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## Overview

This standard identifies the competencies you need to form runners, risers and feeder systems in sand moulds produced from loose or plated patterns, using manual methods and formers, in accordance with approved procedures.

You will be required to select the appropriate equipment to use, based on the type and size of the patterns, the moulding method employed and the metal to be cast. Both ferrous and non-ferrous alloys are covered by this standard. You will be expected to perform the above activities during the production of the moulds or following removal of the patterns from the mould. Moulds will be produced from either greensand, chemically bonded gas activated sand, chemically bonded resin/catalyst activated sand or ester silicate bonded sand.

Patterns will be complex in shape and you will be expected to determine the size, shape, number and position of the ingates, risers and/or feeders. You will use pre-formed (ceramic, insulating or exothermic sleeves) and formed (re-usable) components, which will be inserted during the mould making operations. Manually formed and cut systems will generally be used on greensand moulds. Either of the above methods can be applied to top, bottom or joint line connections. Any slag/dross traps, chokes or filters will be inserted during or after mould production. Repairs and blending of any part of the system will be performed where necessary. You will make decisions regarding the security in the mould of any pre-formed parts. You will ensure that the system is connected, and all extraneous material is removed. You will apply dressings to the system, where appropriate.

Your responsibilities will require you to comply with organisational policy and procedures for the activities undertaken and to report any problems with the pre-formed or formed parts and 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 runner, riser and feeder systems you produce.

Your underpinning knowledge will provide a good understanding of your work and will enable you to identify sub-standard sand, patterns and moulding equipment. It will also enable you to adopt an informed approach to the forming of runner, riser and feeder systems in sand moulds, using loose or boarded patterns. You will understand the different types of sand in use and the reasons why formers and pre-formed parts are used. You will understand the different parts and functions of a complete runner, riser and feeder system. Your knowledge will enable you to identify the differences in pressurised, un-pressurised and neutral types of system and why these different systems are used for different alloys.

You will understand the safety precautions required when carrying out the runner, riser

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and feeder cutting 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 the appropriate 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

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### 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. how to obtain the job instructions and interpret the information
5. the different pattern types used in the moulding process (such as loose, plated and multi-part)
6. the different parts and functions of runner, riser and feeder systems (downsprues, ingates, breaker cores/discs, channel bars, risers, feeders, slag traps, whistlers and chokes)
7. why pre-formed parts are used in some runner and feeder systems
8. the reasons why different materials are used for the pre-formed parts (ceramic, exothermic and insulating)
9. the benefits of using formed parts and pre-formed parts
10. why different parts of any runner, riser feeder system are blended into connecting sections
11. the different sand moulding processes used (green sand, chemically bonded sand)
12. the reasons why manually cutting runner, riser and feeder systems are more appropriate for use on green sand moulds
13. how the pattern type and configuration can determine the runner, riser and feeder system used
14. why different metals need different types and size of runners, risers and feeders
15. why runner systems are pressurised, neutral and un-pressurised
16. why some runner systems have a coating/dressing applied to them
17. why some moulds have runner systems which are positioned at the top, joint or bottom
18. the casting defects which can be directly related to poor design, cutting/forming and cleanliness of runner, riser and feeder systems ( cold shuts, mis-runs, internal and external shrinkage, inclusions, distorted sections, broken sections, undercut areas, excessive metal sections, scabs and swells, dropped sections, poor surface finish and washed mould sections)
19. the company quality control procedures for inspecting the completed moulds (cleanliness, completeness, freedom from foreign bodies, freedom from defects, removal of all formers, checking system connections, checking dimensions and checking insertion of filters and chokes)

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20. why it is important to keep the formers and pre-formers clean and free from damage, to practice good housekeeping of moulding tools and equipment and to maintain a clean working area
21. the extent of your own authority and whom you should report to if you have problems that you cannot resolve when making the moulds
22. how to access, use and maintain information to comply with organisational requirements and legislation

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### Scope/range related to performance criteria

1. Complete forming, 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 to form the runner, riser and feeder systems
  5. follow the defined forming procedures and apply safe working practices and procedures at all times
  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 activities
2. Prepare the formed and pre-formed parts for use, to include both of the following:
  1. visually inspecting the parts for damage
  2. applying release agents to the parts (as applicable)
3. Use formed/pre-formed parts, to include four of the following:
  1. downsprues
  2. breaker cores/discs
  3. feeders (top or side)
  4. chokes
  5. single ingates
  6. channel bars
  7. slag traps
  8. whistlers
  9. multiple ingates
  10. risers
  11. other (specify)
4. Insert and secure any formed and pre-formed parts during mould production, using one of the following types of pattern equipment:
  1. loose
  2. plated
  3. multi-part

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5. Produce runner, riser and feeder systems in moulds produced from 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
  
6. Produce one of the following types of runner system:
  1. pressurised
  2. un-pressurised
  3. neutral
  
7. Manually form and blend runner, riser and feeder systems on the mould, to include four of the following:
  1. ingates (single and multiple)
  2. risers (top and side connected)
  3. whistlers
  4. downsprues
  5. channel bars
  6. chokes
  7. feeders and feeder connections
  8. slag traps (at either downsprue or joint line locations)
  9. opening out feeder heads
  10. forming radii on connecting points
  
8. Apply mould coatings/dressings to the moulds, using one of the following methods:
  1. spray
  2. flood
  3. brush
  4. dry
  
9. Complete mould checks, to include all of the following:
  1. visual inspection (for completeness, freedom from damage, defects or foreign objects)
  2. all parts are correctly and securely connected
  3. dimensional accuracy is achieved
  4. filters and/or chokes are inserted

## Forming runner, riser and feeder systems in sand moulds

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