

Hospital Generator (E service)

| Last Issue Date: 17/01/2018 |   | Type Of Service |   |   |   |   |
|-----------------------------|---|-----------------|---|---|---|---|
|                             |   | A               | B | C | D | E |
| Activity                    |   |                 |   |   |   |   |
| 1                           | STATIC CHECKS (Activities 1-39)   |                 |   |   |   | Y |
| 2                           | INSPECT THE CONDITION OF THE BATTERIES, INCLUDING:<br>a) Check that the batteries are the Vented Stationary Lead Acid type complying with AS4029.1;<br>b) Check the electrolyte level in each cell & record the results. Electrolyte to be replenished only with water complying with AS 2668;<br>c) Check the terminals & connections are tight, clean & corrosion free & apply approved preservative coating to the terminal posts & assemblies;<br>d) Check the battery charger operation incl. the fail alarm & record;<br>e) Check all cell containers for electrolyte leakage;<br>f) Check & record the specific gravity of electrolyte in each cell;<br>g) Before starting the generator, measure and record each battery's voltage; and<br>h) Clean all cells, battery compartments and cabinets. |                 |   |   |   | Y |
| 3                           | REPLACEMENT OF THE BATTERIES:<br>a) Replace the batteries at a timeframe of 70% (default) of the design life of the battery as nominated by the manufacturer. Refer to Special Comments for detail;<br>b) Only Vented (also referred to as Flooded or Wet-Cell) Lead Acid Batteries complying with AS4029.1 are to be used; and<br>c) Write the installation date on the batteries and the calculated date for replacement.   |                 |   |   |   | Y |
| 4                           | Check the engine instruments, controls panel and all indicators.  |                 |   |   |   | Y |
| 5                           | INSPECT THE EXHAUST SYSTEM, ESPECIALLY FOR:<br>a) Condition and any leaks or obstructions;<br>b) Integrity of the fittings and fixings;<br>c) Any signs of overheating including checking adjacent components;<br>d) Condition and operation of the rain flap;<br>e) Condition of flashings and the lagging;<br>f) Condition of flexible connections.   |                 |   |   |   | Y |
| 6                           | Check the air intake, especially for any restrictions.  |                 |   |   |   | Y |
| 7                           | Check the air filters.  |                 |   |   |   | Y |
| 8                           | Check the air intake hoses and pipes, especially for leaks.   |                 |   |   |   | Y |
| 9                           | Check the condition of the belts & pulleys especially for cracks & fraying.   |                 |   |   |   | Y |
| 10                          | Check the condition of the fan hub, idler and water pump.   |                 |   |   |   | Y |
| 11                          | Check the engine oil level and top-up if necessary. Record the level.   |                 |   |   |   | Y |
| 12                          | Check the operation of the block heater. Record the standby temperature.  |                 |   |   |   | Y |
| 13                          | Check the lubrication system for condition and leaks.   |                 |   |   |   | Y |
| 14                          | INSPECT THE FUEL SUPPLY SYSTEM:<br>a) Check the lines for leaks;<br>b) Clean the lift pump sediment chamber and gauze strainer;   |                 |   |   |   | Y |

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|                             | c) Check the quantity;<br>d) Check the bulk tank fuel level and record; and<br>e) Check the day tank fuel level and record.  |                 |   |   |   |   |
| 15                          | Check the operation of the fuel solenoid.  |                 |   |   |   | Y |
| 16                          | FUEL ALARM SYSTEM:<br>a) Check the system is operational & correctly calibrated; &<br>b) Check the alarm is correctly connected to the BMS and the BMS effectively transmits the alarm to the maintenance staff. |                 |   |   |   | Y |
| 17                          | Check the tank breather (for diesel fuelled generators).   |                 |   |   |   | Y |
| 18                          | Check the engine coolant level and the radiator hoses/connections plus the coolant PH level/condition and record.  |                 |   |   |   | Y |
| 19                          | Check the cooling system, especially for any leaks.  |                 |   |   |   | Y |
| 20                          | Check the condition of all auxiliary items especially for correct fixing and for any damaged or stressed components.   |                 |   |   |   | Y |
| 21                          | Check and clean the generator inlet and outlet grille.   |                 |   |   |   | Y |
| 22                          | Record the engine hours at the end of the testing.   |                 |   |   |   | Y |
| 23                          | Check the resilient mounts, all nuts and bolts and clamps.   |                 |   |   |   | Y |
| 24                          | Clean the engine and remove all excess grease, oil, dirt, etc.   |                 |   |   |   | Y |
| 25                          | Analyse the engine oil quality and if required, replace and record.  |                 |   |   |   | Y |
| 26                          | Replace the air filters if necessary.  |                 |   |   |   | Y |
| 27                          | Replace the engine oil filters and the by-pass oil filter.   |                 |   |   |   | Y |
| 28                          | Replace the fuel filter.   |                 |   |   |   | Y |
| 29                          | Check the condensate trap drain (if applicable).   |                 |   |   |   | Y |
| 30                          | LUBRICATION OIL:<br>a) Test & check for evidence of contamination &/or deterioration; &<br>b) Provide a written report including the sample with the name of the installation, plant identification and date.    |                 |   |   |   | Y |
| 31                          | Check and service all generator drive equipment.   |                 |   |   |   | Y |
| 32                          | Check earthing connections and continuity and all other electrical connections.  |                 |   |   |   | Y |
| 33                          | Check cable terminations especially for integrity, cleanliness and signs of overheating.   |                 |   |   |   | Y |
| 34                          | Check brushes and slippings commutator (where applicable).   |                 |   |   |   | Y |
| 35                          | Check the bearing lubrication where possible.  |                 |   |   |   | Y |
| 36                          | Check the circuit breaker and trip setting.  |                 |   |   |   | Y |
| 37                          | Clean and flush the cooling system, including:   |                 |   |   |   | Y |

