



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE  
NOVEMBER EXAMINATION  
BUILDING SCIENCE N1**

**24 NOVEMBER 2016**

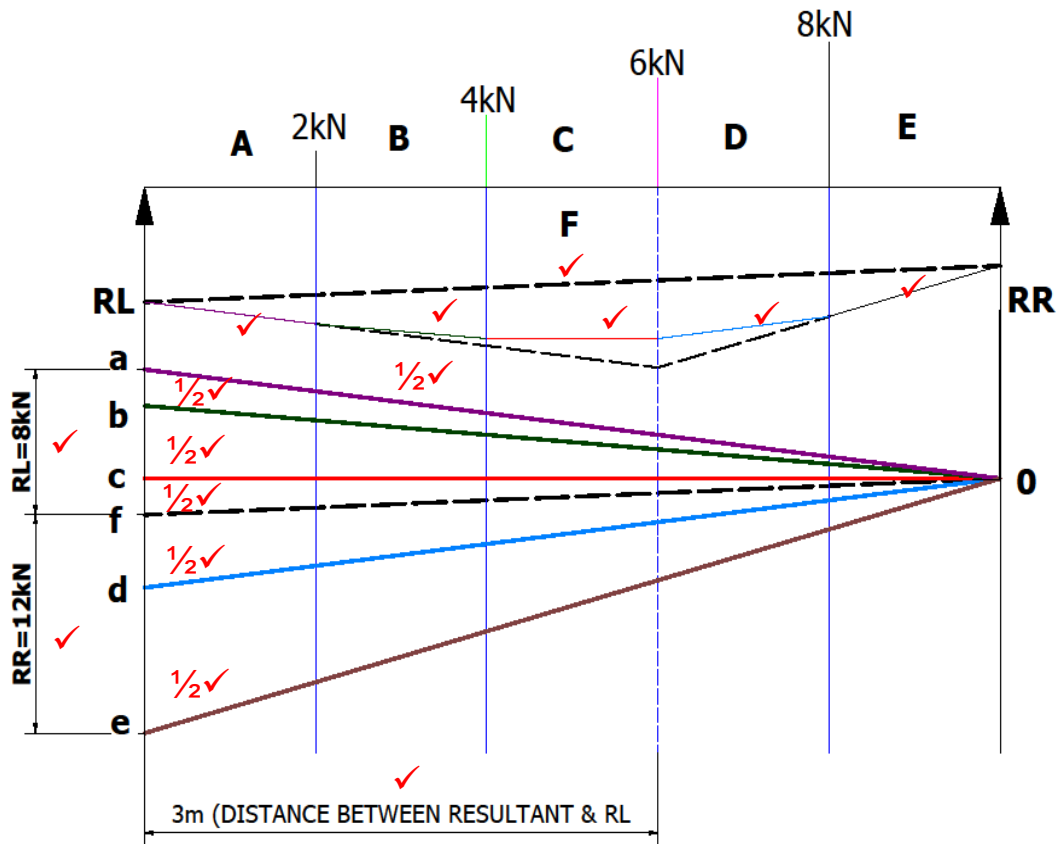
**This marking guideline consists of 7 pages.**

**QUESTION 1**

- 1.1
- Quality of materials
  - Grading of the aggregates
  - Water-cement ratio
  - Mix proportions
  - Method of mixing
  - Method of compacting
  - Curing
- (7 x 1) (7)
- 1.2
- 1.2.1 Water-cement ratio is the proportion of the mass of water to the mass of cement used in a concrete mix.  
It is defined as the proportion of the volume of water to the volume of cement used in a concrete mix. (Any 1 x 3) (3)
- 1.2.2 Coarse aggregates are defined as the material which is retained when the aggregate passes through a 4,8 mm square sieve. (2)
- 1.2.3 Fine aggregates are defined as the aggregate which passes through a 4,8 mm square sieve. (2)
- 1.3 Water : Cement Ratio = Mass of water/Mass of Cement  
∴ Mass of Cement = Mass of water/Water : Cement Ratio  
= 200/0,5  
= 400 kg (4)
- [18]**

QUESTION 2

2.1



RL = 8 kN and RR = 12 kN

(13 Marks for force polygon and polar diagram only.) (13)

