24 25
12M (Months) 550 mins	26 27 28 29
0U (Unspecified)	1 30 31 32
Annual Timing	**5315 mins**

Introduction

1 The purpose of the HTM Aligned specialist set of task maintenance schedules is to create a sector recognised structured approach for Hospitals and Healthcare premises which should not be considered as replacements for Health Technical Memorandums (HTMs). SFG20 has interpreted the HTM requirements by combining them with the SFG20 core elements, current statutory requirements and recognised Codes of Practice.

2 The 'Service Timings' displayed against each frequency are generic. Please note that Service Timings are estimated so could vary dependent on the size, age and/or location of the equipment/building. Consequently, the timings provided within this task schedule may require customising according to individual circumstances. This also applies where it has not been possible to estimate and allocate a Service Timing to a particular task.

3 Frequent running and testing of stand-by power generation equipment is essential to ensure immediate availability at time of need. It is recommended that plant should be run on load for a minimum of four hours on a regular basis or as required by client.

4 A risk assessment should be carried out to see what systems the generator covers, the type of people who are reliant on the generator system starting and the age and condition of the plant. The outcome of the risk assessment will define a frequency for all future tests and length of run.

5 A simple single-line diagram of the electrical infrastructure showing the interface of all primary and secondary power sources and their respective controls should be available at all times. The single-line diagram should include all earthing arrangements while the power is derived from the secondary power source.

6 Records should be kept of all hours that the standby plant is run, whether the purpose is for testing, parallel operation or an outage of the public electrical supply (PES).

7 During any testing or parallel operation of the secondary power source, readings of the output phase-to-phase and phase-to-neutral voltage (V), current (A), frequency (Hz), true power (kW), apparent power (kVA) and power factor should be recorded.

7.1 A computer software system for the automatic recording of the above parameters should be considered. Advantages include the automatic recording of data while the secondary power source is running due to an outage of the PES.

8 The generating set represents a single point of failure, and maintenance routines should be developed to reduce the risk of failure. Some of the commonest reasons for failure are:

8.1 Overload - inadequate testing onto actual site load.

8.2 Cold engine - engine heater turned off or heater failed.

8.3 Flat batteries - battery charger turned off, charger failed, or batteries too cold.

8.4 Cold room - room heater turned off or when the generating set is at standby, room air change rate set too high.

Please refer to the overarching introduction (SFG 00-01) to make sure you are of the correct skill level as indicated within the task schedule to carry out the described works. Ensure you have read and understood the manufacturer's recommendations, carried out risk assessment(s) on each item of plant to identify the correct frequency of maintenance, identified all safety procedures that need to be applied and recorded in order to carry out the work in a safe and reliable manner.

If this asset (item of equipment / system) is within the warranty or guarantee period, it is essential that you maintain it in full accordance with the specific manufacturer's or installer's maintenance requirements. If you are in any doubt about the maintenance requirements or the warranty or guarantee period please contact the manufacturer, installer or their representative to seek clarity.

Notes:

1 Many premises have standby power generation equipment to provide back up in the event of incoming power failures and there has been a tendency to 'fit and forget' with the result that the equipment may fail to operate just when it is needed. These units comprise a mechanical prime mover, usually an oil or gas powered internal combustion engine, an electrical generator with associated equipment and may include mains synchronisation.

1.1 This specification covers primarily the electricity generation and control equipment and except for simple tasks, the maintenance of the prime mover should be carried out by specialist contractors.

2 A similar position arises with small scale combined heat and power units which are being introduced to many sites. Here the equipment can be divided into three sections:

2.1 The prime mover.

2.2 Electrical generation.

2.3 Heat recovery.

3 This section covers the electrical generation equipment and the equipment used for utilising the recovered heat is covered within SFG series 28 Heat Emitters. Again the prime mover should be maintained by specialist firms.

4 Generating plant, in particular the engine system requires regular attention to ensure reliability, optimum performance and long life. All maintenance procedures should be fully in accordance with the generator set operating and maintenance instructions. A maintenance log book should be established upon accepting the plant after commissioning. This should include a full record of hours-run readings and a summary of all servicing and repairs carried out, together with fuel and lubricating oil consumption totals.

