

Overview

This standard identifies the competences you need to assist in the installation of mechanical equipment, in accordance with approved procedures. You will be required to assist in the installation of a range of mechanical equipment such as machine tools, conveyors, elevators, processing plant, engines, lifting and handling equipment, and structures like hoppers and large storage vessels.

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

You will be required to use the specified tools and equipment throughout the installation, and to apply a range of installation methods and techniques, such as marking out, drilling and hole preparation, positioning equipment, shimming and packing, levelling and aligning equipment, and making the required connections. 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 mechanical 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.

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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 promptly and effectively with problems within your control and report those that cannot be solved
- P8 dispose of waste items in a safe and environmentally acceptable manner
- P9 assist in the completion of installation documentation

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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 installation 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
- K3 the specific health and safety precautions to be applied during the installation procedure, and their effects on others
- K4 the hazards associated with installing mechanical equipment, and with the tools and equipment used, and how they can be minimised
- K5 the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the installation
- K6 how to obtain and interpret information from job instructions and other documentation used in the installation activities (such as installation drawings, specifications, manufacturers' manuals, regulations, symbols and terminology)
- K7 the basic principle of operation of the equipment being installed
- K8 methods of marking out the site for positioning the equipment, and the tools and equipment used for this
- K9 the various mechanical fasteners that will be used, and their method of installation (such as threaded fasteners, special securing devices, masonry fixing devices)
- K10 procedures for ensuring that you have the correct tools, equipment, and fasteners for the installation activities
- K11 the types of tools and instruments used to position, secure and align the equipment (such as spanners, wrenches, crowbars, torque wrenches, engineers levels, alignment telescopes and laser devices)
- K12 the techniques used to position, align, level and adjust the equipment
- K13 methods of lifting, handling and supporting the equipment during the installation activities
- K14 methods of connecting to mechanical power transmission devices (such as belt and chain drives, couplings, clutches and brakes)
- K15 methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air, oil and fuel supplies)
- K16 why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K17 the procedure for the safe disposal of waste materials
- K18 how to identify installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, or contamination)
- K19 the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed

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components or pipe ends are correctly covered/protected

- K20 the problems that can occur with the installation operations, and how these can be overcome
- K21 the fault-finding techniques to be used if the equipment fails to operate correctly
- K22 the recording documentation to be completed for the activities undertaken
- K23 the extent of your own responsibility and to whom you should report if you have problems 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 installation of the mechanical 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 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 **one** of the following types of mechanical equipment:
 - 2.1. machine tools
 - 2.2. industrial compressors
 - 2.3. conveyors
 - 2.4. turbines
 - 2.5. process control equipment (such as large valves and actuating mechanisms, pumps)
 - 2.6. elevators
 - 2.7. processing plant
 - 2.8. hoppers or large storage vessels
 - 2.9. lifting and handling equipment
 - 2.10. engines
 - 2.11. other specific mechanical equipment

3. Carry out the installation by applying **five** of the following methods and techniques:
 - 3.1. marking out of locating and securing positions
 - 3.2. drilling and hole preparation
 - 3.3. fitting inserts (such as rag bolts or expanding bolts)
 - 3.4. positioning equipment
 - 3.5. aligning equipment
 - 3.6. make installation connections (such as mechanical, electrical, fluid power, utilities)
 - 3.7. levelling equipment
 - 3.8. shimming and packing
 - 3.9. fitting anti-vibration mountings

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3.10. securing by using mechanical fixings

3.11. applying screw fastener locking devices

4. Assist in the movement and positioning of equipment, using **two** of the following
 - 4.1. slings
 - 4.2. cranes
 - 4.3. fork lift
 - 4.4. portable lifting devices
 - 4.5. block and tackle
 - 4.6. rollers/skates
 - 4.7. hoists
 - 4.8. jacks
 - 4.9. manual handling and moving loads

5. Use **two** of the following during the installation activities:
 - 5.1. straight edges and feeler gauges
 - 5.2. tapes and rules
 - 5.3. engineers' levels
 - 5.4. measuring instruments (such as electrical, mechanical, fluid power)
 - 5.5. plumb lines and taut wires
 - 5.6. self-diagnostic equipment
 - 5.7. dial test indicators
 - 5.8. laser alignment equipment

6. Carry out **five** of the following checks and adjustments on the installed equipment:
 - 6.1. fill/replenish fluids, oil, or grease
 - 6.2. make 'off-load' checks
 - 6.3. check level and/or alignment
 - 6.4. make visual checks for completeness and freedom from damage
 - 6.5. ensure that locking devices are fitted to fasteners (as appropriate)
 - 6.6. ensure that moving parts are clear of obstruction and/or guarded

plus: Assist in carrying out **two** of the following:

 - 6.7. setting working clearance
 - 6.8. tensioning
 - 6.9. pressurising the system
 - 6.10. testing that the equipment operates to the installation specification
 - 6.11. checking torque settings of fasteners
 - 6.12. making sensory checks (sight, sound, smell, touch)

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

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- 7.1. installations with no faults
 - 7.2. partial equipment malfunction
 - 7.3. complete malfunction of equipment
8. Assist in using fault location methods and techniques on installed equipment, to include using **one** of the following:
 - 8.1. diagnostic aids (such as manufacturers' manuals, fault analysis charts, troubleshooting guides)
 - 8.2. fault finding techniques (such as six point, half-split, unit substitution)
 - 8.3. functional testing the installation/running equipment self-diagnostics
 9. Produce installations which comply with **one** of the following:
 - 9.1. equipment manufacturer's operating range
 - 9.2. BS, ISO and/or BSEN standards
 - 9.3. customer (contractual) standards and requirements
 - 9.4. company standards and procedures
 10. Assist in the completion of the relevant paperwork, to include **one** of the following:
 - 10.1. installation records
 - 10.2. company-specific documentation
 - 10.3. job card

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