SEMPEO251

Fettling, finishing and checking cast components

Overview

This standard covers a broad range of basic competences that you need, to fettle and finish cast components produced from sand moulds, metal moulds/dies, ceramic moulds or investment shells using hand and power tools. It will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or it will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare for the fettling and finishing activities by obtaining all necessary information, documentation, materials, tools and equipment, and to plan how you intend to carry out the required fettling, finishing and checking activities.

You will be required to select the appropriate equipment to use, based on the shape and size of the components and the material from which they are cast. You will be expected to carry out checks on the tools and equipment, to ensure that they are in a safe and usable condition and that the abrasive wheels /discs to be used during the fettling operation are suitable for the material and operations to be carried out.

The cast components could be circular, square or irregular in shape, and may have projections and internal cavities. You will remove the runners and risers/feeders, using manual or mechanical means. Other surplus material present, on both external and internal surfaces (such as joint line and core print flash) must also be removed. On completion of the fettling activities, you will be expected to check the castings for a range of visual and geometric defects.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the fettling, finishing and checking activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the activities, materials and equipment, and to seek appropriate help and advice in determining and implementing a suitable solution. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate fettling, finishing and checking procedures safely to cast components. You will understand the fettling, finishing and checking techniques used, and their application, and will know about the equipment, materials and

consumables, to the required 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 fettling and finishing activities, and when using the associated tools and equipment. You will be required to demonstrate safe working practices throughout. You will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

Specific Standard Requirements

In order to prove your ability to combine different casting fettling techniques and procedures, at least one of the components fettled must be of a significant nature, and must contain **four** of the features listed in scope 5.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. plan the fettling, finishing and checking activities before you start them
3. remove the cast components from the moulds/dies, using appropriate tools and techniques
4. clean the cast components and, where appropriate, remove any cores
5. fettle and finish the castings to remove excess material
6. check the casting for visual defects
7. dispose of waste material safely and correctly, in line with organisational procedures
8. deal promptly and effectively with problems within your control, and seek help and guidance from the relevant people if you have problems that you cannot resolve
9. leave the work area in a safe condition on completion of the fettling and finishing activities

Knowledge and understanding

You need to know and understand:

1. the specific health and safety precautions which must be taken when fettling and finishing cast components (such as wearing full protective clothing and protective equipment, using screens and dust extraction equipment)
2. the hazards associated with fettling and finishing cast components (such as handling hot castings, airborne sparks and metal particles, sharp edges on components, using power tools and abrasive discs, handling heavy materials, breathing in dust and fume, noise and vibration), and how they can be minimised
3. the personal protective equipment (PPE) to be used; how to obtain it and check that it is in a safe and usable condition (such as eye and ear protection, overalls, full face masks, breathing equipment)
4. the importance of ensuring that fume extraction equipment is operating effectively, and that good housekeeping and fire prevention procedures are observed
5. the importance of following job instructions and defined fettling procedures
6. manual lifting techniques and requirements on acceptable weights to be handled by hand
7. the emergency procedures to be followed in the event of a malfunction of any of the equipment that you use
8. the factors which govern the cooling times of cast components in the moulds, prior to knocking out
9. the different methods that can be used to knock out and de-core moulds and shells, and how to avoid damaging the moulds and cast components
10. how to clean the castings and remove any cores, and the tools and equipment that can be used
11. the casting defects which can be directly related to the use of incorrect methods for the removal of runners/risers/feeders from castings during the knocking out process
12. how to remove runners and associated systems by braking off or cutting off
13. how to fettle castings to remove joint line flash, runner and feeder stubs, and the amount of material that should be removed
14. the various hand and power tools that are used to carry out the fettling activities (such as hammers and chisels, files, grinding machines/discs, linishing equipment, knives and scrapers, thermal or laser cutters)

15. the checks to be made on the tools and equipment to ensure that they are in a safe and usable condition
16. the various workholding methods and devices used to hold the cast components during the cleaning and fettling activities
17. the effect on casting quality of incorrectly fettling of castings (such as under or over-dressing)
18. the reasons why different types of tools and equipment are used to fettle ferrous, non-ferrous and non-metallic cast components
19. why it is important to keep the equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean working area
20. the different equipment that can be used to assist with the visual inspection of cast components (such as electronic scanning units, shadowgraph units, magnifying glasses or dye-penetrant equipment)
21. the different types of defects which can be detected through visual inspection (such as incomplete or deformed castings, blow holes, impurity inclusions, mis-runs/cold shuts, shrinkage, surface/sub-surface porosity, cracks, undercuts on runners/risers/feeders, poor ingate or feeder cut-off, swells, cross joints, scabs, misplaced cores, variable metal section thickness and excessive flash)
22. when to act on your own initiative and when to seek help and advice from others
23. the importance of leaving the work area in a safe and clean condition on completion of the fettling activities (such as returning tools and equipment to the designated location, cleaning the work area, and removing and disposing of waste)

Scope/range related to performance criteria

1.

Carry out **all** of the following, in preparation for the fettling and finishing activities:

1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
1.2 ensure that the work area is clear of obvious hazards
1.3 obtain any necessary personal protective equipment, and check that it is in good order
1.4 follow job instructions, fettling and finishing specifications and procedures
1.5 check that the tools and equipment you need are in a safe, tested and usable condition (such as extension leads, hoses, pneumatic equipment, hand tools)
1.6 ensure that dust extraction and air filtering equipment is functioning correctly
1.7 ensure that all guards and screens are in place and in good order
1.8 return all tools and equipment to the correct location on completion of the fettling and finishing activities

2.

Remove cast components from moulds, and carry out **all** of the following, as appropriate to the castings produced:

2.1 knocking castings out of the moulds
2.2 de-coring
2.3 removing castings from the moulding material
2.4 removing runner/riser/feeder systems

3.

Fettle and finish cast components which have been produced from **one** of the following materials:

3.1 ferrous alloys
3.2 non-ferrous alloys
3.3 plastics/polymers
3.4 liquid ceramics

4.

Fettle and finish cast components, to include the use of **three** of the following:

4.1 hand tools (such as wire brushes, knives, scrapers, saws, files
4.2 slitting saw
4.3 disc/angle grinder
4.4 linishers
4.5 pedestal grinders
4.6 pneumatic chipping hammers
4.7 thermal cutters
4.8 band saw

4.9 laser cutters
4.10 other specific methods

5.

Fettle and finish cast components that have **four** of the following shapes/profiles:

5.1 circular
5.2 irregular
5.3 curved or tapered profiles
5.4 square
5.5 projections
5.6 internal cavities

6.

Visually check cast components, and identify defects including **six** of the following:

6.1 incomplete or deformed castings
6.2 blow holes
6.3 misplaced cores
6.4 variable metal section thickness
6.5 impurity inclusions
6.6 mis-runs/cold shuts
6.7 incorrect profiles
6.8 shrinkage
6.9 undercuts on runners/risers/feeders
6.10 swells
6.11 cracks
6.12 poor ingate or feeder cut-off
6.13 cross joints
6.14 surface porosity
6.15 excessive flash

7.

Complete dimensional checks on cast components, to include checking **five** of the following features:

7.1 flatness
7.2 taper
7.3 squareness
7.4 profiles
7.5 concentricity
7.6 angularity
7.7 straightness
7.8 roundness

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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