5 Whatever the mode of operation, the generating plant must operate when called upon to do so. Failure of the battery starting system will prevent the generator set starting and hence this needs regular and frequent checking. Periodic maintenance recommendations from the supplier will normally cover routine checks on a frequent basis (possibly after 100 hours of use or at monthly intervals) depending upon various operating factors.

6 More detailed maintenance, including replacement of items such as lubricants, filters, belts and coolant can be expected, every say 500 hours. Major maintenance activities are required typically after 5000 hours. This may involve a complete strip-down of the engine and inspection and replacement of worn or defective parts.

Newly installed Medium Combustion Plants (MCP) such as boilers, engines and gas turbines with a net rated thermal input between 1 MW and 50 MW must comply with strict emissions limits for sulphur dioxide, nitrogen oxides and dust. In some cases this can be the aggregated rating of multiple plants below 1 MW. These MCPs must be registered or have obtained a permit, and they must comply with current emission limit values. The emissions must be tested within 4 months of registration or grant of permit and subsequently monitored at a set frequency: once every three years for 1 to 20 MW plants and annually for plants over 20 MW. Records must be kept for at least 6 years to show the results of emission monitoring, the hours run, the quantities and types of fuel used, and the details of any malfunctions or breakdowns.

The limit extends to generators with a thermal input below 1 MW if they have a capacity or balancing service agreement. Generators can receive an exemption if they operate for less than 500 hours per year when measured as a three-year rolling average for new plants, and a five-year rolling average for existing plants. Backup generators are exempted if they operate for 50 hours a year or less and only for emergency purposes, but they lose this exemption if they enter into a capacity or balancing service agreement.

Warning:
Standby generators are typically designed to start automatically and may start at any time without warning. This may present a hazard to anyone working in the vicinity. Before carrying out maintenance, agree a time with the duty holder for safe isolation of the generator. Isolate the generator following the site-specific procedure for safe isolation then lock the equipment in the OFF position. The duty holder must provide an alternative backup electrical supply for the duration of the work. When maintenance is complete, ensure that the generator changeover switch is left in the automatic start (AUTO) position.

Display Order	Tasks

1	**Periodic Inspection and Testing** **Criticality:** Red **Frequency:** 0U **Skill Set:** Electrical **Action:** Carry out the following: 1 Visual inspection of the installation. 2 Continuity of protective conductor test. 3 Insulation resistance of conductor test. 4 Polarity check. 5 Earth fault loop impedance test. 6 Earth electrode resistance test (as required). 7 RCD tests including functional testing of assemblies (as required). 8 External impedance (ZE) and prospective fault current (PFC) tests. 9 Continuity of main bonding conductors. 10 Any other tests required for the purpose of fault-finding. 11 Report any defects immediately. **Notes:** 1 Follow safe isolation procedures at all times, as advised in the current regulations. 2 Testing must be carried out in accordance with current regulations. 3 The tests listed above are advised by the current regulations, however, other tests may be added for the purpose of fault finding. 4 Periodic Inspection and Testing is aimed at the supply circuit and protective devices within the installation; this inspection will be carried out as part of a larger scale test. 5 Care should be taken to ensure sensitive equipment is not damaged, and the appropriate circuit identification is in place. 6 It is not uncommon for additional loads to be added to a circuit, ensure these are captured during the tests and the relevant documentation updated. 7 Always consult on-site documentation to ensure manufacturer's guidelines are followed. 8 Test equipment is to be checked and tested in accordance with the relevant guidelines. 9 Electrical testing will be incorporated under normal routine testing, and as part of functional testing of assemblies.
2	**Daily inspection** **Criticality:** Amber **Frequency:** 1D **Skill Set:** Competent Person **Action:** 1 Maintain the generator set daily or every 20 hours run time in accordance with the manufacturer's instructions, which should include but not be limited to the maintenance listed below. 2 Lubrication system - check: 2.1 Oil leakage. 2.2 Oil level. 2.3 Replace oil and oil filter after 50 hours run time for an overhauled or new engine. 3 Cooling system - check: 3.1 Coolant leakage. 4 Fuel system - check: 4.1 Fuel leakage. 5 Reporting - report any defects found and record the details in the logbook. **Notes:** Refer to manufacturer's instructions and site-specific risk assessments for additional requirements.
3	**Non-intrusive visual inspection** **Criticality:** Red **Frequency:** 1W **Skill Set:** Competent Person **Action:** 1 A limitation-of-access document should be raised for any non-intrusive visual inspection of the essential standby plant, etc. 2 Check the fuel, lubricating oil and coolant levels of the standby generators are correct, topping up as necessary. 3 Visually inspect for leakage and report if found. 4 Check the status of all instrumentation. 5 Check the general tidiness of the generator house and sweep out as required. **Notes:**
	General - monthly

