SEMEM312

Maintaining electrical equipment

Overview

This standard identifies the competences you need to carry out corrective maintenance activities on electrical equipment, in accordance with approved procedures. You will be required to maintain a range of electrical equipment, such as single, three-phase and direct current power supplies and control systems, motors and starters, switchgear and distribution panels, control systems, electrical equipment, wiring enclosures and luminaires. This will involve dismantling, removing and replacing faulty equipment, at component or unit level, on a variety of different types of electrical assemblies and sub-assemblies. You will be expected to apply a range of dismantling and reassembly methods and techniques, such as soldering, crimping, harnessing and securing cables and components.

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 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 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 electrical maintenance procedures. You will understand the dismantling and reassembly methods and procedures used, and their application. You will know about the electrical equipment worked on, component properties, functions 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 understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment. You will also understand your responsibilities for safety and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

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 time scale
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

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, and the responsibility these requirements place on you
2. the isolation and lock-off procedure or permit-to-work procedure that applies to maintenance activities (such as electrical isolation, locking off switchgear, removal of fuses, placing of maintenance warning notices, proving the isolation has been achieved and secured)
3. how to recognise and deal with victims of electric shock (to include methods of safely removing victim from power source, isolating the power source) including the difference of AC and DC electrical shock and how this affects the victim
4. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
5. hazards associated with carrying out electrical maintenance activities (such as contact with live electrical components, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risk
6. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
7. how to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, wiring regulations, and other documents needed for the maintenance activities
8. the purpose of the components which have been replaced/maintained
9. the different types of cabling and their application (such as multicore cables, single core cables, steel wire armoured (SWA), mineral insulated (MI), screened cables)
10. the different types of electric motors and motor starters
11. the different types of control system, and their various components
12. the application and use of a range of electrical components (such as plugs, switches, sockets, lighting and fittings, junction boxes, consumer units)
13. the various lighting systems used (including tungsten, sodium, mercury vapour and fluorescent)
14. the different types of wiring enclosures that are used (to include conduit,

trunking and traywork systems)
15. the care, handling and application of ohmmeters, multimeters and other electrical measuring instruments
16. organisational policy on the repair/replacement of components, and the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities
17. how to check that the replacement components meet the required specification/operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, working temperature range)
18. the techniques used to dismantle/assemble electrical equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections)
19. methods of removing and replacing cables and wires in wiring enclosures without causing damage to existing cables
20. the use of current wiring, and other regulations when selecting wires and cables and when carrying out tests on systems
21. methods of attaching identification markers/labels to removed components or cables to assist with re-assembly
22. the tools and equipment used in the maintenance activities (including the use of cable stripping tools, crimping tools, soldering irons and torches, gland connecting tools)
23. methods of checking that components are fit for purpose, and the need to replace `lifed' items (such as motor brushes, seals and gaskets overload protection devices)
24. how to make adjustments to components/assemblies to ensure they function correctly
25. how to check tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose
26. the importance of making `off-load' checks before proving the equipment with the electrical supply on
27. the generation of maintenance documentation and/or reports following the maintenance activity
28. the equipment operating and control procedures to be applied during the maintenance activity
29. how to use appropriate lifting and handling equipment in the maintenance activity
30. the problems that can occur during the electrical maintenance activity, and how they can be overcome

31.
the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials
32.
the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

Scope/range

1.

Carry out all of the following maintenance activities:

1.1 plan and communicate the maintenance activities to cause minimal disruption to normal working
1.2 obtain and use the correct issue of organisational and/or manufacturers' drawings and maintenance documentation
1.3 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
1.4 ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids)
1.5 provide and maintain safe access and working arrangements for the maintenance area
1.6 carry out the maintenance activities using appropriate techniques and procedures
1.7 re-connect and return the equipment to service on completion of the maintenance activities
1.8 record the results of the maintenance activity and report any defects found
1.9 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 eight of the following types of electrical equipment:

2.1 single-phase power supplies
2.2 control systems and components
2.3 three-phase power supplies
2.4 electrical plant
2.5 direct current power supplies
2.6 wiring enclosures
2.7 motors and starters
2.8 luminaires
2.9 switchgear and distribution panels
2.10 other specific electrical equipment

3.

Carry out all of the following maintenance activities, as applicable to the equipment being maintained:

3.1 isolating and locking-off equipment
3.2 removing and replacing damaged wires and cables
3.3 disconnecting and reconnecting wires and cables
3.4 attaching suitable cable identification markers
3.5 removing and replacing wiring enclosures

3.6 removing electrical units/components
3.7 setting and adjusting replaced components
3.8 replacing damaged/defective components
3.9 checking components for serviceability
3.10 making `off-load' checks before powering up
3.11 functionally testing the completed system

4.

Replace/refit a range of electrical components, to include ten of the following groups of components:

4.1 cables and connectors
4.2 capacitors
4.3 lighting fixtures
4.4 contactors
4.5 rectifiers
4.6 batteries
4.7 relay components
4.8 encoders or resolvers
4.9 switches and sensors
4.10 overload protection devices
4.11 inverter and servo controllers
4.12 solenoids
4.13 locking and retaining devices (such as cable ties, clips, proprietary fasteners)
4.14 circuit boards
4.15 transformers
4.16 thermistors or thermocouples
4.17 other specific components

5.

Maintain electrical equipment to one of the following:

5.1 organisational guidelines and codes of practice
5.2 equipment manufacturers operation range
5.3 BS, ISO and/or BSEN standards
5.4 current wiring regulations

6.

Complete and store all relevant maintenance documentation in accordance with organisational requirements, using one of the following:

6.1 job cards
6.2 permits to work/formal risk assessment and/or sign on/off procedures
6.3 maintenance logs or reports
6.4 organisational-specific documentation
6.5 electronic reports

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