higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FOUNDRY THEORY N1

2 August 2021

This marking guideline consists of 5 pages.

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QUESTION 1

1.1
- Top gates
- Bottom gates
- Parting line gates (3)

1.2

No.	Name of part
1	Runner cup, sprue cup
2	Cup strainer core
3	Down gate or sprue
4	Pouring basin or runner basin
5	Pencil gates, pencil runners, pop gates
6	Wedge gates
7	Choke
8	Finger gate (vertical)
9	Ring gate
10	Skim bob (cope) or (drag)
11	Ingate
12	Relief sprue
13	Pouring basin
14	Pouring basin with dam
15	Shrink bob
16	Strainer gate (cope)
17	Strainer gate core
18	Strainer gate (drag)
19	Splash core
20	Pouring box or runner box
21	Cross runner
22	Finger gate (horizontal)
23	Flat gate
24	Whirl gate pool
25	Riser or feeder heads supply liquid metal to thick sections: must be sufficiently large so that the metal in them will remain fluid until the metal in the casting has solidified. The riser openings also serve to permit mould gases and steam to escape as the mould is being filled.
26	Bottom gate
27	Horn gate
28	Core for bottom gate
29	Draw-in bottom gate

(7)
(Any 7 × 1)

1.3 1.3.1 A pencil gate consists of a series of small holes leading from the bottom of the pouring basin to the top of the casting; it effectively keeps out the slag.

1.3.2 A wedge gate is frequently used on stove plate castings and baths.

1.3.3 The finger gate is a thinner version of the wedge, used for stove plates and baths.

1.3.4 A ring gate is used for casting rims and gears.

1.3.5 Ingates are used on all castings to let the hot metal flow into the mould.

(5 × 2) (10)
[20]

QUESTION 2

2.1 All castings,✓ with a few exceptions, are fed to a greater or lesser extent in some way or another.✓ The only exceptions are those of extremely light metal, where immediate solidification✓ takes place with uniform internal shrinkage.✓ A mould in which the metal does not solidify immediately✓ (such as is a case with varied sections), forms an outer shell, throughout, but especially at its extremities, while the still fluid interior 'draws' from the basins.✓ This first formation of solid metal and plastic interior are important factors in the feeding of a casting. It is true there are no fixed rules for feeding,✓ as every casting and metal has its own peculiar needs.✓ While allowing for these conditions,✓ one must bear in mind that feeding is a necessity and provision must be made to meet this need.✓ (10)

2.2 In principle feeding is necessary in the solidification of metals.✓ However, these are a few exceptions.✓ In castings with sections varying in thickness,✓ the thin sections will draw from the thick and unless some method of feeding is✓ employed, shrink holes will appear in the heavy sections.✓ (5)

2.3 Individual castings✓ require individual treatment✓ as the methods used✓ are often a matter of compulsion✓ rather than choice.✓ (5)
[20]

QUESTION 3

3.1 The essential feature of this casting process consists of subjecting molten metal✓ to centrifugal pressure✓ created in a rapidly spinning mould.✓ The metal is forced✓ to take up the shape of the mould into which it is being poured.✓ Because of this centrifugal force, the castings produced are particularly strong and require very little by way of feeders.✓ (6)

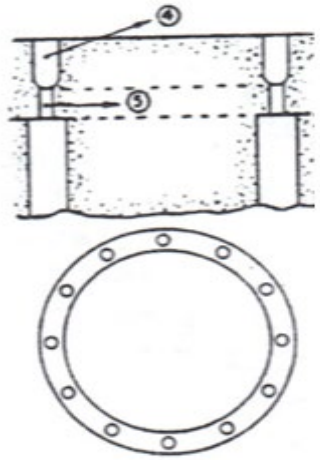
3.2
- A rod with the correct diameter should be used
- The rod should be coated
- The rod should be heated (Any 2 × 2) (4)

3.3 a) A casting with an exothermic riser (1)

3.4 Under the feeder (1)

3.5 A feeder is a reservoir of hot metal✓ that feeds the casting.✓ (2)

3.6 A pencil gate consists of a series of small holes✓ leading from the bottom of the pouring basin to the top of the casting; it effectively keeps out the slag,✓ and for casting liners the inlets are placed such that the metal falls exactly between the mould and the core.✓



A3 POP GATES OR PENCIL GATES

✓✓✓ (6)
[20]

QUESTION 4

4.1
- Electromagnet to pick up the scrap
- Hand loading (2)

4.2 The charge is contained within a refractory lining,✓ which in turn is surrounded by the furnace coil.✓ The coil is water-cooled✓ to protect it from damage✓ due to heat generated by its own losses✓ and also conducted through the lining from the charge. The whole is supported by another shell which is carried✓ on trunnions so that the whole furnace may be tilted to empty out the molten charge.✓
Ferrous and non-ferrous metals✓ (8)

