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SENIOR CERTIFICATE EXAMINATION/ NATIONAL SENIOR CERTIFICATE EXAMINATION

CIVIL TECHNOLOGY: CONSTRUCTION

2019

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 19 pages.

**QUESTION 1: OHS&A, SAFETY, MATERIALS, TOOLS, EQUIPMENT AND JOINING
(GENERIC)**

- 1.1 1.1.1 G ✓ (1)
- 1.1.2 E ✓ (1)
- 1.1.3 A ✓ (1)
- 1.1.4 C ✓ (1)
- 1.1.5 D ✓ (1)
- 1.2 • When heavy materials/loads are not lifted/lowered/handled correctly. ✓
 • Wrong posture when lifting materials.
 • Not using safety apparel.
ANY ONE OF THE ABOVE (1)
- 1.3 ✓ ✓
 1 : 4 **OR** 76° (2)
- 1.4 • A qualified person must operate the device. ✓
 • The device must never be overloaded. ✓
 • The gates and wire components of the lift of the hoisting device must be
 at least 1 980 mm high.
 • The gates must be shut when the device is being used.
 • Emergency brake mechanisms must be installed.
 • Safety measures must be displayed inside the cage.
 • Inspections and maintenance work should be carried out regularly
 (at least six-monthly) by qualified persons.
 • Overhead protection must be provided to protect workers from falling
 objects.
 • When material or equipment is being hoisted, it must be stacked firmly
 and correctly, and secured properly.
 • The hoist must be inspected weekly by a qualified person.
ANY TWO OF THE ABOVE (2)
- 1.5.1 A = Laser level ✓
 B = Dumpy level ✓ (2)

1.5.2	Laser level (A)	Dumpy level (B)
	<p>To determine levels when:</p> <ul style="list-style-type: none"> • installing ceilings and floor tiles. ✓ • installing chair rails for example in a dining room. • installing receptacles for power inside a building during construction. • hanging pictures. • excavating for new buildings. • aligning and levelling floors. • when installing doors and windows. • aligning shelves and cabinets. • levelling post and beams on decks, fences and porches. • setting out buildings on a site. • aligning fences, post and decks. • determining gradient/slope for drainage and irrigation. • establishing contours for farming or drainage. <p>• To determine levels and slopes when installing sewer pipes.</p>	<p>The dumpy level is used when:</p> <ul style="list-style-type: none"> • determining differences between levels and vertical heights, especially over longer distances. ✓ • determining levels and slopes. • setting out buildings. • transferring levels and heights. • determining/measuring the distances between two points.

ANY ONE IN EACH COLUMN ABOVE

(2)

1.6 1.6.1 Rawl bolt ✓

(1)

- 1.6.2
- A** – Drill a hole of the required diameter and depth. ✓
 - B** – Remove debris and thoroughly clean the hole with a brush or by blowing into it. ✓
 - C** – Remove the bolt and washer, insert the sleeve/shield into the hole and align the fixture (for example base plate, etc...) with the hole. ✓
 - D** – Insert the bolt with washer through the fixture and tighten to the recommended torque. ✓

(4)

- 1.6.3 Rawl bolts:
- are stronger fasteners than a screw with a plastic plug. ✓
 - are designed to resist pull-out failure.
 - have excellent mechanical properties such as tensile and yield stress.
 - have excellent carrying capacity.
 - have excellent tolerance to variance in the hole size.

ANY ONE OF THE ABOVE

(1)

[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)**ANSWER SHEET 2**

NO.	QUESTIONS	ANSWERS	MARKS
1	Identify the elevation shown in FIGURE A.	Eastern/East elevation/East ✓	1
2	Name the scale of FIGURE B.	1 : 100 ✓	1
3	Identify number 1.	Barge board ✓	1
4	Identify number 2.	Roof overhang/Eave/Open eave ✓	1
5	Recommend a suitable finish for number 3.	Plaster/Paint/Face brick/Tiles/ Cladding ✓	1
6	What is indicated by number 4?	Door/Entrance door/Door opening ✓	1
7	Identify the drawing symbol indicated by number 5.	Finished floor level/FFL ✓	1
8	Identify the drawing symbol indicated by number 6.	Natural ground level/NGL ✓	1
9	What is indicated by number 7?	Step ✓	1
10	Give the date on which the building plan was printed.	2019/06/16 ✓	1
11	Who checked the building plan?	P Blade ✓	1
12	Name the electrical drawing symbol in the column for the notes in FIGURE 2 that must be placed at a staircase.	Two-way switch ✓	1
13	Name the electrical feature in the column for the notes in FIGURE 2 that must be placed at the entrance door of the house.	Wall light ✓	1

