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## Overview

This standard identifies the competences you need to assist in the installation of electrical/electronic equipment, in accordance with approved procedures. You will be required to assist in the installation of various electrical power supplies, such as single phase, three-phase, direct current and low voltage. The installation will also include fitting and connecting a range of electrical components, such as switchgear and distribution panels, motors and starters, control systems, safety devices, luminaires, and wiring enclosures.

This standard does not involve maintenance/repair type activities, such as removal and replacement of existing equipment, or the installation of simple, self-contained items of equipment requiring minimal installation.

You will be required to use the appropriate tools and equipment throughout the installation, and to apply a range of installation methods and techniques to install various electrical components, wires, cables, enclosures and connectors that make up the electrical system/circuit. In addition, you will be expected to make electrical connections to sensors/activators and other devices, as appropriate to the equipment being installed, which could include mechanical, fluid power, water or fuel supplies. The installation activities will include making checks and adjustments, in line with your permitted authority, and assisting others to ensure that the installed equipment functions to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the installation activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the installation activities are removed from the work area on completion of the work, and that the 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.

The installation activity may be carried out as a team effort, but you must demonstrate a significant personal contribution to the installation activities, in order to satisfy the requirements of the standard, and you must demonstrate competence in all the areas required by the standard.

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/electronic installation procedures. You will have an understanding of the equipment being installed and its installation requirements, in adequate depth to provide a sound basis for carrying out the installation process safely and effectively.

You will understand the safety precautions required when carrying out the installation activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for 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 all relevant instructions/documentation for the installation being carried out
- P3 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition
- P4 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques
- P5 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification
- P6 assist in using fault location methods and techniques on the installed equipment
- P7 deal with problems within your control and report those that cannot be solved
- P8 dispose of waste materials in line with organisational and environmentally safe procedures
- P9 complete and store all relevant documentation in accordance with organisational requirements

## Knowledge and understanding

### *You need to know and understand:*

- K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- K2 the importance of wearing the appropriate personal protective equipment (PPE), and of keeping the work area clean and tidy
- K3 how to obtain and interpret information from job instructions and other documentation used in the installation activities
- K4 the basic principle of operation of the equipment/circuits being installed
- K5 the different types of cabling used in the maintenance activities, and their methods of termination
- K6 the care, handling and application of electrical measuring instruments
- K7 methods of lifting, handling and supporting the equipment during the installation activities
- K8 how to check that components meet the required specification/operating conditions
- K9 the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD)
- K10 the techniques used to terminate electrical equipment
- K11 methods of attaching markers/labels to components or cables, to assist with identification
- K12 the tools and equipment used in the installation activities
- K13 how to make adjustments to components/assemblies to ensure that they function correctly
- K14 how to check tools and equipment are free from damage or defects, are in a safe, tested and usable condition
- K15 the importance of making 'off-load' checks before proving the equipment with the electrical supply on
- K16 why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K17 the calibration/care and control procedures for tools and equipment
- K18 the issues that can occur with the installation operations, and how these can be overcome
- K19 the fault-finding techniques to be used if the equipment fails to operate correctly
- K20 the recording documentation to be completed for the activities undertaken

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K21 the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

## Scope/range related to performance criteria

1. Carry out all of the following during the installation of the electrical/electronic equipment:
  - 1.1 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
  - 1.2 confirm that authorisation to carry out the installation activities has been given
  - 1.3 check that safe access and working arrangements for the installation area have been provided
  - 1.4 confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids)
  - 1.5 check that all required installation consumables are available
  - 1.6 leave the work area in a safe condition and free from foreign object debris
  
2. Assist in the installation of six of the following electrical modules/components:
  - 2.1 switchgear
  - 2.2 control devices
  - 2.3 emergency/standby batteries
  - 2.4 alarm devices
  - 2.5 communication equipment
  - 2.6 overload protection devices
  - 2.7 programmable controllers
  - 2.8 cable connectors
  - 2.9 sensors and actuators
  - 2.10 power factor correction devices
  - 2.11 encoders or resolvers
  - 2.12 electronic modules/units
  - 2.13 motors and starters
  - 2.14 conduit
  - 2.15 trunking
  - 2.16 luminaires
  - 2.17 bus bars
  - 2.18 traywork
  - 2.19 panels or sub-assemblies
  - 2.20 safety devices
  - 2.21 other specific electrical equipment

3. Carry out four of the following installation methods and techniques:
  - 3.1 marking out the location of components/modules
  - 3.2 positioning and securing equipment and components
  - 3.3 securing by using mechanical fixings
  - 3.4 drilling and hole preparation
  - 3.5 levelling and/or alignment
  - 3.6 securing by using masonry fixings
  - 3.7 making installation connections (such as mechanical, electrical, fluid power, utilities)
  
4. Carry out four of the following cable termination activities:
  - 4.1 stripping cable insulation/protection
  - 4.2 attaching suitable cable identification
  - 4.3 routing and securing wires and cables
  - 4.4 heat shrinking (devices and boots)
  - 4.5 terminating cables and wires
  - 4.6 crimping (such as tags and pins)
  - 4.7 making mechanical/screwed/clamped connections
  - 4.8 sealing and protecting cable connections
  - 4.9 soldering and de-soldering
  - 4.10 adding cable end fittings
  
5. Assist in the connection of equipment to two of the following types of electrical supply:
  - 5.1 single phase
  - 5.2 three phase
  - 5.3 direct current
  - 5.4 low voltage (up to 115V)
  
6. Use two of the following instruments during the installation activities:
  - 6.1 multimeter
  - 6.2 earth-loop impedance tester
  - 6.3 insulation resistance tester
  - 6.4 other specific test equipment
  
7. Carrying out three the following checks on the installed equipment:
  - 7.1 making visual checks for completeness and freedom from damage

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- 7.2 polarity
  - 7.3 insulation resistance values
  - 7.4 earth-loop impedance
  - 7.5 continuity
8. Assist in dealing with two of the following conditions during the installation process:
- 8.1 installations with no faults
  - 8.2 partial equipment malfunction
  - 8.3 complete malfunction of equipment
9. Assist in using fault location methods and techniques on the installed equipment, to include one of the following:
- 9.1 diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides)
  - 9.2 fault finding techniques (such as six point, half-split, unit substitution)
  - 9.3 functional testing the installation/running equipment self-diagnostics
10. Produce installations which comply with one of the following:
- 10.1 equipment manufacturer's operation range
  - 10.2 BS7671/IET wiring regulations
  - 10.3 BS, ISO and/or BSEN standards
  - 10.4 customer (contractual) standards and requirements
  - 10.5 organisational standards and procedures
11. Assist in the completion of the relevant paperwork, to include one of the following:
- 11.1 installation records
  - 11.2 organisational specific documentation
  - 11.3 job card
  - 11.4 electronic reports

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Assisting in the installation of electrical/electronic equipment



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