4	**Criticality:** Amber **Frequency:** 1M **Skill Set:** M&E **Action:** 1 Visually inspect for oil leaks, loose guards, etc. 2 Check coolant level and oil level. **Notes:**
5	**Engine heater** **Criticality:** Amber **Frequency:** 1M **Skill Set:** M&E **Action:** Check that the engine heater is working. **Notes:**
6	**Oil** **Criticality:** Amber **Frequency:** 1M **Skill Set:** M&E **Action:** Check oil in sump using the dipstick and top-up oil if necessary. **Notes:** Ensure correct grade and type of oil is used in accordance with the manufacturer's recommendations.
7	**Coolant** **Criticality:** Amber **Frequency:** 1M **Skill Set:** M&E **Action:** 1 Check water level in the radiator and top-up if necessary. 2 Check operation of low water switch. **Notes:** 1 The acidity (pH) and specific gravity (SG) should be checked regularly by the operator. 2 The pH of the coolant water should be between 8 and 10.5.
8	**Fuel tank** **Criticality:** Amber **Frequency:** 1M **Skill Set:** M&E **Action:** 1 Check that the fuel tank is full. 2 Drain off any water 3 See also: 3.1 SFG schedule 56-05 Oil Storage Tanks - Above Ground. 3.2 SFG schedule 56-06 Oil Storage Tanks - Underground. **Notes:** Top-up as required.
9	**Starter battery - monthly** **Criticality:** Amber **Frequency:** 1M **Skill Set:** Electrical **Action:** 1 Check starter batteries are fully charged and top-up with distilled water as necessary. 2 Inspect cells, ensure that vent holes in filter caps are clear. 3 Check that conducting bars and cable connections are clean and tight. Any trace of verdigris to be cleaned off and connections to be coated with petroleum jelly. 4 Take random test of specific gravity and cell voltage. **Notes:** 1 Charge batteries as necessary (in accordance with instructions in operating log). 2 Top-up electrolyte using pure distilled water, ensure that cells are gassing freely whilst charging. 3 Charge batteries to 1250 s.g. and 2.1 volts per cell, or otherwise as specified. Re-check specific gravity. 3.1 Electrolyte should be kept to 12 mm above plates, only pure distilled water to be used for this purpose. 3.2 Topping up should be carried out before charging to ensure good mixing. 3.3 Ventilation holes in filter caps must be kept clean. 3.4 A lead acid battery is fully charged when s.g. is 1250 and all cells are at 2.4 volts. The battery cells should not be allowed to fall below 1150 s.g. or 1.8 volts. 3.5 When the charging rate is in doubt, a long slow charge is better than a short sharp one. 4 Some generators are started by compressed air. Check compressed air starter and air system if applicable.
	Routine online testing

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Criticality: Red **Frequency:** 1M **Skill Set:** M&E

Action:

1 The use of a permit-to-work document for any test of the secondary power source may be required.
2 Run the generator online with the building load where possible (see notes).
- 2.1 Duration of the test should be at least one hour but preferably two hours.
- 2.2 Check that oil pressure is correct, if not trace and repair fault.
- 2.3 Check the electrical output on the generator control panel.
- 2.4 Examine for any leaks of coolant, fuel or lubricating oil, rectify as necessary.

3 During the testing or parallel operation of the secondary power source, readings of the output phase-to-phase and phase-to-neutral voltage (V), current (A), frequency (Hz), true power (kW), apparent power (kVA) and power factor should be recorded.
4 Run generator offline after the test for a period of ten minutes to allow the generator cooling system to stabilise.
5 Where the distribution strategy exists and arrangements with the distribution network operator (DNO) are in place to allow the standby generators to operate in parallel with the public electrical supply (PES), the frequency of the test to prove the essential electrical systems can be reduced.
- 5.1 Operations with the standby generator and PES in parallel should be considered in order to offset the maximum demand and hence reduce energy cost.
- 5.2 Where these strategies exist, the parallel operation can supplement the routine requirement to test the essential standby plant to six-monthly frequencies.

