SEMPEO248

Producing and preparing sand moulds and cores for casting

Overview

This standard covers a broad range of basic competences you need to produce and prepare sand moulds and cores for casting. 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 production of the moulds and cores by obtaining all necessary information, documentation, materials, tools and equipment, and to plan how you intend to carry out the required activities and the sequence of operations you intend to use.

You will be required to select the appropriate equipment to use, based on the type and size of the pattern, the moulding method employed, and the material to be cast. You will be expected to prepare the sand and produce the moulds using either greensand, chemically bonded gas activated sand, chemically bonded resin/catalyst activated sand or resin bonded heat activated sand. The patterns used will be loose or boarded, circular, square or irregular in shape, and will have projections and internal cavities. The moulds will be produced either in boxes or boxless, as appropriate.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the production and preparation of the sand moulds and cores. You will need to take account of any potential difficulties or problems that may arise with the patterns, sand, additives or equipment used, 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 manual sand moulding and core making techniques safely. You will understand the manual sand moulding and core making process, and its application, and will know about the equipment, materials, consumables and tests that are used to confirm that the sand is fit for purpose, 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 sand moulding 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 moulding techniques and procedures, at least one of the moulds produced must be of a significant nature, and must contain a minimum of **one** core.

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 sand moulding and core making activities before you start them
3. obtain and prepare the appropriate tools, equipment and materials
4. ensure that the patterns are correctly prepared, sited and positioned ready for the moulding process
5. ensure that the sand is correctly mixed and milled
6. test the prepared sand to ensure that it meets the specification requirements
7. carry out the sand moulding and core making activities, using the correct methods and techniques
8. produce moulds and cores to the required specification
9. assemble and finish the moulds to the required specification
10. dispose of surplus material safely and correctly
11. 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
12. leave the work area in a safe condition on completion of the moulding and core making activities

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken when producing and preparing sand moulds for casting (such as wearing full protective clothing and protective equipment; ensuring adequate ventilation/fume extraction and the elimination of slipping or tripping hazards)
2. the COSHH regulations that apply when dealing with chemically bonded sands, surface coatings, release agents and surface dressings
3. the hazards associated with producing and preparing sand moulds and cores for casting, including exposure to dust and fume, and how they can be minimised
4. the importance of wearing appropriate protective clothing and equipment (PPE), and keeping the work area safe and tidy
5. the types of sands and sand binder systems used in core and mould making activities (such as silica, olivine, chromite and zircon sands, and greensand, and chemically prepared sands such as gas activated, resin/catalyst activated types)
6. the various types of sand additives which are suitable for the sand and type of metal to be cast (such as chemicals, resins, catalyst, esters, breakdown agents, inhibitors, refractory materials, and bentonite)
7. methods used to prepare greensand and chemically or resin bonded sands, using manual and machine methods
8. how to calculate the amount of sand required, and the ratios of sand additives that may be required
9. the effects on the prepared materials if the base product is passed the 'use by' date, is added to the mix at the wrong time or at the wrong temperature, too little or too much is added to the mix, or the mixture is over mixed or over milled
10. the procedures for testing the prepared sand for moisture content, strength, viscosity and freedom from foreign bodies
11. the various types of core box that are used (such as solid turnout boxes, split boxes, multi-part, strickle and boxes containing loose pieces or prints)
12. the different pattern types used in the moulding process (such as loose and plated), and the jointing methods that are required for the different pattern types
13. methods of positioning the patterns for correct orientation; centralising and supporting the pattern in the moulding box
14. the application and use of pattern release agents and core coatings or dressings