2.2 The distance between RL and the resultant force = 3 m

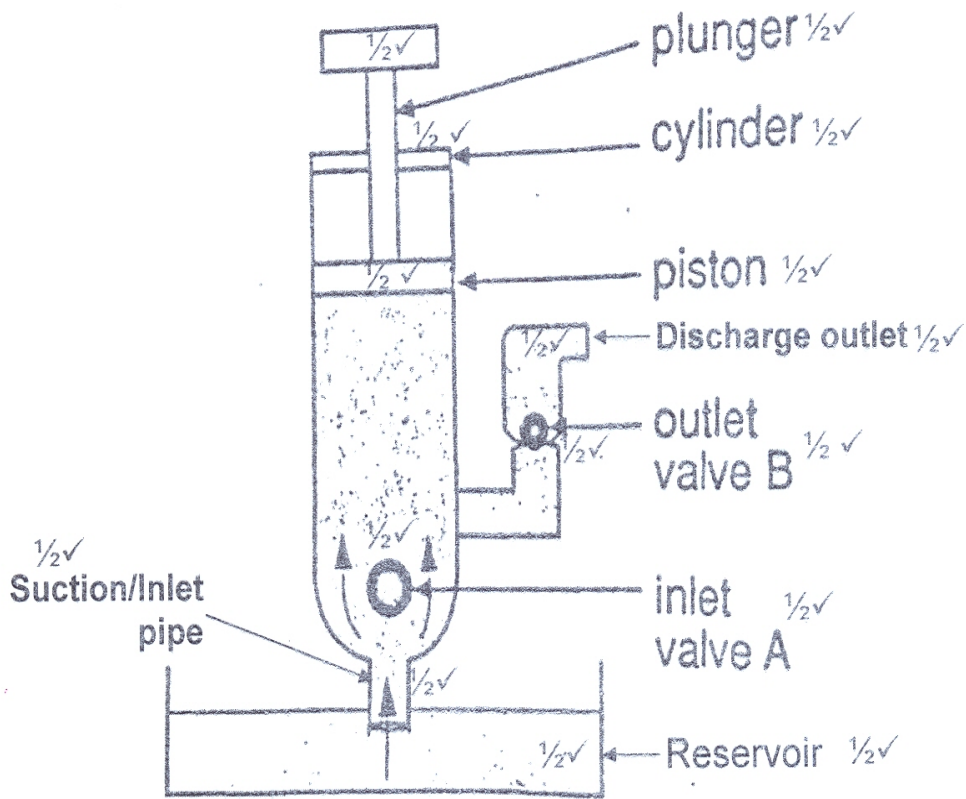
(Second mark for indicating the distance on the diagram) (2)  
[15]

**QUESTION 3**

- 3.1 Materials such as brick and wood absorb moisture✓ by capillary action✓ causing water/dampness/moisture✓ to rise from the ground around them.✓ The absorbed moisture causes damage to finishes✓ such as paint stains, flacking of plaster, decaying (rotting) of timber which leads to respiratory infections and structural failure.✓ An impervious (impenetrable)✓ material is therefore required to keep dampness ( rising damp, rain falling on top of walls and rain against side of walls) outside and below ground level.✓  
(Mark any other technically correct response)(5 x 2) (10)
- 3.2
- Asphalt
  - Slate
  - Dense brick
  - Polythene
  - Copper and lead plates
  - Bitumen
- (Any 5 × 1) (5)
- 3.3 A slump test is a test carried out to determine the workability of a fresh concrete mix. (2)
- 3.4 Minimum slump = 25 mm; Maximum slump = 76 mm (4)
- 3.5
- It should deflect direct sunrays of the sun.
  - Keep out rain.
  - Allow for free circulation of air.
- (3)  
**[24]**

**QUESTION 4**

4.1



(10)

4.2 4.2.1 Boyle's law states that if the temperature of a gas is constant, the volume of a gas is inversely proportional to its pressure.