Notes:

1 Where practicable, the generator should be started under mains failure conditions.
2 The method of initiating the start of such test will depend on the electrical distribution strategy of the healthcare premises.
3 A long-term paralleling of the generator and distribution network operator (DNO) connection (in accordance with the Energy Networks Association's 'Engineering requirements G59') will minimise the inconvenience to the healthcare premises staff.
4 Without such arrangements, testing of generators with the building load will require a short-term isolation of the electrical supply, which may not be acceptable.
5 In these cases, tests should be conducted with a load bank that has reactive and resistive components to test the generator. (Purely resistive load banks may damage the cylinder or cylinder liners due to the high carbon build-up.)
6 Where the essential standby plant consists of more than one generator connected to the same part of the distribution (and long-term parallel arrangements exist), it may not be necessary to test all sets at the same time.
7 The generator(s) on test should operate at greater than 70% full load, by adjusting the load-sharing controls of the generator and mains. Allowing the generator to operate as the lead electrical unit and the DNO connection to act as the supplementary supply will achieve this.
8 Where there is more than one generator connected to the same part of the healthcare site's distribution, there are advantages in starting the second set after about one hour of running the first.
9 Synchronise the second set with the running set, before connecting to the load and then stopping the first generator after a further 15 minutes.
10 On completion of test:
- 10.1 Shut down plant and examine all components for excessive temperatures.
- 10.2 Ensure that all switches are in the 'ready' position.
- 10.3 Check fuel, oil and water levels and top-up if necessary.

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Starter battery

Criticality: Red **Frequency:** 3M **Skill Set:** M&E

Action:

1 Check starter batteries are fully charged and top-up with distilled water as necessary.
2 Inspect cells, ensure that vent holes in filter caps are clear.
3 Check that conducting bars and cable connections are clean and tight. Any trace of verdigris to be cleaned off and connections to be coated with petroleum jelly.
4 Take random test of specific gravity and cell voltage.
5 The specific gravity of the electrolyte should be measured and recorded.
6 A battery should be fully discharged and re-charged every six months.

Notes:

1 A permit-to-work document should be raised for any non-intrusive functional maintenance task of the secondary power sources.

11 continued	2 Charge batteries as necessary (in accordance with instructions in operating log). 3 Top-up electrolyte using pure distilled water, ensure that cells are gassing freely whilst charging. 4 Charge batteries to 1250 s.g. and 2.1 volts per cell, or otherwise as specified. Re-check specific gravity. 4.1 Electrolyte should be kept to 12 mm above plates, only pure distilled water to be used for this purpose. 4.2 Topping up should be carried out before charging to ensure good mixing. 4.3 Ventilation holes in filter caps must be kept clean. 4.4 A lead acid battery is fully charged when s.g. is 1250 and all cells are at 2.4 volts. The battery cells should not be allowed to fall below 1150 s.g. or 1.8 volts. 4.5 When the charging rate is in doubt, a long slow charge is better than a short sharp one. 5 The generator should be isolated from all control systems and distribution connections while performing any non-intrusive functional tests.
12	**Fuel quality test - generator without fuel polishing unit** **Criticality:** Amber **Frequency:** 3M **Skill Set:** Specialist **Action:** Fuel quality should be tested three-monthly in accordance with the manufacturer's instructions if there is no fuel polishing system installed. **Notes:**
13	**Battery charger** **Criticality:** Red **Frequency:** 3M **Skill Set:** Competent Person (LV) **Action:** 1 Check condition of battery charger, inspect for damage. 2 Open and check on condition of wiring and transformer insulation. 3 Check on all electrical connections, clean or blow out. 4 Test operation of any ON/OFF or selector switches, test accuracy of meters. 5 Inspect or renew if damaged any flying leads, terminals or clips. 6 Test the measurement of battery unit cell voltage and charging current in accordance with the battery manufacturer's recommendations. 7 Take insulation and earth impedance test. **Notes:** 1 A permit-to-work document should be raised for any non-intrusive functional maintenance task of the secondary power sources. 2 The generator should be isolated from all control systems and distribution connections while performing any non-intrusive functional tests.
14	**Antifreeze** **Criticality:** Red **Frequency:** 3M **Skill Set:** Competent Person (LV) **Action:** Add antifreeze to cooling system or check specific gravity as applicable. **Notes:** 1 A permit-to-work document should be raised for any non-intrusive functional maintenance task of the secondary power sources. 2 A measurement of the coolant anti-freeze should indicate a 35% to 50% mixture, or as recommended by the engine manufacturer. 3 If the coolant water anti-freeze is refilled, ethylene glycol base should be used. 4 The coolant water should have a suitable corrosion inhibitor. 5 The condition of any radiator guards and exhaust insulation should also be inspected. 6 The generator should be isolated from all control systems and distribution connections while performing any non-intrusive functional tests.
15	**Fuel quality test - generator with fuel polishing unit** **Criticality:** Amber **Frequency:** 6M **Skill Set:** Specialist **Action:** Fuel quality should be tested six-monthly in accordance with manufacturer's instructions if there is a fuel polishing system installed. **Notes:**
	Electrical - six-monthly

