



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2015

CIVIL TECHNOLOGY
MARKING GUIDELINES

Time: 3 hours

200 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

QUESTION 1**1.1 MULTIPLE CHOICE**

- 1.1.1 C
- 1.1.2 A
- 1.1.3 D
- 1.1.4 A
- 1.1.5 B (5)

1.2 Safety with portable power tools

- 1.2.1 Cable is out of the way.
Do not adjust tool while in motion.
Work must be secure.
Check there are no impediments on the cutting line.
Check the wood for nails or loose knots.
Wear safety glasses.
Any ONE or ANY other acceptable answer (1)

- 1.2.2 Wear safety glasses and gloves.
Work must be secure.
Use the correct disc for the work to be done.
Check the disc for cracks and notches.
Do not touch freshly grinded surfaces.
Use both hands on the grinder.
Electrical cable is out of the way.
Any ONE or ANY other acceptable answer (1)

- 1.2.3 Make sure the drill bit is secure.
Make sure that the work is secure.
Do not place excessive force on the drill bit.
Make sure the cable is out of the way.
Concentrate on the point of the drill.
Keep the machine steady at all times.
Any ONE or ANY other acceptable answer (1)

1.3 ROOF trusses

- 1.3.1 A – Lean-to roof
Carports
Max span of 5 m
Smaller roofs
Lapas and smaller extension rooms on existing wall
Any ONE or ANY other acceptable answer (2)

- B – SA truss/Howe truss
Houses
Small dwellings
Max span 7 m
Any ONE or ANY other acceptable answer (2)

1.3.2 Nuts and bolts

Fishplate

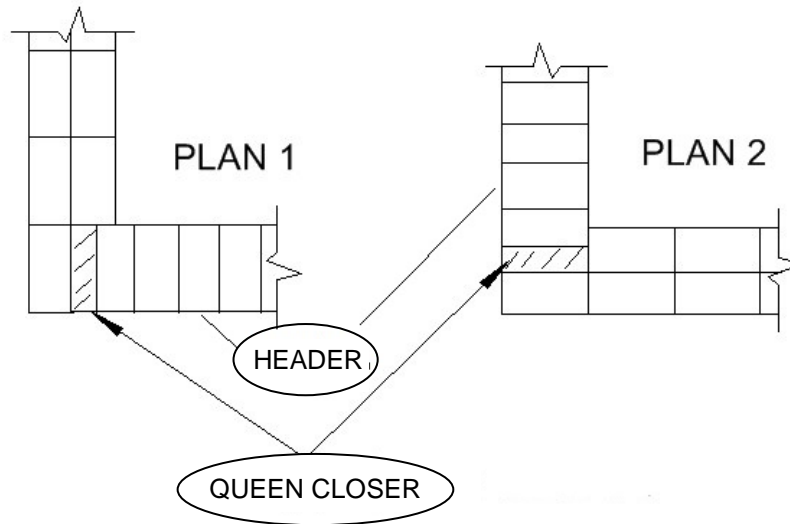
Gang nail

Connector plate

Any ONE or ANY other acceptable answer

(1)

1.4 English bond plan view



Correctness of plan 4 (2 marks each plan view)

Labels 2 marks

Proportion 2 marks

(8)

1.5 Terminology:

1.5.1 Compaction: Removing air (void) from concrete and ensuring greater density. (1)

1.5.2 Seasoning of timber: Drying timber to similar moisture as environment. (1)

1.5.3 Priming of metal: Placing of undercoat to prevent rust. (1)

1.6 One use of an angle iron:

Steel roof trusses

Bracing

Structure reinforcement

Any ONE or ANY other acceptable answer

(1)

1.7 CLADDING:

1.7.1 Placement of material over an existing wall (1)

1.7.2 Material used for CLADDING:

Glass

Metal

Wood

Rhino board

Any ONE or ANY other acceptable answer

(1)

1.8 Construction process:

1.8.1 Plate or tile to cover opening on apex/top of roof (1)

1.8.2 Rest rafter on wall plate to distribute the force of trusses (1)

1.8.3 Horizontal beam over windows or door opening to distribute force over the span (1)

[30]

QUESTION 2

2.1 CARE of power tools

Clean and service them regularly.
Pack them away after use.
Check the blades are sharp and electrical cords are secure.
Oil the moving parts.
Use a specific tool for a specific job.

