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## Overview

This standard identifies the competences you need to carry out corrective maintenance activities on electrical equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing or repairing faulty components, in line with company procedures, on electrical equipment that uses single, three-phase or direct current power supplies, and includes equipment such as control systems, motors and starters, switchgear and distribution panels, electrical plant, wiring enclosures and luminaires, portable appliances and other specific electrical equipment.

You will be expected to cover a range of maintenance activities, such as isolating and locking off, disconnecting, removing and reconnecting electrical components, wires and cables, attaching cable identification markers, replacing damaged or defective components, cables and wires, setting and adjusting components, and making 'off-load' checks before testing and starting up the equipment, using appropriate techniques and procedures.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities that you cannot personally resolve, or 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 to instructions, alone or in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying electrical maintenance procedures. You will have an understanding of dismantling and reassembly methods and procedures, and their application. You will know how the electrical equipment functions and the purpose of individual components, in adequate depth to provide a sound basis for carrying out any maintenance, repair or adjustment. In addition, you will 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 also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

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### Performance criteria

*You must be able to:*

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 follow the relevant maintenance schedules to carry out the required work
- P3 carry out the maintenance activities within the limits of your personal authority
- P4 carry out the maintenance activities in the specified sequence and in an agreed time scale
- P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P6 complete relevant maintenance records accurately and pass them on to the appropriate person
- P7 dispose of waste materials in accordance with safe working practices and approved procedures

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### Knowledge and understanding

*You need to know and understand:*

- K1 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
- K2 the isolation and lock-off procedure or permit-to-work procedure that applies to maintenance activities (to include electrical isolation, locking off switchgear, removal of fuses, placing of maintenance warning notices, proving that isolation has been achieved and secured)
- K3 what constitutes a hazardous voltage and how to recognise victims of electric shock
- K4 the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
- K5 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber mating and isolating transformers)
- K6 how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, BS7671/IET regulations, symbols and terminology)
- K7 the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components
- K8 the different types of cabling used in the maintenance activities, and their method of termination
- K9 the care, handling and application of electrical measuring instruments
- K10 the techniques used to dismantle/assemble electrical equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections)
- K11 methods of removing and replacing cables and wires in wiring enclosures without causing damage to existing cables
- K12 the use of IET wiring, and other, regulations when selecting wires and cables and when carrying out tests on systems
- K13 methods of attaching identification markers/labels to removed components or cables, to assist with re-assembly
- K14 the tools and equipment used in the maintenance activities (such as the use of cable stripping tools, crimping tools, soldering irons and torches, gland connecting tools)
- K15 methods of checking that components are fit for purpose, and the need to replace 'lived' items (such as seals and gaskets overload protection devices)
- K16 how to make adjustments to components/assemblies to ensure that they function correctly
- K17 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 the

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#### intended purpose

- K18 the importance of making `off-load' checks before proving the equipment with the electrical supply on
- K19 the equipment operating and control procedures to be applied during the maintenance activity
- K20 how to use appropriate lifting and handling equipment in the maintenance activity
- K21 the problems that can occur during the maintenance activity, and how they can be overcome
- K22 the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials
- K23 the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

## Additional Information

### Scope/range related to performance criteria

*You must be able to:*

1. Carry out **all** of the following during the maintenance activities:
  - 1.1. undertake the maintenance activities to cause minimal disruption to normal working
  - 1.2. use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records, schedules)
  - 1.3. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
  - 1.4. ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids)
  - 1.5. ensure that safe access and working arrangements have been provided for the maintenance area
  - 1.6. carry out the maintenance tasks, using appropriate techniques and procedures
  - 1.7. re-connect and return the equipment to service on completion of the maintenance activities
  - 1.8. dispose of waste items in a safe and environmentally acceptable manner
  - 1.9. leave the work area in a safe and tidy condition
  
2. Carry out maintenance activities on **one** of the following types of circuit:
  - 2.1. single phase power supplies
  - 2.2. three-phase power supplies
  - 2.3. direct current power supplies
  - 2.4. single phase lighting circuits
  
3. Carry out maintenance activities on **two** of the following types of electrical equipment:
  - 3.1. electrical plant
  - 3.2. wiring enclosures
  - 3.3. portable appliances
  - 3.4. motors and starters
  - 3.5. luminaires
  - 3.6. switchgear and distribution panels
  - 3.7. control systems and components
  - 3.8. other specific electrical equipment
  
4. Carry out **all** of the following maintenance activities:
  - 4.1. isolating and locking-off equipment
  - 4.2. disconnecting and reconnecting wires and cables
  - 4.3. attaching suitable cable identification markers
  - 4.4. removing electrical units/components

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- 4.5. checking components for serviceability
  - 4.6. replacing damaged/defective components
  - 4.7. removing and replacing damaged wires and cables
  - 4.8. setting and adjusting replaced components
  - 4.9. making 'off-load' checks before powering up
  - 4.10. functionally testing the maintained equipment
  - 4.11. recording the results of the maintenance activity
  - 4.12. reporting or taking action with regard to any defects that require immediate attention (such as replacing non-'lived' components)
5. Maintain and/or replace a range of electrical components, to include **six** of the following:
    - 5.1. cables and connectors
    - 5.2. locking and retaining devices
    - 5.3. overload protection devices
    - 5.4. inverter and servo controllers
    - 5.5. relay components
    - 5.6. rectifiers
    - 5.7. capacitors
    - 5.8. circuit boards
    - 5.9. lighting fixtures
    - 5.10. switches or sensors
    - 5.11. contactors
    - 5.12. encoders or resolvers
    - 5.13. batteries
    - 5.14. transformers
    - 5.15. solenoids
    - 5.16. thermistors or thermocouples
    - 5.17. other specific components
6. Maintain electrical equipment, in accordance with **one** of the following:
    - 6.1. organisational guidelines and codes of practice
    - 6.2. equipment manufacturer's operation range
    - 6.3. BS7671/IET wiring regulations
    - 6.4. BS, ISO and/or BSEN standards
7. Complete **one** of the following maintenance records, and pass it to the appropriate person:
    - 7.1. job cards
    - 7.2. company-specific documentation
    - 7.3. permit to work/formal risk assessment
    - 7.4. maintenance logs and action reports

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<b>Developed by</b>	SEMTA
<b>Version number</b>	2
<b>Date approved</b>	February 2015
<b>Indicative review date</b>	March 2018
<b>Validity</b>	Current
<b>Status</b>	Original
<b>Originating organisation</b>	SEMTA
<b>Original URN</b>	SEMEMI2-10
<b>Relevant occupations</b>	Maintenance fitter
<b>Suite</b>	Engineering Maintenance And Installation Suite 2
<b>Key words</b>	Engineering; manufacturing; maintenance; electrical; power supply; process plant; motors; starters; switchgear; distribution panels