SEMEM385

Assisting in the installation of instrumentation and control equipment

Overview

This standard identifies the competences you need to assist in the installation of instrumentation and control equipment, in accordance with approved procedures. You will be required to assist in the installation of a range of instrumentation and control equipment such as pressure, flow, level, and temperature monitoring and control equipment, fiscal monitoring equipment, fire and gas detection and alarm equipment, industrial weighing equipment, speed measurement and control equipment, vibration monitoring equipment, nucleonics and radiation measurement, analysers, recorders and indicators, telemetry equipment and emergency shutdown equipment.

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 activities, and to apply a range of installation methods and techniques to position, level and align the equipment, and to make connections to the required services. 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 that 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.

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 to instrumentation and control equipment. 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 you will understand your responsibility for 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 all relevant instructions/documentation for the installation being carried out
3. use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition
4. assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques
5. carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition
8. complete and store all relevant installation documentation in accordance with organisational requirements

Knowledge and understanding

You need to know and understand:

1. the health and safety requirements of the area in which the installation 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
3. the specific health and safety precautions to be applied during the installation procedure, and their effects on others
4. the hazards associated with installing equipment, and with the tools and equipment used, and how to minimise them and reduce any risks
5. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during installation 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 information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, regulations, symbols and terminology)
9. the basic principles of how the equipment functions, and its operating sequence
10. the reasons for making sure that control systems are isolated or put into manual control, and that appropriate trip locks or keys are inserted, before removing any sensors or instruments from the system
11. the identification of instrument sensors (including how to identify their markings, calibration information, component values, operating parameters and working range)
12. the correct way of fitting instruments to avoid faulty readings (caused by head correction, poor flow past the sensor, blockages, incorrect wiring, poor insulation, incorrect materials)
13. how to carry out visual checks of the instruments (checking for leaks, security of joints and physical damage)
14. methods of attaching identification marks/labels to components or cables
15. methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air, oil and fuel supplies)
16. why electrical bonding is critical, and why it must be both mechanically and

electrically secure

17. the procedure for the safe disposal of waste materials

18. how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, contamination)

19. the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected

20. the problems that can occur with the installation operations, and how these can be overcome

21. the fault finding techniques to be used if the equipment fails to operate correctly

22. the recording documentation to be completed for the activities undertaken

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

Scope/range

1.

Carry out all of the following during the installation of the instrumentation and control equipment:

1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
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, fluids)
1.5 check that all required installation consumables are available
1.6 deal promptly with any problems and report any that cannot be solved

dispose of waste materials in accordance with safe working practices and approved procedures, and leave the work area in a safe condition

1.

Assist in the installation of one of the following types of instrumentation and control equipment:

1.1 pressure monitoring/control
1.2 speed measurement
1.3 flow monitoring/control
1.4 speed control
1.5 level monitoring/control
1.6 vibration monitoring/control
1.7 temperature monitoring/control
1.8 nucleonic and radiation
1.9 weight monitoring/control
1.10 analysers
1.11 fiscal metering
1.12 recorders and indicators
1.13 fire detection and alarm
1.14 telemetry equipment
1.15 gas detection and alarm
1.16 control equipment (such as indexing, positioning, sequencing)
1.17 emergency shutdown

2.

Carry out all of the following installation methods and techniques:

2.1 positioning and securing equipment/components
2.2 installing and connecting process pipework

2.3 making mechanical connections
2.4 tightening fastenings to the required torque
2.5 proof marking/labelling of wires or components
2.6 making installation connections (such as mechanical, electrical, fluid power, utilities)
2.7 taking electrostatic discharge (ESD) precautions when handling components/circuit boards (as appropriate)

plus: Assist in carrying out two of the following:

8. installing electrical/electronic components
9. setting, calibrating and adjusting instruments
10. installing and connecting peripherals (such as sensors, actuators, relays, switches, back-up batteries)
11. connecting the electrical/pneumatic supply to instruments/sensors
12. connecting the signal transmission supply to instruments/sensors

1.

Assist in using two of the following types of instrumentation test and calibration equipment:

1.1 signal sources
1.2 pressure sources
1.3 logic probes
1.4 standard test gauges
1.5 comparators
1.6 temperature baths
1.7 analogue and digital meters
1.8 manometers
1.9 workshop potentiometers
1.10 digital pressure indicators
1.11 current injection devices
1.12 dead weight testers
1.13 calibrated flow meters
1.14 calibrated weights
1.15 insulation testers
1.16 special purpose test equipment

2.

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

2.1 making visual checks for completeness and freedom from damage
2.2 making sensory checks (sight, sound, smell, touch)
2.3 checking the system for leaks
2.4 checking security of connections/terminations

plus: Assist in carrying out two more from the following:

5. checking signal transmission (electrical, electronic, pneumatic, mechanical)
6. confirming that signal measurement and transmission are satisfactory
7. final start-up of the system and removal of any trip defeats
8. testing that the equipment operates to the installation specification

1.

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

1.1 installations with no faults
1.2 partial equipment malfunction
1.3 complete malfunction of equipment

2.

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

2.1 diagnostic aids (such as organisational records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides)
2.2 fault finding techniques (such as six-point, half-split, unit substitution)
2.3 function testing the installation/running equipment self-diagnostics

3.

Produce installations which comply with one of the following:

3.1 equipment manufacturer's operation range
3.2 BS, ISO and/or BSEN standards
3.3 customer (contractual) standards and requirements
3.4 organisational standards and procedures

4.

Complete and store all relevant installation documentation in accordance with organisational requirements, using one of the following, and pass it to the appropriate people:

4.1 installation records
4.2 organisational-specific documentation
4.3 job card
4.4 electronic reports

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