Any THREE or other acceptable answers (3)

2.2 Metal used in reinforcing

1 – Twisted rib bar
2 – Ribbed bar
3 – Round bar

(3)

2.3 Pile foundations

2.3.1 A – Driven piling
Non-load-bearing soil over firmer pile
Soil Marsh
Any ONE or other acceptable answer

(2)

2.3.2 B – Bored pile or Auger pile
Clay ground
Stable soil
Any ONE or other acceptable answer

(2)

2.4 Formwork

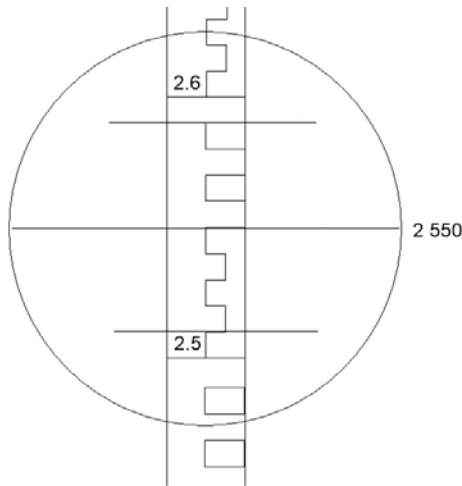
2.4.1 1 – Shuttering
2 – Joist
3 – Head tree/Bearer
4 – Fishplate/Gang-Nail/Connector plate
5 – Upright/Prop
6 – Soleplate/Baseplate/Footplate

(6)

2.4.2 **ANSWER BOOKLET** (6)

2.5 Dumpy level

2.5.1



OR any other acceptable drawing

(4)

2.5.2 $2\ 350 - 1\ 850 = 500\ \text{mm}$ **OR** 0,5 m
Rise B to C

(3)

2.6 Concrete tests

2.6.1 To check if the water content is correct
To check if ingredients are mixed properly
To check consistency of the batches
Any ONE or other acceptable answer

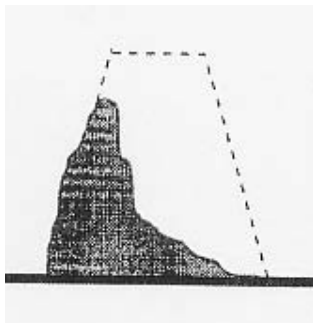
(1)

2.6.2 Truncated cone
Cone
Mould
Open cone
Any ONE answer

(1)

2.6.3 Shear slump – the sand, stone and water are not correctly mixed.

(1)



Drawing of correct slump

(2)

2.7 SCAFFOLD:**2.7.1 Pipe scaffold**

Trestles scaffold

Putlog scaffold

Independent scaffold

Any TWO or other acceptable answers**(2)****2.7.2 Pipe scaffold – used in projects that bear lighter loads**

Trestles scaffold – used to support working platforms of low height

Putlog scaffold – used in high-rise buildings

Independent scaffold – similar to putlog scaffold but independent scaffold is free-standing scaffold

(2)**2.8 Advantages of using dry walls:**

They are adaptable and can be erected in difficult places

It is a dry process

Less storage area for material is needed

They weigh less

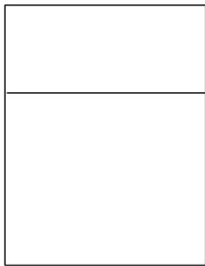
They are slightly cheaper

Any TWO or other acceptable answers**(2)****[40]**

QUESTION 3

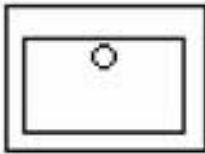
- 3.1 Column A and B
- 3.1.1 D
 - 3.1.2 E
 - 3.1.3 G
 - 3.1.4 F
 - 3.1.5 C (5)
- 3.2 Colour-coding
- 3.2.1 Soil – Brown (1)
 - 3.2.2 Industrial waste – Orange (1)
 - 3.2.3 Waste pipes – Green (1)
- 3.3 **ANSWER BOOKLET** (8)
- 3.4 House section
- 3.4.1 1 – Ventilation pipe
2 – Rodding eye
3 – Drain pipe/Sewage pipe
4 – Gully/gully cover (4)
 - 3.4.2 Dia = 110 mm (1)
 - 3.4.3 Dia = 32 mm
44 mm
50 mm
Any ONE of the above (1)
 - 3.4.4 Abbreviation
6 – S
7 – B
8 – WC (3)

3.4.5 Plan view 8

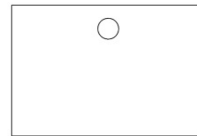


(1)