15. methods of filling moulds and core boxes and compacting sands (such as manual filling and compacting and machine filling and compacting), and the precautions to be taken to ensure that the pattern doesn't become displaced during the filling and compacting activities
16. methods of reinforcement and venting of the moulds and cores (such as using vent wire and rods, pre- formed shapes, pre-formed wax or nylon) and placement and use of chills and filters
17. methods of mould stripping and pattern rapping; removing the pattern without damaging the mould cavity or pattern
18. methods of cutting and forming downsprues, ingates, riser and feeder systems
19. the various methods of drying and curing cores (such as the use of ovens, CO_2 gas and catalytic action)
20. why it is necessary to check the moulds and cores prior to commencing core setting and mould closing operations
21. the defects that can occur in the moulds and cores (such as cracked surfaces, exposed reinforcements, friable surfaces, broken or weak mould and core sections, incomplete mould or cores, damaged or broken core prints and core locations, mould location devices missing or distorted, uncoated moulds or cores)
22. methods of rectifying defects in moulds or cores, by patching and gluing
23. how to prepare the moulds, and the methods of locating and setting cores in the moulds (using core prints, chaplets, glues and sprigs)
24. the methods of closing and securing the moulds (using weights or clamps), and the dangers/effects of using moulds which are incorrectly closed or clamped
25. why it is important to keep the pattern and core box equipment clean and free from damage, to practice good housekeeping of moulding tools and equipment, and to maintain a clean working area
26. when to act on your own initiative and when to seek help and advice from others
27. the importance of leaving the work area in a safe and clean condition on completion of the sand moulding and core making 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 sand moulding and core making 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 follow job instructions and moulding procedure specifications
1.3 use the correct tools and equipment for the moulding activity
1.4 follow the defined moulding techniques and procedures
1.5 ensure that the moulds produced meet the required specification for quality and accuracy
1.6 return all tools and equipment to the correct location on completion of the moulding and core making activities

2.

Prepare sand and produce moulds/cores from **two** of the following types of sand:

2.1 greensand (naturally or synthetically bonded)
2.2 chemically bonded resin/catalyst
2.3 chemically bonded gas activated
2.4 resin bonded heat activated
2.5 other type of sand (specify)

3.

Prepare the sand for the mould/core making activities, to include carrying out **all** of the following:

3.1 measuring out the required amounts of sand for the operations being performed
3.2 adding the correct additives in the correct ratios
3.3 performing the mixing and milling operations safely and correctly
3.4 testing that the finished sand meets requirements (such as moisture, permeability, viscosity and strength)

4.

Prepare the mould/coremaking equipment for use, to include carrying out **both** of the following:

4.1 visually inspecting the pattern or core box for damage
4.2 applying release agents to the pattern or core box (as applicable)

5.

Produce full or half cores from **both** of the following types of core box:

5.1 solid turnout boxes
5.2 split boxes

6.

Produce cores using **two** of the following techniques:

6.1 hand tucking and ramming
6.2 inserting reinforcements (such as wire or bars)
6.3 mechanical assistance with core consolidation

6.4 incorporating vents (such as pre-formed, manually applied)
6.5 curing and drying the cores

7.

Produce drag and cope mould parts from patterns which are **either**:

7.1 loose flat back and split type

or

2. plated flat type and split type

1.

Produce mould parts, using **one** of the following methods:

1.1 use of moulding boxes
1.2 boxless, using mould location devices

2.

Assemble and finish the moulds (which must include **at least one** core), by carrying out **all** of the following:

2.1 inserting the cores (such as horizontal or vertical location)
2.2 securing the cores (using print locations, adhesives or mechanical devices)
2.3 forming runner, riser and feeder systems on the mould (such as cut and formed manually, reformed with fixed formers, preformed with loose formers)
2.4 inserting filters, chills or feeder sleeves as necessary
2.5 carrying out any repairs to the moulds/cores (such as patching up greensand moulds or cores, repairing rigid sand moulds or cores using adhesives)
2.6 applying mould coatings/dressings (such as by spray, flood, brush or dry)

3.

Prepare and close the moulds ready for casting, to include carrying out **all** of the following:

3.1 cleaning and removing foreign bodies and surplus sand from the mould cavity
3.2 carrying out visual checks on moulds for completeness (including all cores and freedom from cracks)
3.3 checking that runner/riser/feeder systems are clean, connected and complete
3.4 applying mould sealant, where appropriate
3.5 locating the moulds (using pins, rebates, diabolos or cores, as appropriate)
3.6 closing moulds manually or by mechanical means
3.7 securing the moulds using clamps/clips and/or weights

4.

Produce sand moulds which meet **all** of the following quality and accuracy standards:

4.1 complete and free from obvious defects (such as cracks, broken or damaged mould surfaces)
4.2 meet the required specification (such as shape, dimensional accuracy)

4.3 free from soft spots

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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