16	**Criticality:** Amber **Frequency:** 6M **Skill Set:** Electrical **Action:** The following check is recommended for electrical installations in hospitals and medical clinics (medical locations) and is carried out as part of ongoing routine maintenance. 1 Isolate and perform an inspection on the generator and its associated electrical equipment. 2 Inspect the electrical equipment for the following: 2.1 Breakages. 2.2 Wear/deterioration. 2.3 Signs of overheating. 2.4 Missing parts, covers or screws. 2.5 Loose fixings or connections. 3 Confirm that: 3.1 The switchgear is accessible and unobstructed. 3.2 Enclosure doors are secure. 3.3 Adequate labelling is in place. 4 Check the correct operation of the following: 4.1 Switchgear. 4.2 Equipment. 4.3 RCDs (using test button). **Notes:**
17	**Oil filter and oil** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** 1 Change oil filter elements and clean oil filter bowls. 2 Drain the sump and refill with fresh clean oil. 3 Check operation of sump heater. **Notes:** Ensure correct grade and type of oil is used in accordance with the manufacturer's recommendations.
18	**Breather and air cleaners** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** Examine and clean if necessary. **Notes:**
19	**Bearings and moving parts** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** 1 Lightly grease the water pump bearings and the clutch and power take off bearings (if fitted). 2 Check all moving parts for smooth operation, lubricate any pivoting spindles as necessary. **Notes:**
20	**Drive belts** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** Check belts for slackness and alignment or wear and adjust as necessary. **Notes:** 1 Replace drive belts using manufacturer's replacement belts. 2 If the drive has more than one belt ensure all belts are changed at the same time. 3 Do not apply belt dressing.
21	**Fuel filter** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** 1 Change the fuel filter element and clean the filter bowl. 2 Replace water removal filter (type OFS E104 for non-critical systems or type SAE J1488 for critical systems). **Notes:**
	Air intake grilles - alternator