4.2.2 Charles' law states that the volume of a gas is directly proportional to its absolute temperature if the pressure is kept constant

(2 × 1) (2)

4.3 4.3.1 Relative Density = Density of material/Density of water  
 But Density of material = Relative Density × Density of water 1/2 ✓  
 $= 4,65 \times 1\,000 \text{ kg/m}^3$  1/2 ✓  
 $= 4\,650 \text{ kg/m}^3$  ✓

4.3.2 Mass of object = Density of Material × Volume 1/2 ✓  
 $= 4\,650 \times 1 \times 0,8 \times 0,35$  1/2 ✓  
 $= 1\,302 \text{ kg}$  ✓

(2 × 2) (4)

- 4.4
- Mass
  - Pressure
  - Volume
  - Temperature

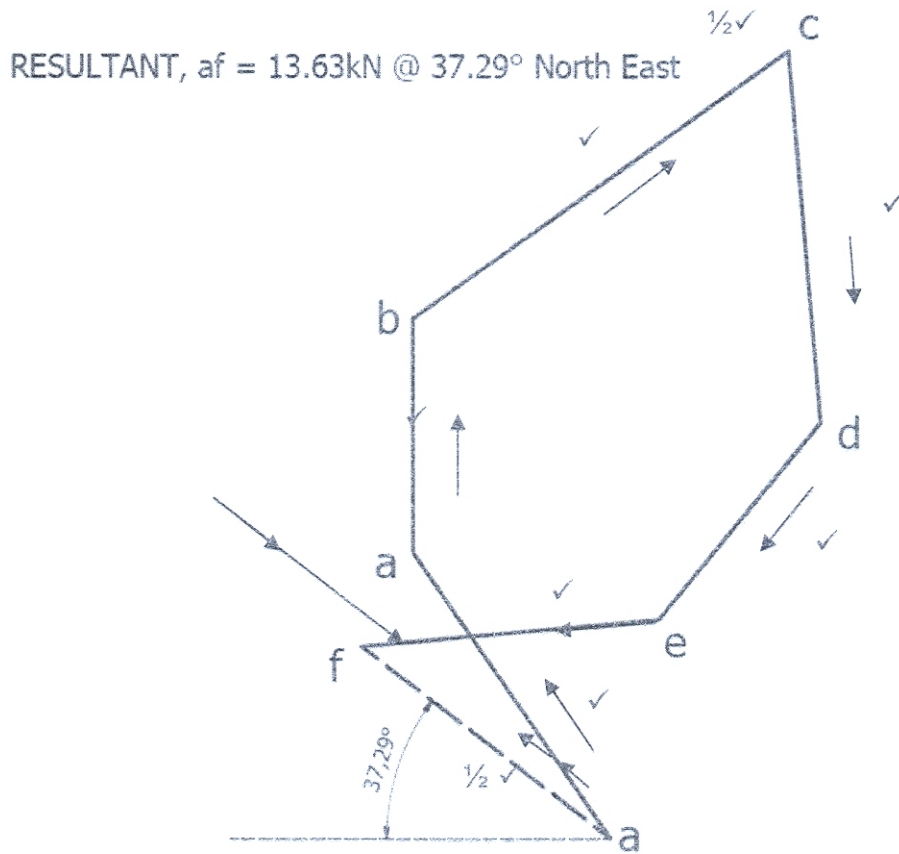
(4 × 1) (4)

**[20]**

**QUESTION 5**

5.1 An equilibrant is defined as the force applied in the opposite direction that brings a body that is in motion to a state of rest. (1)

5.2



(9)  
[10]

**QUESTION 6**

6.1 % Porosity = [(Bulk Volume – Solid Volume)/Bulk Volume] × 100%✓

But, Bulk Volume = (L)(b)(h)✓  
 = (22)(11)(7,5)✓  
 = 1 815 cm<sup>3</sup>✓  
 Solid volume = 1 350 cm<sup>3</sup>

Substituting value in the formulae

% Porosity = [(1 815 – 1 350)/(1 815)] × 100%✓  
 = 25,62%✓

(6)

6.2 Solid Density = Mass/Solid Volume

= 2 500/1 815✓  
 = 1,35 g/cm<sup>3</sup>✓

(2)

6.3 Apparatus

- Measuring flask
- Water

Procedure

Measure and record the mass of the empty flask.✓

Pour a known volume of water into the flask.✓

Measure and record the mass of the measuring flask filled with water.✓

Subtract the mass of the empty measuring flask from the combined mass of measuring flask and water.✓

Calculate the density. ½✓

Density = (Combined Mass Flask & Water – Mass of Empty Flask)/Volume of Water. ½✓

(5)

**[13]****TOTAL: 100**