

Maintaining emergency power generation equipment

Overview

This standard identifies the competences you need to carry out corrective maintenance activities on emergency power generation equipment, in accordance with approved procedures. This will include the engine/primary power source, the generator, the electrical load connection, and the appropriate control equipment. The maintenance activity will involve dismantling, removing and maintaining faulty or damaged sub-assemblies and components, such as engine components, generator, fans, pumps, valves, couplings, ducting, heaters, filters and control gear, and equipment such as speed governors, voltage regulation, safety control devices, fire protection and shutdown systems, measurement display and recording systems, control panels, electrical components and wiring.

You will be required to apply a range of dismantling and assembly methods and techniques, to include marking/labelling of components to aid the assembly, aligning/adjusting of components, and dismantling components by mechanically dismantling, unplugging, de-soldering, and removal of screwed, clamped and crimped connections.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, or the tools and equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. You will be expected to work with minimal supervision, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying maintenance procedures to emergency power generation systems and equipment. You will understand the dismantling and reassembly methods and procedures used, and their application. You will know how the equipment functions, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and ensuring that the repaired equipment functions to the required specification and remains compliant with all standards and regulations. You will also have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment. You will be required to demonstrate safe working practices throughout, and will understand your responsibility

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for taking the necessary safeguards to protect yourself and others in the workplace.

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Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation and other relevant regulations, directives and guidelines
2. follow the relevant maintenance schedules to carry out the required work
3. carry out the maintenance activities within the limits of your personal authority
4. carry out the maintenance activities in the specified sequence and in an agreed timescale
5. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
6. complete and store all relevant maintenance documentation in accordance with organisational requirements
7. dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition

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Knowledge and understanding

You need to know and understand:

1. the health and safety requirements of the area in which the maintenance activity is to take place
2. the isolation and lock-off procedures or permit-to-work procedure that applies to the equipment being maintained
3. the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others
4. hazards associated with carrying out maintenance activities on emergency power generation equipment/systems (such as moving machinery, hot components, stored pressure/force, live electrical connections, handling oils and coolants, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise them to reduce any risks
5. the importance of wearing the correct personal and environmental protection equipment (PPE) and other appropriate safety equipment during the maintenance process
6. what constitutes a hazardous voltage and how to recognise victims of electric shock
7. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
8. how to obtain and interpret drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process
9. the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities
10. organisational policy on repair/replacement of components during the maintenance process
11. the basic principles of how the equipment functions, its operation sequence, the working purpose of individual units/components and how they interact (to include principles of power generator sets, the function of the stator, rotor and excitation system, principles of AC power generation, electrical losses, synchronizing and loading, output voltage control)
12. generator and prime mover tripping and protection devices
13. generator and bus terminal connections
14. why electrical earthing and bonding is critical and why it must be both mechanically and electrically secure
15. the sequence to be adopted for the dismantling/reassembly of various types of assemblies
16. the methods and techniques used to dismantle/assemble emergency power generation equipment (such as removing bolted components and assemblies, removing components requiring pressure, unplugging, de-soldering, removal of screwed, clamped

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- and crimped connections)
- 17. methods of checking components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lived' items (such as batteries, lamps, filters, seals and gaskets)
- 18. how to make adjustments to components/assemblies to ensure they function correctly
- 19. methods of removing and replacing components and units without damaging the system and infrastructure
- 20. the use of electrical measuring equipment (such as multimeters and resistance testers)
- 21. methods of testing equipment and systems for leaks, and the tools and equipment that can be used
- 22. types and application of coolants and antifreeze agents; quantities used; and methods of flushing and filling the system
- 23. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for their intended purpose
- 24. the generation of maintenance documentation and/or reports following the maintenance activity
- 25. the equipment operating and control procedures to be applied during the maintenance activity
- 26. how to use lifting and handling equipment correctly and safely in the maintenance activity
- 27. the problems associated with the maintenance activity, and how they can be overcome
- 28. the organisational procedure to be adopted for the safe disposal of waste of all types of materials
- 29. the extent of your own authority and to whom you should report if you have problems that you cannot resolve

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Scope/range

1. Carry out all of the following during the maintenance activity:
 1. plan and communicate the maintenance activities to cause minimum disruption to normal working
 2. obtain and use the correct issue of organisational and/or manufacturers' drawings and maintenance documentation
 3. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
 4. ensure the safe isolation of equipment (such as mechanical, electricity, gas, air, fuel oil, fluids)
 5. provide and maintain safe access and working arrangements for the maintenance area (such as barriers, signage)
 6. carry out the maintenance activities using appropriate techniques and procedures
 7. re-connect and return the system to service on completion of the maintenance activities
 8. record the results of the maintenance activity and report any defects found
 9. dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition
2. Carry out maintenance activities on six of the following types of emergency generation equipment:
 1. turbine alternator sets
 2. governors
 3. batteries and chargers
 4. piston engine alternator sets
 5. control gear
 6. mechanical protection equipment
 7. generators
 8. voltage regulators
 9. electrical protection equipment
3. Carry out all of the following maintenance techniques, as appropriate to the equipment being maintained:
 1. dismantling units to component level
 2. marking/labelling of components
 3. checking components for serviceability
 4. replacing damaged/defective components

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5. setting, aligning and adjusting replaced components
 6. dismantling equipment to sub-assembly level
 7. checking correct operation of all safety devices
 8. tightening fasteners to the required torque
 9. making 'off-load' checks before starting up
 10. replenishing oil, coolant and grease
 11. replacing all 'lived' items (such as batteries, lamps)
 12. testing the system for leaks
 13. functionally testing the completed system
4. Maintain and/or replace a range of emergency power generation equipment components, to include twelve of the following:
1. engine components (such as valves, shell bearings)
 2. annunciators/alarms
 3. turbine components
 4. voltage regulators
 5. bearings and seals
 6. relays and solenoids
 7. clutches and brakes
 8. sensors
 9. drive mechanisms (such as chains, pulleys and belts)
 10. switches and switch gear
 11. transmission items (such as shafts, couplings)
 12. electrical cables
 13. fuel supply components (such as pumps, injectors, pipes)
 14. overload protection devices
 15. ignition (such as plugs, heaters, burners)
 16. safety devices
 17. cooling equipment (such as radiators, pumps, hoses)
 18. pressure relief valves
 19. lubrication components (such as pumps, filters, pipes)
 20. meters/gauges (such as temperature, pressure, speed)
 21. exhaust systems
 22. test systems (such as manual, automatic)
 23. speed governing components
 24. noise reduction/attenuation
 25. control panel components (such as breakers, contactors)
 26. temperature control components (such as thermostat, thermocouples, thermistors)
 27. electronic components (such as circuit boards, timers, transducers)
5. Maintain emergency power generation equipment /systems in compliance with one of the following:
1. organisational guidelines and codes of practice
 2. equipment manufacturer's guidelines
 3. BS, ISO and/or BSEN standards

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6. Complete and store all relevant maintenance documentation in accordance with organisational requirements, using one of the following:
 1. job cards
 2. permits to work/formal risk assessment and/or sign-on/off procedures
 3. electronic reports
 4. maintenance log or report
 5. organisational-specific documentation

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