22	**Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** 1 Check that air intake grilles on alternator are clean and unobstructed. 2 Remove cover from non-drive and remove any fluff or dirt that may have accumulated around diode plates and exciter assembly. **Notes:**
23	**Generator - electrical** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** 1 Check all electrical connections for security. 2 Inspect the alternator and starter motor electrical connections, check tightness and mounting. 3 Check operation of low oil and high coolant shutdown switches. **Notes:**
24	**Operation and auto-change facility (where applicable)** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** 1 Check engine starter and solenoid for good strong operation. 2 Check operation and starting sequence. **Notes:**
25	**Instruments** **Criticality:** Amber **Frequency:** 6M **Skill Set:** M&E **Action:** Check that instruments are functioning correctly and that glass is clean. **Notes:**
26	**Test run** **Criticality:** Red **Frequency:** 12M **Skill Set:** M&E **Action:** 1 The use of a permit-to-work document for any test to prove the generator engine condition of the secondary power source may be required. 2 Run the generator online with the building load where possible (see notes). Duration of the test should be not less than three hours and ideally four hours. 3 During the testing or parallel operation of the secondary power source, readings of the output phase-to-phase and phase-to-neutral voltage (V), current (A), frequency (Hz), true power (kW), apparent power (kVA) and power factor should be recorded. 4 Test the overspeed governor by operating it to prove its action. 4.1 This test will depend on the type of overspeed governor – electrical or hydraulic. 4.2 This test should not be carried out if there is only one generator running (in island or parallel mode). 5 Test the over-temperatures to ensure the alarms and actions function. 5.1 This test should not be carried out if there is only one generator running (in island or parallel mode). 6 Force off the fuel rack to test the auto-shutdown of the set. 6.1 This test should not be carried out if there is only one generator running (in island or parallel mode). 7 Run generator offline after the test for a period of ten minutes to allow the generator cooling system to naturally cool the set down **Notes:** 1 Where practicable, the generator should be started under mains failure conditions. 2 The method of initiating the start of such test will depend on the electrical distribution strategy of the healthcare premises. 3 A long-term paralleling of the generator and distribution network operator (DNO) connection (in accordance with the Energy Networks Association's 'Engineering requirements G59') will minimise the inconvenience to the healthcare premises staff. 4 Without such arrangements, testing of generators with the building load will require a short-term isolation of the electrical supply, which may not be acceptable.

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5 In these cases, tests should be conducted with a load bank that has reactive and resistive components to test the generator. (Purely resistive load banks may damage the cylinder or cylinder liners due to the high carbon build-up.)
6 Where the essential standby plant consists of more than one generator connected to the same part of the distribution (and long-term parallel arrangements exist), it may not be necessary to test all sets at the same time.
7 The generator(s) on test should operate at greater than 70% full load, by adjusting the load-sharing controls of the generator and mains. Allowing the generator to operate as the lead electrical unit and the DNO connection to act as the supplementary supply will achieve this.
8 Where there is more than one generator connected to the same part of the healthcare site's distribution, there are advantages in starting the second set after about one hour of running the first.
9 Synchronise the second set with the running set, before connecting to the load and then stopping the first generator after a further 15 minutes.
10 On completion of test:
10.1 Shut down plant and examine all components for excessive temperatures.
10.2 Ensure that all switches are in the 'ready' position.
10.3 Check fuel, oil and water levels and top-up if necessary.

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Injector pump

Criticality: Amber **Frequency:** 12M **Skill Set:** M&E

Action:
1 Check injector pump drive belts for wear and tightness.
2 Adjust or replace as necessary.

Notes:

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Electrical - twelve-monthly

Criticality: Amber **Frequency:** 12M **Skill Set:** Electrical

Action: The following check is recommended for electrical installations in hospitals and medical clinics (medical locations) and is carried out as part of ongoing routine maintenance.
1 Isolate and perform an inspection on the generator and its associated electrical equipment.
2 Inspect the electrical equipment for the following:
2.1 Breakages.
2.2 Wear/deterioration.
2.3 Signs of overheating.
2.4 Missing parts, covers or screws.
2.5 Loose fixings or connections.
3 Confirm that:
3.1 The switchgear is accessible and unobstructed.
3.2 Enclosure doors are secure.
3.3 Adequate labelling is in place.
4 Check the correct operation of the following:
4.1 Switchgear.
4.2 Equipment.
4.3 RCDs (using test button).

Notes:

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Fuel transfer pump

Criticality: Amber **Frequency:** 12M **Skill Set:** M&E

Action: Check operation.

Notes:

30

Blackout test

Criticality: Red **Frequency:** 0U **Skill Set:** Competent Person (LV)

Action:
1 The frequency of this task will be set following a full risk assessment.
2 During the testing or parallel operation of the secondary power source, readings of the output phase-to-phase and phase-to-neutral voltage (V), current (A), frequency (Hz), true power (kW), apparent

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power (kVA) and power factor should be recorded.

Notes:

1 Maintenance tests for standby generators should include a test of any automated switchgear used to transfer power supplies from the primary supply and secondary supply.

2 Where the standby plant does not provide the recommended 100% coverage, the standby plant should include test runs in island mode.

