SEMPEO131

Manually casting components

Overview

This standard covers a range of basic competences that you need, to prepare and safely cast molten materials (such as ferrous or non-ferrous alloys, plastic polymers and liquid ceramics) into prepared moulds, dies, or shells, manually. It will prepare you for entry into the engineering or manufacturing sector, 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 casting activities by obtaining all the necessary job instructions, materials, tools, equipment and any documentation that may be required.

You will need to check that the moulds to be cast are positioned correctly and are bushed up and secure. You must ensure that the casting ladles, and any supporting or carrying frames, are free from defects that could affect the safe operation of carrying and pouring the molten material. You will collect the molten material from the source vessel or furnace, and skim or apply coagulant to the molten material to remove/contain impurities from the surface. You will then cast the moulds in a safe manner and at the correct speed. On completion of the casting activity, any surplus molten material must be disposed of safely and correctly, and you will be expected to return all tools and equipment to the correct location and to leave the work area in a safe and tidy condition.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the casting activities undertaken. You will need to report any difficulties or problems that may arise with the casting activities, and to carry out any agreed actions. 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 molten material pouring and casting techniques and procedures safely. You will understand the casting 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 manual casting activities, especially those for transporting and pouring molten materials. 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

At least one of the components produced must combine different casting techniques and procedures, such as casting components that have flat and curved external surfaces and internal cavities.

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. ensure that the moulds are correctly prepared, sited and positioned ready for the casting process
3. collect and transport the molten material safely and correctly from the furnace
4. use the appropriate technique to pour the molten material into the moulds
5. produce cast components to the required specification
6. report any difficulties or problems that may arise with the casting activities, and carry out any agreed actions
7. dispose of surplus material safely and correctly
8. leave the work area in a safe and tidy condition on completion of the casting activities

Knowledge and understanding

You need to know and understand:

1. the specific health and safety precautions which must be taken with regard to handling and transporting molten materials (such as wearing full protective clothing and protective equipment, and the elimination of slipping or tripping hazards)
2. the hazards associated with pouring molten materials (such as splashes and spills of molten materials; fumes; handling hot and heavy materials), and how they can be minimised
3. the personal protective equipment (PPE) that should be used; how to obtain it, and how to check that it is in a safe and usable condition
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 casting procedures
6. the emergency procedures to be followed in the event of a furnace failure or malfunction in any vessel used to transport and cast molten materials
7. the various methods of collecting molten material from the furnace or ladle, and the different types of vessel used
8. manual lifting techniques and requirements on acceptable weights to be handled by hand
9. why it is sometimes necessary for the ladles to be preheated, and the effects of using wet or untreated/cold ladles
10. the causes of surface impurities on molten materials, and the methods of removing them
11. the effects on the quality of the cast components if impurities are allowed to enter the mould/die cavity
12. the checks to be carried out on the moulds/dies/shells prior to casting (such as checking that clamps or weights are correctly positioned, downsprues are marked and pouring bushes/basins are in position, necessary filters are in place and access to moulds is clear)
13. the importance of using the correct pouring techniques, and of casting at the correct speed
14. methods of pouring molten material for single operations or double pour applications
15. the defects in cast components which can be directly related to using the

incorrect pouring technique, incorrect material temperature, or untreated molten material/material

16. how to dispose of surplus molten material (such as returning material to furnace or receiver; pouring into prepared sand beds or ingot moulds)
17. when to act on your own initiative and when to seek help and advice from others
18. the importance of leaving the work area in a safe and clean condition on completion of the casting 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 during the manual casting 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 follow job instructions, and apply safe and appropriate casting techniques and procedures at all times
1.4 confirm that the required material handling equipment is available and is in a safe and usable condition
1.5 check that any required ancillary equipment is available (such as fume extraction equipment, molten material treatment equipment)
1.6 return all tools and equipment to the correct location on completion of the casting activities

2.

Check that the moulds/dies are complete and ready for casting, to include carrying out **all** of the following checks:

2.1 appropriate clamps and/or weights are in position
2.2 downsprues are marked, and pouring bushes/basins are in position and free from obstructions
2.3 any necessary filters are in place
2.4 access to the moulds/dies/shells is clear
2.5 containers for surplus molten material are prepared and positioned conveniently in relation to the mould/dies/shells

3.

Prepare the molten material ladles/handling equipment, to include carrying out **all** of the following:

3.1 checking that the ladle is the correct size for the amount of material to be poured
3.2 checking that the ladle/lining is in a safe condition and is complete and dry
3.3 ensuring that any necessary pre-heating has been carried out

4.

Collect the molten material and carry out **two** of the following melt checks/procedures, as appropriate to the melt:

4.1 making temperature checks
4.2 applying coagulant material
4.3 skimming of the melt to remove slag and other impurities
4.4 using inhibitor materials or gas

5.

Produce cast components from **one** of the following:

5.1 ferrous alloys
5.2 non-ferrous alloys
5.3 plastics/polymers
5.4 liquid ceramics

6.

Transfer and pour the molten material into moulds/dies, using **one** of the following:

6.1 single operation
6.2 double pour

7.

Cast molten materials into **one** of the following:

7.1 sand moulds
7.2 metal moulds/dies
7.3 shells (investment process)

8.

Produce cast components which contain **all** of the following features:

8.1 faces that are flat, square or angular to each other
8.2 have slots or holes
8.3 have round, curved or contoured surfaces

9.

Produce cast components which comply with **all** of the following:

9.1 cast components are complete and free from obvious defects (such as blow holes, impurities, cracks, damaged or deformed surfaces)
9.2 the cast components meet the required specification (such as shape, dimensional accuracy)
9.3 the cast components meet company standards and procedures

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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