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|                             | a) Pressure test new coolant; and<br>b) Flow test on radiator and engine block.  |                 |   |   |   |   |
| 38                          | Test that the diesel fuel is to the specification of the generator manufacturer. If required, replace or clean the fuel and flush the fuel and pipes.<br>Note:<br>1/ The total cost of the fuel replacement or cleaning and flushing of the tanks and pipes is an additional cost.<br>2/ The cleaning option is to be approved by the site and the cleaned diesel must meet the manufacturer's fuel specification. |                 |   |   |   | Y |
| 39                          | Undertake a general inspection of the area, including:<br>a) Check the lighting;<br>b) Check the ventilation openings are clear and any mechanical ventilation is operating correctly;<br>c) Check the condition and location of the safety signage;<br>d) Check for general cleanliness; and<br>e) Check the communications (phone lines etc.) operate correctly.   |                 |   |   |   | Y |
| 40                          | DYNAMIC CHECKS (Activities 40-67):   |                 |   |   |   | Y |
| 41                          | Check the condition and operation of the starting system.  |                 |   |   |   | Y |
| 42                          | Check the instrument panel starting sequence.  |                 |   |   |   | Y |
| 43                          | Check and record the battery charging voltage with the generator running.  |                 |   |   |   | Y |
| 44                          | Check for noise and vibration.   |                 |   |   |   | Y |
| 45                          | Check and record the actual water temperature against the motor gauge indication.  |                 |   |   |   | Y |
| 46                          | Check the air flow through the radiator.   |                 |   |   |   | Y |
| 47                          | Check the actual engine speed against the motor tachometer indication.   |                 |   |   |   | Y |
| 48                          | Check the engine speed stability and record.   |                 |   |   |   | Y |
| 49                          | Check the condition and operation of the fuel pump, including calibration (for diesel fuelled).  |                 |   |   |   | Y |
| 50                          | Check the operation of the speed governor.   |                 |   |   |   | Y |
| 51                          | Check for leaks especially fuel, water and oil while the motor is operating.   |                 |   |   |   | Y |
| 52                          | Check the condition and operation of the fuel make up pump and valves (if installed).  |                 |   |   |   | Y |
| 53                          | Check the air intake, especially for restrictions.   |                 |   |   |   | Y |
| 54                          | Check the air flow and cooling through the generator.  |                 |   |   |   | Y |
| 55                          | Check the fuel supply and top up as required.  |                 |   |   |   | Y |
| 56                          | Check, measure & record the output amps, voltage & frequency at:<br>a) No load conditions.<br>b) Load conditions.  |                 |   |   |   | Y |

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| 57                          | <p>AUTOMATIC TRANSFER SWITCH (IF FITTED):<br/>(This service has the same restrictions as the load tests).<br/>a) Check the condition and operation;<br/>b) Simulate a mains power failure allowing the generator to start &amp; checking the automatic changeover sequence operates correctly; &amp;<br/>c) After mains power is restored check that the generator runs on for the pre-set period and that the automatic changeover resets itself to its normal operating position.</p>  |                 |   |   |   | Y |
| 58                          | <p>ANNUAL LOAD TEST:<br/>a) Check on the oil, cooling water and fuel levels before commencing.<br/>b) Refer to the manufacturer's Operational Manual for the test procedure and intervals to record the results. The default interval is 15 minutes.<br/>With the Generator running -<br/>c) Run or load the generator to the hospital's full essential load for 4 hours to check the overall performance of the system. This can be done in 3 ways:<br/>c1) Using a smart load bank (if installed) and if the hospital's full essential load is metered or a controller is installed; or<br/>c2) Switching the Hospital's essential power supply to the generator when mains power is available (if a changeover switch is installed); or<br/>c3) Using an external (portable) load bank and if the hospital's full essential load is metered or a controller is installed.<br/>(Where the standing load (Option c2) is below 40% of rated output an external load bank must be connected to make up the shortfall).<br/>d) Provide a written report. Record as a minimum:<br/>- Voltage.<br/>- Load amps.<br/>- Water temperature.<br/>- Oil pressure.<br/>- RPM.<br/>- Oil used.<br/>- Diesel used.<br/>- The date, duration and performance of the generator.<br/>e) Once the test is done check the oil, cooling water &amp; fuel levels.<br/>LOAD TEST NOTES:<br/>1) If a manual changeover switch is installed, extra time and care is to be taken where large motors are installed to avoid excessive inrush currents while energising back to mains supply. For example, a 10sec delay for a 40kW motor is considered adequate.<br/>2) Do not undertake the Load Test if it causes significant disruption to the hospital services.<br/>3) Site approval is required before the Load Test is undertaken.<br/>Refer to the Special Comments for notes on this annual activity.</p> |                 |   |   |   | Y |
| 59                          | Check the actual oil pressure against the motor gauge indication.  |                 |   |   |   | Y |
| 60                          | <p>Check the shutdown of the system by simulating operation of safety devices including:<br/>a) High water temperature;</p>  |                 |   |   |   | Y |

