

Overview

This standard identifies the competences you need to assist in the installation of process control equipment, in accordance with approved procedures. You will be required to assist in the installation of a range of process control equipment, which typically includes process controllers or sequential controllers (such as programmable logic controllers (PLCs), or equipment controlled by personal computers (PCs)), and which are working in an integrated system involving two or more of the following interactive technologies: mechanical, electrical or fluid power. You will also install peripheral components and communication links, and assist with the loading/downloading of process controller programs, check them for errors, and create back-up copies of completed programs.

This standard does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

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 position, level and align the equipment, and to make connections to sensors and actuators, which could be electrical, fluid power, water or fuel supply, as appropriate to the equipment installed. 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 relevant 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.

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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 installation procedures for process controllers. 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.

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 documents needed in the installation process
- K4 methods of drilling holes for rag bolts and expanding bolts
- K5 the various mechanical fasteners that will be used, and their method of installation

- K6 procedures for ensuring that you have the correct tools, equipment, and fasteners for the installation activities
- K7 the types of tools, instruments and techniques used to position align, level, secure and adjust the equipment
- K8 methods of lifting, handling and supporting the equipment during the installation activities
- K9 the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD)
- K10 the basic principles of how the system functions, and its operating sequence
- K11 the techniques used to connect PLC equipment
- K12 the use of BS7671/IET wiring, and other, regulations when selecting wires and cables, and when carrying out tests on systems
- K13 the devices and systems for storing programs
- K14 the different types of interface cards
- K15 the numbering system and codes used for identification of inputs and outputs
- K16 how to interpret a program within the process controller for specific elements
- K17 how to make adjustments to components to ensure that they function correctly
- K18 why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K19 how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation
- K20 how to recognise installation defects
- K21 the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components are

correctly covered/protected

K22 the issues that can occur with the installation operations, and how these can be overcome

K23 the fault-finding techniques to be used if the equipment fails to operate correctly

K24 the recording documentation to be completed for the activities undertaken

K25 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 process controller 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 dispose of waste items in a safe and environmentally acceptable manner
 - 1.7 leave the work area in a safe condition and free from foreign object debris

 - 2 Assist in the installation of one of the following types of process control systems:
 - 2.1 monitoring system
 - 2.2 safety system
 - 2.3 diagnostic system
 - 2.4 combination system
 - 2.5 process/product control system
 - 2.6 business management system

 - 3 Assist in the installation of one of the following process controllers:
 - 3.1 fixed I/O units
 - 3.2 rack mount controller units
 - 3.3 modular controller units

 - 4 Assist in the installation of one of the following:
 - 4.1 electrical wires and cables
 - 4.2 trunking and traywork
 - 4.3 conduit
- Plus: Assist in the installation/connection of three of the following:
- 4.4 sensors
 - 4.5 modems
 - 4.6 panels and sub-assemblies

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- 4.7 actuators
 - 4.8 printers
 - 4.9 signal transmission components/cables
 - 4.10 switches
 - 4.11 PC peripheral devices
 - 4.12 overload protection devices
 - 4.13 motor starters
 - 4.14 other specific components
- 5 Apply installation methods and techniques, to include five of the following:
- 5.1 marking out of locating and securing positions
 - 5.2 drilling and hole preparation
 - 5.3 fitting inserts (such as rag bolts or expanding bolts)
 - 5.4 positioning equipment
 - 5.5 connecting wires and cables
 - 5.6 securing by using mechanical fixings
 - 5.7 securing by using masonry fixings
 - 5.8 levelling and alignment equipment
 - 5.9 making installation connections (such as mechanical, electrical, fluid power, utilities)
- 6 Carry out four of the following cable termination activities:
- 6.1 terminating armoured cables
 - 6.2 routeing and securing wires and cables
 - 6.3 terminating mineral cables
 - 6.4 heat shrinking (devices and boots)
 - 6.5 sealing and protecting cable connections
 - 6.6 crimping (tags and pins)
 - 6.7 making mechanical/screwed/clamped connections
 - 6.8 stripping cable insulation/protection
 - 6.9 soldering and de-soldering
 - 6.10 adding cable end fittings
 - 6.11 attaching suitable cable identification
- 7 Use three of the following instruments during the installation activities:
- 7.1 multimeter
 - 7.2 ammeter

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7.3 earth-loop impedance tester

7.4 watt meter

7.5 insulation resistance tester

7.6 voltmeter

7.7 other specific test equipment

8 Carry out all of the following checks and adjustments, as appropriate to the equipment being installed:

8.1 making sensory checks (sight, sound, smell)

8.2 making 'off-load' checks

8.3 making visual checks for completeness and freedom from damage

8.4 ensuring that moving parts are clear of obstruction and/or are guarded

Plus: Assist in carrying out two of the following:

8.5 checking signal transmission

8.6 checking the security of connections/terminations

8.7 confirming that the correct software has been installed

8.8 testing to ensure that the equipment operates to the installation specification

8.9 final start-up of the system and removal of any trip defeats

9 Assist in dealing with two of the following conditions during the installation process:

9.1 installations with no faults

9.2 partial equipment malfunction

9.3 complete malfunction of equipment

10 Assist in using fault location methods and techniques on the installed equipment to include one of the following:

10.1 diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides)

10.2 fault finding techniques (such as six point, half-split, unit substitution)

10.3 function testing the installation/running equipment self-diagnostics

11 Produce installations which comply with one of the following:

11.1 equipment manufacturer's operation range

11.2 BS, ISO and/or BSEN standards

11.3 organisational standards and procedures

11.4 customer (contractual) standards and requirements

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- 12 Assist in the completion of the relevant paperwork, to include one of the following:
 - 12.1 installation records
 - 12.2 organisational specific documentation
 - 12.3 job card
 - 12.4 electronic reports

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