

Solve engineering or manufacturing problems

Overview

This standard identifies the competences you need to solve engineering or manufacturing problems, in accordance with approved procedures. Problems could occur in any aspect of engineering, such as in design, development, procurement manufacturing, installation, commissioning production, maintenance, testing and quality control, and you will be expected to take prompt and appropriate action to rectify the problem.

You will be required to investigate the problem, obtaining all the necessary information to enable you to identify and evaluate possible solutions, and their effects on both the engineering process and on the people involved. You will also be expected to decide on a plan of action, and to communicate this to the relevant people.

Your responsibilities will require you to comply with organisational policy and procedures for the successful solution of engineering problems, and to report any difficulties that you cannot personally resolve to the relevant authority. You will be expected to work unsupervised, either on your own or as part of a team, which you may lead or direct, taking full responsibility for your actions, and possibly for the work of colleagues or subordinates.

Your underpinning knowledge will provide a good understanding of general and discipline-specific engineering or manufacturing principles and processes. You will be fully conversant with organisational procedures and systems, including methods of evaluating the outcomes of the problem solving activity. Your underpinning knowledge will enable you to take an informed approach to applying problem solving techniques and procedures to a range of engineering or manufacturing problems, and will provide a sound basis for carrying out the activities to the required standard.

You will be fully aware of any health, safety and environmental requirements, and the appropriate legislative and regulatory frameworks applicable to your area of responsibility. You will be required to ensure that safe working practices are maintained throughout, and will understand the responsibility you owe to yourself and others in the workplace.

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Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. take prompt action to solve problems and keep all relevant people informed of progress
3. obtain all relevant information relating to the engineering or manufacturing problems
4. identify correctly the nature, extent and root cause of any engineering or manufacturing problems that arise
5. evaluate all realistic solutions to solve engineering or manufacturing problems
6. identify the most effective solution for solving engineering or manufacturing problems
7. ensure that solutions are implemented correctly and promptly
8. ensure that the solutions to engineering or manufacturing problems comply with all relevant regulations, standards, directives or codes of practice

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Knowledge and understanding

You need to know and understand:

1. the health, safety and environmental requirements applicable to the engineering or manufacturing area
2. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the investigation of the problem, and where it may be obtained
3. how to obtain details of engineering or manufacturing problems
4. the importance of getting to the root cause of the problem
5. the techniques used to get to the root cause of the problem such as the 5 why analysis, cause and effect diagrams, fault trees, flowcharting, process flow analysis
6. the criticality of different types of problem, and how to prioritise the problems to be solved
7. methods used to contain the problem such as in relation to non-conformance of a product or process
8. how to obtain and interpret relevant data and information such as drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed for the problem solving process
9. the engineering or manufacturing processes and operating procedures within the area of your responsibility
10. the engineering or manufacturing principles and processes within the function where the problem exists
11. how to obtaining any necessary ancillary equipment or resources to support the investigation or solution to the problem under investigation
12. the typical problems that occur in your area of responsibility
13. the factors that have to be taken into account when selecting the solution to a problem
14. the techniques used to obtain information on problems, and the sources of information
15. what factors need to be taken into consideration when prioritising the problems to be solved
16. the methods and techniques involved in evaluating information
17. the factors to be taken into account when selecting the corrective action to a problem
18. the methods used to monitor the effectiveness of the corrective action
19. why it is important to review the problem solving process to understand the lessons learned
20. how to obtain and interpret relevant documentation associated with legislation, regulations, standards, directives or codes of practice
21. how to obtain and interpret company policy and personnel procedures
22. the reporting procedures and documentation, and their application

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- 23. whom to inform of actions taken, and by what means
- 24. how to retrieve necessary data from company information systems
- 25. the types of monitoring systems/techniques available, and their application
- 26. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

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Scope/range related to performance criteria

1. Carry out **all** of the following during the problem solving activity:
 1. discuss/consult with the relevant people on the nature and extent of the problem
 2. gather information from appropriate sources to help identify and define the problem
 3. identify and evaluate possible solutions, considering temporary, short term and long term solutions
 4. communicate the proposed solution to the relevant people, obtaining feedback where appropriate
 5. prepare a plan of action for implementation of the appropriate solution
 6. ensure that the agreed solution is implemented in an effective and timely manner
 7. ensure that the agreed solution complies with appropriate regulations and guidelines
 8. monitor the implementation of the solutions and make necessary revisions to the plan of action (plan do check act)
2. Take action to resolve engineering or manufacturing problems arising from **four** of the following:
 1. assembly
 2. manufacturing
 3. installation
 4. commissioning
 5. process operations or sequencing
 6. maintenance
 7. quality
 8. personnel problem
 9. material handling or processing
 10. external contractual problem
 11. deviation from component/product specification
 12. lack of resources/materials
 13. equipment malfunction
 14. environmental problem (pollutants, temperature, irritants, waste materials)
 15. ergonomics related
 16. utilities supply (such as gas, electricity, water, air)
 17. change to requirements (such as a customer request)
 18. time or schedule problem
 19. design related
 20. research and development
 21. company strategy

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22. safety related
 23. deviation from departmental procedures, policies or work instructions
 24. the customer (internal and or external)
 25. other specific problem
3. Evaluate possible solutions to the problems, by considering **six** of the following:
 1. operational effectiveness
 2. functionality of the system, product, component or equipment
 3. conformity with company policies, procedures or work instructions
 4. ease of implementation
 5. environmental impact
 6. health and safety implications
 7. timescale for implementation
 8. staffing implications
 9. training and development
 10. financial impact
 11. customer impact (internal and or external)
 12. regulations, standards, directives or codes of practice
 13. other specific solution
4. Obtain and use information on the problem from **four** of the following :
 1. statistical data
 2. operating procedures/manufacturing manuals
 3. historic records (such as maintenance or shift logs)
 4. company procedures
 5. quality audits
 6. health and safety information
 7. external sources
 8. environmental documents/reports
 9. process mapping
 10. feedback from users, colleagues or customers
 11. approved and controlled tests, trials or experiments
 12. observation
5. Implement engineering solutions for **two** of the following timescales:
 1. temporary (interim solution)
 2. long term (permanent solution)
 3. short term (will require further action)

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6. Ensure that solutions to engineering problems comply with **three** the following:

1. organisational guidelines and codes of practice
2. recognised compliance agency/body's standards
3. equipment manufacturer's operating
4. customer standards and requirements specification
5. British, European, International standards or directives
6. health, safety and environmental requirements

7. Report and communicate solutions to problems, using:

1. verbal report

plus **one** from the following:

2. electronic mail
3. computer-based presentation
4. computer generated report
5. specific company document
6. other appropriate media

Behaviours

Additional Information

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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