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|                             | b) Low water temperature;<br>c) Low oil temperature;<br>d) Over voltage output of alternator; and<br>e) Over-speed.  |                 |   |   |   |   |
| 61                          | Check, measure and record the load current of the generator output per phase during the Load Test.   |                 |   |   |   | Y |
| 62                          | Check the exhaust smoke colour and density against the 'Ringleman' chart.  |                 |   |   |   | Y |
| 63                          | Check the condition and operation of the injectors including any adjustments.  |                 |   |   |   | Y |
| 64                          | Check the manifold, especially the gasket condition and torque of nuts and bolts.  |                 |   |   |   | Y |
| 65                          | Check the breathers.   |                 |   |   |   | Y |
| 66                          | Gas fuelled generator (if applicable):<br>a) Check the gas mixing valve for correct operation;<br>b) Check and clean the mixture intercooler;<br>c) Check the condition and operation of the exhaust gas turbocharger;<br>d) Replace the gas fitter on module; and<br>e) Check the condition & operation of gas regulation & safety devices. |                 |   |   |   | Y |
| 67                          | Check that all systems are back to their normal positions.   |                 |   |   |   | Y |
| 68                          | Provide a written report on the condition and operation of the generator including any costed remedial work.   |                 |   |   |   | Y |
| 69                          | Record all readings and results in the log book.   |                 |   |   |   | Y |

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## Special Comments and Technical Data

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E SERVICE REPLACEMENT OF THE BATTERIES - SEE BELOW

REFER TO E03B FOR FULL SERVICE SCHEDULE

REFER TO E03BAA FOR THE A SERVICE

REFER TO E03BA FOR THE B SERVICE

REFER TO E03BC FOR THE C SERVICE

REFER TO E03BB FOR THE D SERVICE

REFER TO E03BE FOR THE E SERVICE

THIS SERVICE SPLIT ONLY TO BE UNDERTAKEN FOR APPROVED SITES. PRIOR TO EACH LOAD TEST APPROVAL IS REQUIRED FROM THE SITE. LOAD TESTS CAN ONLY BE UNDERTAKEN IF THERE IS NO SIGNIFICANT DISRUPTION TO HOSPITAL SERVICES. NOTE: FOR THIS TO BE DONE THE SITE MUST HAVE THE APPROPRIATE ESSENTIAL & NON ESSENTIAL POWER SET UP SUCH AS UPS, CIRCUITRY AND SWITCHING.

NOTIFY THE SITE REPRESENTATIVE AND THE FACILITY MANAGER IF IT IS NOT POSSIBLE TO UNDERTAKE A LOAD TEST.

THE ACTIVITIES AND FREQUENCIES DETAILED ABOVE ARE OF A GENERIC NATURE AND MAY NEED TO BE VARIED TO SUIT THE MANUFACTURER'S RECOMMENDATIONS AND SITE REQUIREMENTS. FOR ADDITIONAL INFORMATION REFER TO AS3009.

THE MONTHLY LOAD TEST REQUIREMENTS

ARE THE MINIMUM TO MEET AS3009. THE ANNUAL LOAD TEST REQUIREMENTS (ACTIVITY 58) ARE MORE STRINGENT THAN THE MONTHLY LOAD TEST REQUIREMENTS & ARE RECOMMENDED GOOD PRACTICE TO: CHECK THE GENERATOR IS CAPABLE OF SUSTAINING THE ESSENTIAL LOAD FOR AT LEAST 4 HOURS.

SEALED BATTERIES THAT CANNOT BE TOPPED UP WITH WATER & ARE ON CONSTANT CHARGE ARE NOT TO BE USED AS THEY MAY EXPLODE. VENTED STATIONARY LEAD ACID TYPE BATTERIES COMPLYING WITH AS4029.1 ARE TO BE USED. REPLACEMENT TIMEFRAME IS 70% (DEFAULT) OF THE DESIGN LIFE NOMINATED BY THE MANUFACTURER, EXAMPLES ARE:

DESIGN LIFE OF 10 YEARS = REPLACE AT 7 YEARS (DEFAULT)

DESIGN LIFE OF 5 YEARS = REPLACE AT 3.5 YEARS (DEFAULT)

SERVICE TECHNICIANS MUST WEAR CORRECT PPE DUE TO THE POTENTIAL EXPOSURE TO BATTERY (SULPHURIC) ACID.

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