Overview

This standard identifies the competencies you need to produce sand moulds from loose patterns, using manual methods, in accordance with approved procedures. 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 metal to be cast. The moulds to be produced will be for either ferrous or non-ferrous metal and moulding will take place using recognised techniques in jobbing and semi-mechanised foundries.

You will be expected to produce the moulds using either greensand, chemically bonded gas activated sand, or chemically bonded resin/catalyst activated sand. The patterns used will be complex in shape and you will be expected to select mould joint lines from irregular shaped patterns. It is expected that the patterns will have at least three cores. You will determine the required runner, riser/feeder systems and where appropriate, insert pre-formed parts during mould production. Mould reinforcements and chills/denseners, where required, will be inserted during mould production. Repairs to the mould cavity will be performed where necessary. You will make the decisions regarding mould coating/dressing, if required and will mix/approve and apply the coating/dressings to company standards.

Your responsibilities will require you to comply with organisational policy and procedures for the moulding activities undertaken and to report any problems with the patterns, sand or equipment in use that you cannot personally resolve, or 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 actions and for the quality and accuracy of the moulds that you produce.

Your underpinning knowledge will show a good understanding of your work, and will provide an informed approach to applying manual sand moulding techniques using loose patterns. You will understand the different types of sand in use and the additives and additions used in preparing the moulding material. You will understand the difference in the moulding processes using different sands and different types of pattern equipment and moulding accessories. Your knowledge will enable you to identify sub-standard sand, patterns, moulding equipment and finished moulds.
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 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 legislation, regulations, directives and other relevant guidelines
2. follow the correct component drawing or any other related specifications for the component to be produced
3. obtain and prepare tools, equipment and materials
4. carry out the moulding or laying-up activities using the correct methods and techniques
5. produce components to the required specification
6. check that all the required operations have been completed to specification
7. deal promptly and effectively with problems within your control and report those that cannot be solved
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. how to obtain the job instructions and interpret the information
6. the different pattern types used in the moulding process (loose, flat, multi and irregular joint)
7. the jointing methods used for different pattern types
8. the different types of core print used to locate and secure cores (including drag and cope prints and interconnecting types)
9. the different types of mould reinforcements (fixed and loose bars, grids, sprigs and lifters/gaggers/soldiers)
10. why chills/denseners are used
11. the different sand moulding processes used (greensand and chemically bonded sand)
12. the various additions and additives that are used when mixing sands, and how these affect the moulding process (clays, starches, chemicals, resins, catalyst, breakdown agents, inhibitors, refractory materials)
13. the effects of using incorrect amounts of additions or additives in the moulding sand
14. why some types of sand mixes used for producing moulds have limited or unlimited life
15. how the pattern type and configuration can determine the moulding process and the sand used
16. the application and use of release agents and mould coatings
17. the reasons why different release agents are used with different sand and pattern types
18. the type and application of mould coating/dressing for different metal alloys
19. how to identify mould defects (such as soft spots,
broken/damaged mould surfaces, clagging/sticking, distorted sections, misplaced/displaced chills and joint line deformation)

20. the organisational quality control procedures for producing and inspecting moulds (checks for completeness, cleanliness, freedom from foreign bodies, freedom from defects; correct type, application, coverage and thickness of mould coatings/dressings; checking mould section thickness; mould hardness testing)

21. the importance of keeping the pattern equipment clean and free from damage, good housekeeping of moulding tools and equipment and maintaining a clean working area

22. the extent of your own authority and whom you should report to if you have problems that you cannot resolve when making the moulds

23. how to access, use and maintain information to comply with organisational requirements and legislation
1. Produce sand moulds, carrying out all of the following activities:
   1. confirm that all the required materials and equipment are available and in a safe and usable condition
   2. adhere to health and safety regulations, systems and procedures to realise a safe system of work
   3. comply with job instructions, moulding specifications
   4. use the correct tools and equipment for the moulding activity
   5. follow the defined moulding procedures
   6. ensure that the moulds produced meet the required specification for quality and accuracy
   7. leave the work area in a safe condition on completion of the moulding activities

2. Prepare the pattern equipment for use, including both of the following:
   1. visually inspecting the pattern for damage
   2. applying release agents to the pattern

3. Produce complete moulds from patterns, with and without cores, to include two of the following:
   1. loose flat back and split types
   2. irregular joints
   3. multi-parts

4. Produce moulds from patterns with at least three cores, where core locations must cover all of the following positions:
   1. horizontal
   2. vertical
   3. interconnecting

5. Form mould joints manually, to include both of the following:
   1. flat joints
   2. irregular joints

6. Incorporate reinforcements in the mould, to include one of the following:
   1. boxes with bars
   2. loose strengthening provision
7. Carry out moulding techniques, to include one of the following:
   1. chill insertion
   2. densener insertion
   3. use of chill sand

8. Produce moulds using one of the following types of sand:
   1. greensand (naturally or synthetically bonded)
   2. chemically bonded resin/catalyst
   3. chemically bonded gas activated
   4. ester silicate
   5. other (specify)

9. Form runner, riser and feeder systems on the mould, using two of the following methods:
   1. cut and formed manually
   2. pre-formed with fixed formers
   3. pre-formed with loose formers

10. Finish/repair the moulds using one of the following methods:
    1. patching up greensand moulds
    2. repairing rigid sand moulds using adhesives

11. Apply mould coatings/dressings to the moulds using two of the following methods:
    1. spray
    2. brush
    3. flood
    4. dry

12. Produce sand moulds which meet all of the following quality and accuracy standards:
    1. moulds are complete and free from obvious defects (cracks, broken or damaged mould surfaces)
    2. the mould meets the required specification (shape, dimensional accuracy)
    3. the mould is free from soft spots
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