**DO NOT MARK
THESE QUESTIONS**

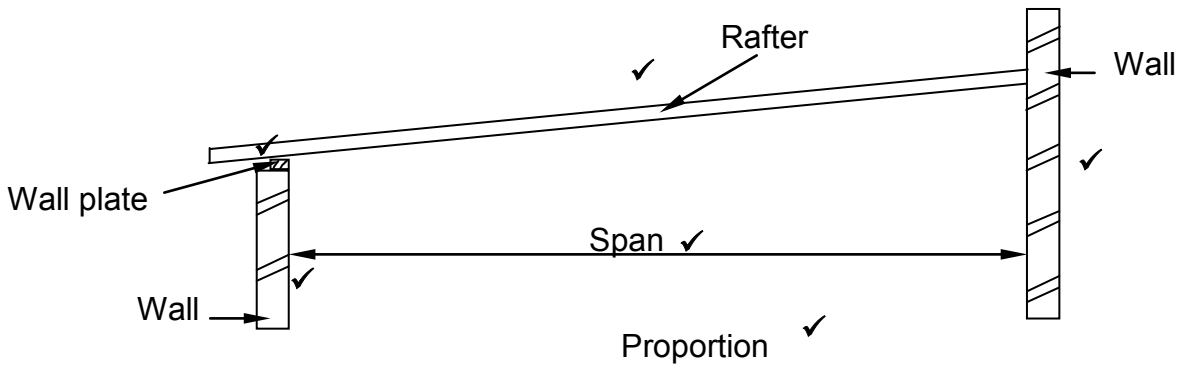
14	Identify the type of roof that is used on the building in FIGURE A.	Gable roof ✓	1
15	Explain the purpose of number 1.	To cover ends of purlins/battens/fixed to the purlins/battens for a neat appearance. To finish of the gable end of the roof. ✓	1
16	Who is the owner of this house?	Mr H Smith ✓	1
17	In which street is the proposed dwelling situated?	Jupiter street ✓	1
18	Identify number 8.	Rainwater down pipe/Downpipe ✓	1
19	What is the sanitary fitting indicated by number 9 used for?	To wash your face/Body ✓ Brush your teeth Wash your hands Washing/Rinsing	1
20	Recommend an alternative sanitary fitting to replace number 10 that will serve a similar purpose.	Bath ✓	1
21	Explain the purpose of number 11 as indicated on the staircase.	Landing to serve as resting place or change of direction of staircase. ✓	1
22	What is indicated by number 13?	Emergency light/External light Thickness of wall/110 mm ✓	1
23	What is indicated by number 15?	North- symbol/direction/point ✓	1
24	Deduce the height of window 1 from the window schedule.	1,8 m or 1 800 mm ✓	1
25	Deduce the width of window 2 from the window schedule.	2,4 m or 2 400 mm ✓	1
26	Name the elevations of the building on which the staircase is situated.	Western/West elevation/West ✓ Southern/South elevation/South ✓	2

27	Differentiate between the electrical symbols indicated by numbers 12 and 14.	12 – One way light switch single pole/ lever ✓ 14 – One way light switch double pole/ lever ✓	2
28	Recommend a suitable floor covering for the lounge.	Tiles/Novilon/Carpets/Laminated flooring/Wooden flooring. ✓	1
29	Calculate the area of the lounge in m ² . Show ALL calculations.	6 m ✓ x 3 m ✓ = 18 m ² ✓ OR 6 000 mm x 3 000 mm = 18 m ²	3
30	Calculate the perimeter of the building. Show ALL calculations.	(220 + 3 000 + 110 + 3 000 + 220) ✓ x 2 ✓ = 6 550 x 2 = 13 100 mm ✓ (220 + 6 000 + 220) ✓ x 2 ✓ = 6 440 x 2 = 12 880 mm ✓ 13 100 + 12 880 = 25 980 mm ✓ OR = 25,98 m	7
		TOTAL:	40

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

- 3.1 17° ✓ (1)
- 3.2 76 mm ✓ x 50 mm ✓ **OR** 76 mm x 76 mm (2)
- 3.3 650 mm ✓ (1)
- 3.4 Tilting batten/Foot batten ✓ (1)
- 3.5 **A** - King post ✓
B - Rafter ✓
C - Strut ✓
D - Queen post ✓
E - Tie beam ✓ (5)
- 3.6

Any TWO labels ✓✓



IF A LINE DIAGRAM IS DRAWN MINUS ONE MARK FOR PROPORTION

ASSESSMENT CRITERIA	MARK
Span	1
Walls	2
Wall plate	1
Rafter	1
Any TWO labels	2
Proportion	1
TOTAL:	8

(8)

- 3.7
 - At least 300 mm to 600 mm for concrete tile. ✓
 - The galvanised strap should be embedded above the lintel and the last course of bricks at wall plate level.
 - At least four brick courses.**ANY ONE OF THE ABOVE** (1)