3 These tests will assist staff to understand the limitations of the electrical standby systems and, therefore, exercise their contingency plans.

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Full service

Criticality: Red **Frequency:** 0U **Skill Set:** Competent Person (LV)

Action:

1 Carry out in accordance with the manufacturers data sheets and recommendations for a full service and comprehensive overhaul of the alternator, stator and control systems.

2 Frequency of this task will be greater than one year but not greater than 10 yearly. This will depend on running hours and manufacturers recommendations.

Notes:

1 The planned full mechanical servicing of the secondary power source should be undertaken at the same time as the electrical full servicing.

2 A permit-to-work document should be used for the full servicing of standby generator plant.

3 The full service of standby generators will reduce the embedded essential power resilience. Distribution strategies with an N+1 resilient standby power system will negate such restrictions.

4 Alternatively, additional mobile standby plant may be brought in for the duration of the full servicing.

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Load bank testing

Criticality: Amber **Frequency:** 0U **Skill Set:** M&E

Action:

1 Carry out a load test of the generator including a 110% overload and 50% drop test.

2 Where practicable, the generator should be started under mains failure conditions.

2.1 The method of initiating the start of such test will depend on the electrical distribution strategy of the healthcare premises.

2.2 A long-term paralleling of the generator and distribution network operator (DNO) connection (in accordance with the Energy Networks Association's 'Engineering requirements G59') will minimise the inconvenience to the healthcare premises staff.

2.3 Without such arrangements, testing of generators with the building load will require a short-term isolation of the electrical supply, which may not be acceptable.

2.4 In these cases, tests should be conducted with a load bank that has reactive and resistive components to test the generator. (Purely resistive load banks may damage the cylinder or cylinder liners due to the high carbon build-up).

Notes:

1 It is preferable to test the generator using the building load, but where this is not possible or practical for the site-specific system, a load bank can be used as an alternative. The load bank used for this test should have reactive and resistive components to avoid damage to the generator.

2 It should be reviewed and decided why do this type of testing and what are its benefits, versus the risks of not doing this type of testing.

2.1 Can the facility's critical load be taken off line or placed onto a generator backup in order to have this type of testing performed?

2.2 Where will the load banks be staged? What type of heat will be generated and how will the added heat affect the building? When doing large system tests there will be a large amount of heat generated and that can affect sprinkler systems if the load banks are staged inside of the building.

2.3 Are doors going to have load bank cables run through them so that the doors cannot be locked or used for normal use, this may require extra security personnel during testing?

3 In addition, on some older systems it can make perfect sense to do a system test with load banks in order to recalibrate the system and the modules. On some of these older systems that use calibration potentiometers, these potentiometers can drift out of calibration over the years and by performing a recalibration it will ensure that the system is operating at peak performance.

Legislation, Regulations and Guidance

http://knowledge.bsigroup.com/products/liquid-fuel-firing-installations-for-liquid-fuelled-standby-generators-furnaces-kilns-ovens-and-other-industrial-purposes-code-of-practice?version=standard BS 5410-3:2023 Liquid fuel firing - Installations for liquid fuelled standby generators, furnaces, kilns, ovens and other industrial purposes. Code of practice (BSI)
http://knowledge.bsigroup.com/products/fire-detection-and-fire-alarm-systems-for-buildings-code-of-practice-for-design-installation-commissioning-and-maintenance-of-systems-in-non-domestic-premises-1?version=standard BS 5839-1:2017 Fire detection and fire alarm systems for buildings - Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises (BSI)
http://knowledge.bsigroup.com/products/requirements-for-electrical-installations-iet-wiring-regulations-3/standard BS 7671:2018+A2:2022 Requirements for Electrical Installations. IET Wiring Regulations (BSI)
http://knowledge.bsigroup.com/products/fire-safety-in-the-design-management-and-use-of-buildings-code-of-practice?version=standard BS 9999:2017 Fire safety in the design, management and use of buildings. Code of practice (BSI)
http://knowledge.bsigroup.com/products/reciprocating-internal-combustion-engine-driven-alternating-current-generating-sets-emergency-power-supply-to-safety-services?version=standard BS ISO 8528-12:2022 Reciprocating internal combustion engine driven alternating current generating sets - Emergency power supply to safety services (BSI)
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