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## Overview

This standard identifies the competences you need to use hand-fitting techniques to produce detail components for use in experimental vehicle development activities, in accordance with approved procedures. This will involve the modification of existing components as well as producing new parts. You will also be required to select the appropriate equipment to use, based on the operations to be carried out, to the level of accuracy required.

In producing the components, you will be expected to use a range of hand tools, portable power tools, and shaping and fitting techniques appropriate to the type of material and operations being performed. These activities will include such processes as hand sawing, band sawing, filing, drilling, threading, and offhand grinding. The components produced will have features that have flat, square, parallel and angular faces, radii and curved profiles, drilled holes, internal and external threads, and sliding or mating parts.

Materials to be used will include ferrous, non-ferrous, non-metallic and composites, which may be in sheet form, bar sections (such as square/rectangular, round, angle, I or channel), part machined or existing vehicle components.

Your responsibilities will require you to comply with organisational policy and procedures for the cutting and shaping activities undertaken, and to report any problems with the 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 hand-fitting procedures. You will understand the hand-fitting techniques and their application, and will know about the tools and equipment used, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the completed components are to the required specification.

You will understand the safety precautions required when carrying out the hand fitting

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activities. You will be required to demonstrate safe working practices 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. follow relevant specifications for the component to be produced
3. obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition
4. produce components and using appropriate shaping methods and techniques
5. check that all the required shaping operations have been completed to the required specification
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. ensure that work records are completed, stored securely and available to others as per organisational requirements
8. 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, sketch, development sheets, job instructions and other related specifications
6. how to extract and use information from engineering drawings and related specifications (to include symbols and conventions, current industry standards) in relation to work undertaken
7. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
8. the cutting and shaping methods to be used, and the sequence in which the operations will need to be carried out
9. how to file flat, square and curved surfaces, and achieve a smooth surface finish
10. how to cut external threads using hand dies, and the method of fixing and adjusting the dies to give the correct thread fit
11. how to determine the drill size for tapped holes and the importance of using taps in the correct sequence
12. how to produce a sliding or mating fit, and the techniques to be adopted
13. how to select saw blades for different materials, and how to set the saw blades for different operations (cutting externally and internally)
14. the various types of files that are available, the cut of files for different applications
15. how to prepare the components for the filing operations ( cleaning, de-burring, marking out)
16. the use of vice jaw-plates to protect the workpiece from damage
17. the types and application of portable power tools that can be used for the hand

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fitting operations

18. the importance of ensuring that file handles are secure and free from embedded foreign bodies or splits
19. how to check that portable power tools and extension cables are free from damage and are in a safe, tested and usable condition
20. the problems that can occur with the cutting and shaping operations, and how can these be overcome
21. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
22. 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 hand fitting activities:

- 1.1 obtain and use the appropriate documentation (such as job instructions, assembly 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 check that all cables, extension leads or air supply hoses are in a safe, tested and serviceable condition
- 1.4 check that all tools and equipment to be used are within current calibration/certification dates
- 1.5 use safe and approved fitting techniques at all times
- 1.6 return all tools and equipment to the correct location on completion of the fitting activities
- 1.7 leave the work area in a safe and appropriate condition on completion of the activities

2.

Produce components for experimental vehicle development activities, to include both of the following:

- 2.1 modify existing components
- 2.2 produce new components

3.

Use a range of hand-fitting methods to produce components, to include seven of the following:

- 3.1 hand sawing
- 3.2 band/power sawing
- 3.3 filing
- 3.4 drilling
- 3.5 chiselling
- 3.6 threading external
- 3.7 reaming
- 3.8 riveting
- 3.9 offhand grinding
- 3.10 tapping
- 3.11 scraping
- 3.12 lapping

4.

Produce or modify components which combine several features and cover eight of the following:

- 4.1 flat datum faces

- 4.2 faces which are parallel to each other
- 4.3 faces which are square to each other
- 4.4 faces at an angle to each other
- 4.5 curved profiles
- 4.6 radii
- 4.7 drilled holes (through; to a depth)
- 4.8 counter-bored/counter-sunk/spot-faced holes
- 4.9 reamed holes
- 4.10 external threads
- 4.11 internal threads
- 4.12 sliding or mating parts
- 4.13 chamfers and radii

5.

Cut and shape three different types of material from the following:

- 5.1 low carbon steel
- 5.2 plastic/synthetic
- 5.3 high carbon steel
- 5.4 aluminium
- 5.5 stainless steel
- 5.6 brass/bronze
- 5.7 cast iron
- 5.8 composite
- 5.9 other specific material

6.

Check components comply all of the following standards, as applicable to the operations performed:

- 6.1 surface finish 63'in or 1.6 'm
- 6.2 screw threads to BS Medium fit
- 6.3 reamed and bored holes within H8
- 6.4 flatness and squareness 0.001" per inch or 0.025mm per 25mm

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Using hand fitting techniques to produce components for experimental vehicle engineering



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