3.4.6 Plan view 9



OR



(1)

3.4.7 Principles for a drainage system:

- Minimum depth is 600 mm.
 - Drains must be watertight.
 - Inside it must be clean and free from loose objects.
 - It should be laid at a constant gradient.
 - It must be in a straight line.
 - At a direction change, there must be an inspection hole.
 - A manhole comes where several pipes meet.
 - The drain under the building is encased in concrete.
 - Junctions must not exceed 90 degrees.
 - Traps are placed at the inlet of drains.
 - All gullies, rodding eyes must be encased in concrete.
- ANY TWO or any other acceptable answer**

(2)

3.4.8 Ball test

(1)

[30]

QUESTION 4

4.1. Joining

4.1.1 Wall ties/Roof anchor/Wall anchor (1)

4.1.2 Fisher plug, wall anchor, Rawl bolts (1)

4.1.3 PVC glue (1)

4.1.4 Wire nail/screw (1)

4.1.5 Ceiling screw/Jetting (1)

Any ONE or any other acceptable answer

4.2 Four-panel door – Cutting list

4.2.1 Stile (1)

4.2.2 100 mm (1)

4.2.3 1 (1)

4.2.4 100 mm (1)

4.2.5 45 mm (1)

4.2.6 2 (1)

4.2.7 22 mm (1)

4.3 **ANSWER BOOKLET** (18)
[30]

QUESTION 5

5.1 Centroid

$$\begin{aligned} \text{Tri} &= 45 \times 25 = 1\,125 \text{ mm}^2 \\ \text{Sq1} &= 50 \times 50 = 2\,500 \text{ mm}^2 \\ \text{Rectangle} &= 20 \times 30 = 600 \text{ mm}^2 \\ \text{Rectangle} &= 10 \times 30 = 300 \text{ mm}^2 \end{aligned}$$

$$\text{Total} = 4\,525 \text{ mm}^2$$

$$\begin{aligned} 4\,525 \times \alpha &= (300 \times 5) + (600 \times 15) + (2\,500 \times 25) + (1\,125 \times 65) \\ &= 1\,500 + 9\,000 + 62\,500 + 73\,125 \\ &= 146\,125 / 4\,525 \\ &= 32,29 \text{ mm} \end{aligned}$$

OR

$$\begin{aligned} Y &= \frac{\Sigma Ay}{\Sigma A} \\ &= \frac{(50 \times 50 \times 25) + (50 \times 10 \times 5) + (20 \times 20 \times 20) + [\frac{1}{2} \times 50 \times 45 \times (\frac{1}{3} \times 50 \times 45)]}{(50 \times 50) + (50 \times 10) + (20 \times 20) + (\frac{1}{2} \times 50 \times 45)} \\ &= \frac{14\,625}{4\,525} \\ &= 32,29 \text{ mm} \end{aligned}$$

Any ONE or any other acceptable method (8)

5.2 Beam calculation

5.2.1 Moments about Q.

$$\begin{aligned} P \times 10 &= (35 \times 2) + (30 \times 5) + (50 \times 8) \\ &= 70 + 150 + 400 \\ &= 620 / 10 \\ &= 62 \text{ kN} \end{aligned} \tag{2}$$

Moments about P.

$$\begin{aligned} Q \times 10 &= (50 \times 2) + (30 \times 5) + (35 \times 8) \\ &= 100 + 150 + 280 \\ &= 530 / 10 \\ &= 53 \text{ kN} \end{aligned} \tag{2}$$

5.2.2 Bending moments

$$\text{BMb} = 62 \times 2 = 124 \text{ kN/m} \tag{2}$$

$$\begin{aligned} \text{BMc} &= 62 \times 8 - [(30 \times 3) + (50 \times 6)] \\ &= 496 - [90 + 300] \\ &= 496 - 390 \\ &= 106 \text{ kN/m} \end{aligned} \tag{4}$$

5.2.3 Shear force

$$SF_b^- = 62 - 50 = 12 \text{ kN} \quad (1)$$

$$SF_c^- = 62 - 50 - 30 - 35 = -53 \text{ kN} \quad \text{OR} \quad (1)$$
$$= 12 - 30 - 35 = -53 \text{ kN}$$

5.3 **ANSWER BOOKLET** (10)
[30]

QUESTION 6

6.1 and 6.2 **ANSWER BOOKLET** [40]

Total: 200 marks