4.3 Spectroscope✓
The advantage is the speed✓ at which the analysis✓ can be given.✓ (4)

4.4 Soda ash as a flux (2)

4.5 Ladles are used to transport hot metal to moulds for casting. (2)

4.6
- Bottom pour
- Lip pour (2)
[20]

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QUESTION 5

5.1

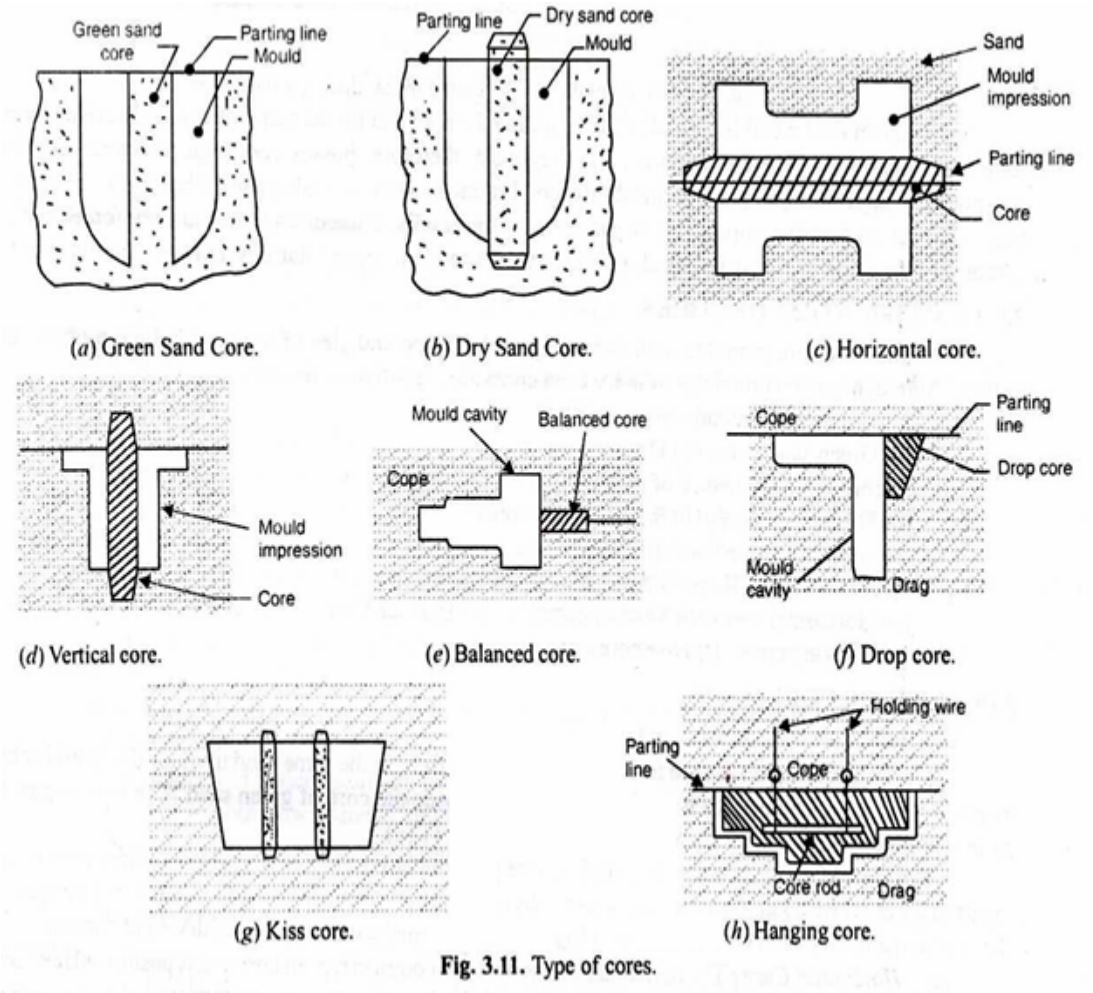


Fig. 3.11. Type of cores.

(Any 3 × 2) (6)

5.2 Small, straight cores have a vent wire✓ pushed through them, entering at one core print and coming out at the other,✓ or vent wires may be rammed up in the sand and pulled out to leave passages.✓
Wax vents, a wick soaked in wax,✓ are placed in the centre of cores shaped like the letter S, V, U, etc.,✓ as one could not be certain that passages made by pushing in straight wires✓ would be connected. The wax soaks into the sand during baking and leaves a hole,✓ vent, or chimney, through the centre of the core. Nylon venting material is now more widely used than✓ wax vents as it leaves no residue.✓ The centres of medium and large cores are filled with ash or clinker✓ which permit the core gases to escape, assist the core to contract✓ when the casting is cooling, and allow the core sand to be more easily cleaned out after casting.✓ (12)

5.3 Vent holes are necessary to allow hot gases created✓ during casting to pass freely to the core prints and through the mould to the atmosphere.✓ (2)

[20]

TOTAL: 100

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