
Overview

This standard identifies the competences you need to prepare for and mark out materials and components, manufactured or modified for experimental vehicle and development purposes, in accordance with approved procedures. You will be required to select the appropriate marking out equipment to use, based on the features to be marked out and the accuracy required, and this may include the use of precision instruments. Marking out will be required in preparation for activities such as hand cutting/detail fitting, bending and forming activities, machining, positioning of components or for assembly into the vehicle.

Materials to be marked out will include ferrous, non-ferrous, non-metallic and composites, which may be in sheet form, bar sections (such as square/rectangular, round, hexagonal), part machined components, existing vehicle sub- assemblies or irregular-shaped components such as castings and forgings.

Your responsibilities will require you to comply with organisational policy and procedures for the marking out activities undertaken, and to report any problems with the marking out activities 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 marking-out methods and procedures. You will understand the marking-out process, and its application, and will know about the marking out equipment and marking mediums, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the marking-out activities, especially those for using cleaning solutions and marking mediums. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

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. obtain and use the correct information for marking out
3. obtain the appropriate marking out equipment and check that it is in a usable condition
4. prepare suitable datum and marking out surfaces
5. mark out using appropriate methods and techniques
6. check that the marking out complies with the specification
7. deal promptly and effectively with problems within your control and report those that cannot be resolved
8. ensure that work records are completed, stored securely and available to others as per organisational requirements
9. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. the procedure for obtaining the required drawings, sketches, development sheets, job instructions and other related specifications, and how to interpret them correctly
6. how to extract and use information from engineering drawings and related specifications (to include symbols and conventions)
7. principles of marking out and the type of equipment used
8. the range of operations that various items of marking out equipment are capable of performing
9. how to prepare the materials in readiness for the marking out activities (such as visually checking for defects, cleaning the materials, removing burrs and sharp edges)
10. how to select and establish suitable datums on the workpiece/material
11. the importance of ensuring that marking out is undertaken from the selected datums, and the possible effects of working from different datums
12. how to prepare the surfaces for marking out, and the types of marking out mediums that can be used
13. methods of holding and supporting workpieces during the marking out activities, and equipment that can be used (such as surface plates, angle plates, vee blocks and clamps, parallel bars, screw jacks)
14. how to mark out the workpiece (including datums, cutting guidelines, square and rectangular profiles, circular and radial profiles, angles, holes which are linearly positioned, boxed and on pitch circles)
15. the problems associated with marking out components for the

experimental/development process, and how to overcome them

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

17. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1.

Carry out all of the following during the marking out activities:

- 1.1 obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation)
- 1.2 adhere to procedures or systems in place for risk assessment, hazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
- 1.3 follow safe practice/approved marking out procedures at all times
- 1.4 check that all tools and measuring equipment are within current calibration/certification dates
- 1.5 return all tools and equipment to the correct location on completion of the marking out activities
- 1.6 leave the work area in a safe and appropriate condition on completion of the activities

2.

Mark out a range of material forms, to include three of the following:

- 2.1 specific vehicle components
- 2.2 round/cylindrical sections
- 2.3 irregular-shaped items
- 2.4 flat or sheet materials
- 2.5 quadrilateral section
- 2.6 angle sections
- 2.7 machined items
- 2.8 channel and I sections
- 2.9 assemblies
- 2.10 castings/forgings

3.

Use marking out methods and techniques, which include one of the following:

- 3.1 direct marking using instruments
- 3.2 use of templates
- 3.3 tracing/transfer methods

4.

Use a range of marking out equipment, to include four of the following:

- 4.1 rules/tapes
- 4.2 scribing blocks
- 4.3 protractors
- 4.4 dividers/compasses
- 4.5 squares
- 4.6 vernier instruments
- 4.7 scribes
- 4.8 depth gauges

- 4.9 trammels
- 4.10 angle plates
- 4.11 laser equipment
- 4.12 other specific equipment

5.

Mark out workpieces which include five of the following features:

- 5.1 datums/centre lines
- 5.2 square/rectangular profiles
- 5.3 angles/angular profiles
- 5.4 radial hole positions
- 5.5 linear hole positions
- 5.6 simple pattern developments
- 5.7 allowances for bending

6.

Check marked out workpieces comply with all of the following quality and accuracy standards:

- 6.1 dimensionally accurate (to drawing/specification or sketch)
- 6.2 clearly defined for required processes
- 6.3 use recognised marking out conventions
- 6.4 meet the requirements of the experimental/development process
- 6.5 meet cutting out/machining requirements

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