SEMENG307
Resolve engineering or manufacturing problems

Overview

This standard identifies the competences you need to resolve engineering or manufacturing problems, in accordance with approved procedures. You will be required to investigate the problems, obtaining all the necessary information from the relevant sources to enable you to establish a clear picture of the situation, to identify and evaluate potential corrective actions, and to select the most appropriate and effective solution. Your proposed solution will take into account the effects on both the engineering process and on the people involved.

Your responsibilities will require you to comply with organisational policy and procedures during the rectification of the engineering problem, and to report any problems that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying problem solving techniques and procedures to engineering or manufacturing situations. You will understand the relevant engineering or manufacturing process, and will know about the company procedures and systems of operation, in adequate depth to provide a sound basis for carrying out the activities to the required standard.

You will be aware of any company/customer, legislative or regulatory health, safety and environmental requirements applicable to the engineering or manufacturing activities being investigated. You will understand the specific safety precautions required when carrying out the investigation, especially those for isolating equipment. 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 work area.

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Performance criteria

You must be able to:

- P1 take prompt action to solve engineering problems and keep all relevant people informed of progress
- P2 obtain all relevant information relating to the engineering or manufacturing problems
- P3 identify correctly the nature, extent and root cause of any engineering or manufacturing problems that arise
- P4 evaluate all realistic solutions to solve engineering or manufacturing problems
- P5 identify the most effective solution for solving engineering or manufacturing problems
- P6 ensure that solutions are implemented correctly and promptly
- P7 ensure that 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:

K1 how to access information on health and safety regulations and guidelines relating to the engineering or manufacturing activities or work area in which the problem exists

K2 how to obtain and interpret relevant documentation associated with legislation, regulations, standards, directives or codes of practice

K3 how to obtain information on the engineering or manufacturing requirements, and the types of information available (such as customer requirements and instructions, quality control requirements, product specification, manufacturing methods)

K4 how to access and use the appropriate information and documentation systems

K5 how to obtain and interpret relevant data and information such as drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed in the problem solving process

K6 the company engineering or manufacturing operation procedures for the area where the problem exists

K7 the business need for problem identification and removal

K8 the effects of engineering problems on associated activities

K9 the communication techniques used to obtain information

K10 the principles of effective problem solving, the main problem solving methods and techniques in use, and how to apply them

K11 the benefits of adopting a formalised problem solving process

K12 how to involve the user/customer in the problem solving process

K13 the importance of collecting as much relevant information as possible, and of collating such information in a way which facilitates decision making, and the methods to achieve this

K14 action planning (to include risk analysis, testing decisions, determining timescales and protecting the user/customer)

K15 methods used to contain the problem such as in relation to non conformance of a product or process

K16 the importance of analysing problems from a variety of perspectives

K17 how to define and verify the root cause of a problem

K18 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

K19 the importance of involving a range of relevant people in generating possible solutions

K20 the importance of developing a range of possible options in solving problems

K21 the factors to be taken into account when resolving problems and determining suitable solutions (especially those covering working conditions and safety)
K22 the methods and techniques for evaluating information
K23 how to present possible solutions in a way which helps relevant people to reach an informed and realistic judgement
K24 how to determine and select permanent corrective actions (to include decision making, assessing the criteria and determining the risks, costs and generating alternatives)
K25 the process used in the organisation to validate the solution to the engineering or manufacturing problem
K26 how to prevent recurrence of the problems (to include proposed changes to management systems, operating systems and procedures, and identification of opportunities for improvements)
K27 the importance of customer care and satisfaction
K28 the importance of maintaining records of the problem solving activities; what needs to be recorded, and where records are kept
K29 the company procedures that apply to the rectification of problems
K30 the company reporting procedures, documentation and their application
K31 the different ways in which the solutions can be reported back
K32 whom to inform of actions taken, and by what means
K33 the extent of your own responsibility, and to whom you should report if you have problems that you cannot resolve
K34 the sources of technical expertise if you have problems that you cannot resolve

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Additional Information

Scope/range related to performance criteria

You must be able to:

1 Carry out **all** of the following during the problem solving activity:

- 1.1 discuss/consult with the relevant people about the extent of the problem and its impact on the engineering activity
- 1.2 gather all appropriate information to help identify or clarify the problem
- 1.3 evaluate possible solutions, considering temporary, short term and long term solutions
- 1.4 consider cost implications for each solution
- 1.5 select the most appropriate solution to rectify the problem
- 1.6 communicate the proposed solution to the relevant people, obtaining feedback where appropriate
- 1.7 prepare a plan of action for implementation of the agreed solution
- 1.8 ensure that the agreed solution is implemented correctly and promptly
- 1.9 monitor outcomes of the rectification activity, and make any necessary revisions to the plan of action (plan do check act)
- 1.10 ensure that the problem is rectified to the agreed level of acceptability
- 1.11 ensure that all information is documented to provide an audit trail
- 1.12 identify the root cause of the problem, using a standard technique
- 1.13 implement preventative measures, where applicable, to ensure that there is no recurrence of the problem

2 Resolve engineering or manufacturing problems associated with **one** of the following engineering disciplines:

- 2.1 drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
- 2.2 manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
- 2.3 material processing activities (such as heat treatment, casting, injection moulding, purification)
- 2.4 composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
- 2.5 finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- 2.6 assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- 2.7 installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)

2.8 plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
2.9 equipment capability studies/performance measurement
2.10 movement of materials, components or finished goods
2.11 engineering safety audits or risk assessments
2.12 business improvement activities
2.13 quality control/quality assurance
2.14 maintenance activities
2.15 modification and repair activities
2.16 commissioning/decommissioning
2.17 testing and trialling
2.18 research and development
2.19 engineering support services

3 Rectify engineering or manufacturing problems arising from **two** of the following:
3.1 component/assembly failure
3.2 scheduling/planning
3.3 production control
3.4 equipment malfunction
3.5 product over budget
3.6 contractor related
3.7 quality related
3.8 ergonomically related
3.9 customer request
3.10 deviation from component/product specification
3.11 lack of resources/materials
3.12 material handling devices
3.13 environmental/compatibility
3.14 utilities supply (such as gas, electricity, water, air)
3.15 deviation from departmental procedure(s)
3.16 product/service over lead time
3.17 other specific situations

4 Use information obtained from **four** of the following sources to help evaluate the problem:
4.1 statistical data
4.2 fault diagnostics
4.3 historical records (such as maintenance of shift logs)
4.4 company procedures
4.5 operational procedures/manufacturing manuals
4.6 quality audits
4.7 health and safety information
4.8 external sources
4.9 environmental documents/reports

4.10 process mapping
4.11 feedback from users, colleagues or customers
4.12 development tests
4.13 condition monitoring
4.14 manufacturer's data
4.15 observation

5 Determine and implement the solution for **two** of the following:
5.1 temporary (interim solution)
5.2 long term (permanent solution)
5.3 short term (will require further action)
Taking into account **both** of the following:
5.4 safety/environmental considerations
5.5 associated costs

6 Ensure that the solution complies with relevant regulations, standards and guidelines, from **three** of the following:
6.1 organisational guidelines and codes of practice
6.2 customer standards and requirements
6.3 equipment manufacturer's operation specification/range
6.4 British, European or International standards or directives
6.5 recognised compliance agency/body's standards
6.6 health, safety and environmental requirements

7 Communicate the solution to appropriate people, using the following methods:
7.1 specific company documentation
Plus **one** more from the following:
7.2 computer generated report
7.3 verbal report
7.4 computer based presentation
7.5 other specific media

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