- | | | | |
|------|-------|---|--------------------|
| 3.8 | 3.8.1 | Nosing ✓ | (1) |
| | 3.8.2 | Apron ✓ | (1) |
| | 3.8.3 | Pitch board ✓ | (1) |
| | 3.8.4 | Stairwell ✓ | (1) |
| | 3.8.5 | Handrail ✓ | (1) |
| 3.9 | 38° ✓ | | (1) |
| 3.10 | | <ul style="list-style-type: none">• Long steel bolts are placed into holes of a loose template base plate, which is placed into the wet concrete. ✓• Allow the concrete to dry. ✓• Weld the base plate to the column/drill holes in the base plate/Fit prefabricated column over bolts and fasten. ✓• Place the column with a steel foot plate with holes in over the bolts after the concrete has dried. ✓• The column is then bolted firmly into the concrete base. ✓ | (5)
[30] |

QUESTION 4: EXCAVATIONS, FORMWORK, TOOLS AND EQUIPMENT AND MATERIALS (SPECIFIC)

- 4.1 4.1.1
- Very strong ✓
 - Very tough ✓
 - Easy to cast into shapes
 - Durability/Long lasting/Sturdy
 - Good tensile and yield strength
 - Good thermal conductivity
 - Resistance against corrosion if protected (painted, oxide)
 - Ductile
 - Easy to weld
 - Heavy/High density
- ANY TWO OF THE ABOVE** (2)
- 4.1.2
- Very soft metal ✓
 - Malleable – can be stretched in any direction ✓
 - Heavy/High density
 - Corrosion-proof
 - Low melting point
 - Blue-grey metal
 - Highly toxic
 - Ductile
 - Durability/Long lasting
 - Easy to cut
- ANY TWO OF THE ABOVE** (2)
- 4.2 Purpose of the cube test:
- To determine the maximum compressive strength of cured concrete when load is applied. ✓
 - To ensure that the concrete complies with the requirements of the project specifications. ✓
 - To indicate the compressive strength (measured in MPa or N/m²), thus its ability to resist loads.
- ANY TWO OF THE ABOVE** (2)
- 4.3 4.3.1 Safety factors to be considered before excavations:
- Ensure that a competent person evaluates the stability of the ground. ✓
 - Draw up a safety plan. ✓
 - Take sufficient steps to ensure safe working conditions. ✓
 - Ensure that any planned trench or excavation will be supported by a protective system (formwork or shoring).
 - Eliminate as many hazards and risks as possible (e.g. risk of a person being buried or trapped by collapsing or dislodgement of material)
 - Erect fencing at least one metre high around the perimeter of the excavation site.

- Ensure that all excavations take place under the supervision of a qualified person whose appointment has been confirmed in writing.
- Carry out inspections to determine whether there are electric cables, water pipes, gas lines or any other service pipes in the area to be excavated, since this may affect the excavation process.

ANY THREE OF THE ABOVE

(3)

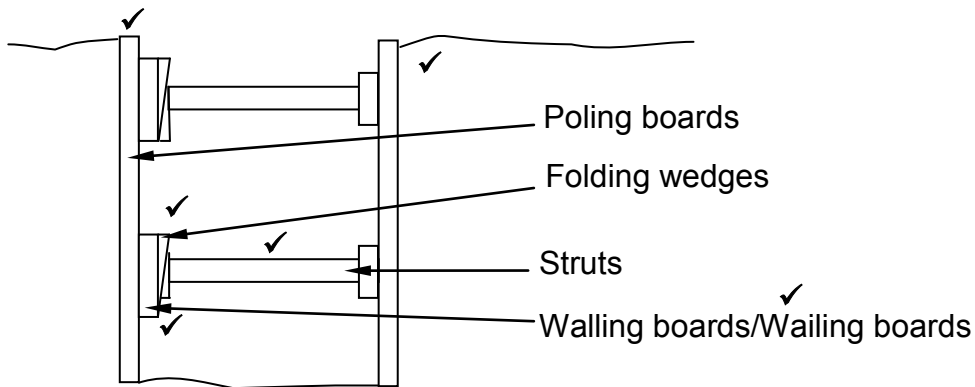
4.3.2 Factors than can cause excavations to collapse:

- Heavy rains ✓
- Poor soil strata, structure of composition. ✓
- Sides not dug at the correct angle. ✓
- Incorrect use of formwork or shoring to support the walls.
- Vibration by machinery or heavy vehicles nearby.
- Human traffic close to excavations.
- Water seeping into the excavated area.
- Contact with underground service.
- Access to and exit from the excavation.
- Soil slides due to cracks or loose soil.
- Natural causes

ANY THREE OF THE ABOVE

(3)

4.4



Shuttering correctly drawn ✓

Proportion ✓

ASSESSMENT CRITERIA	MARK
Folding wedge	1
Walling boards/Wailing boards	1
Poling boards	2
Struts	1
Shuttering correctly drawn	1
Any ONE label	1
Proportion	1
TOTAL:	8

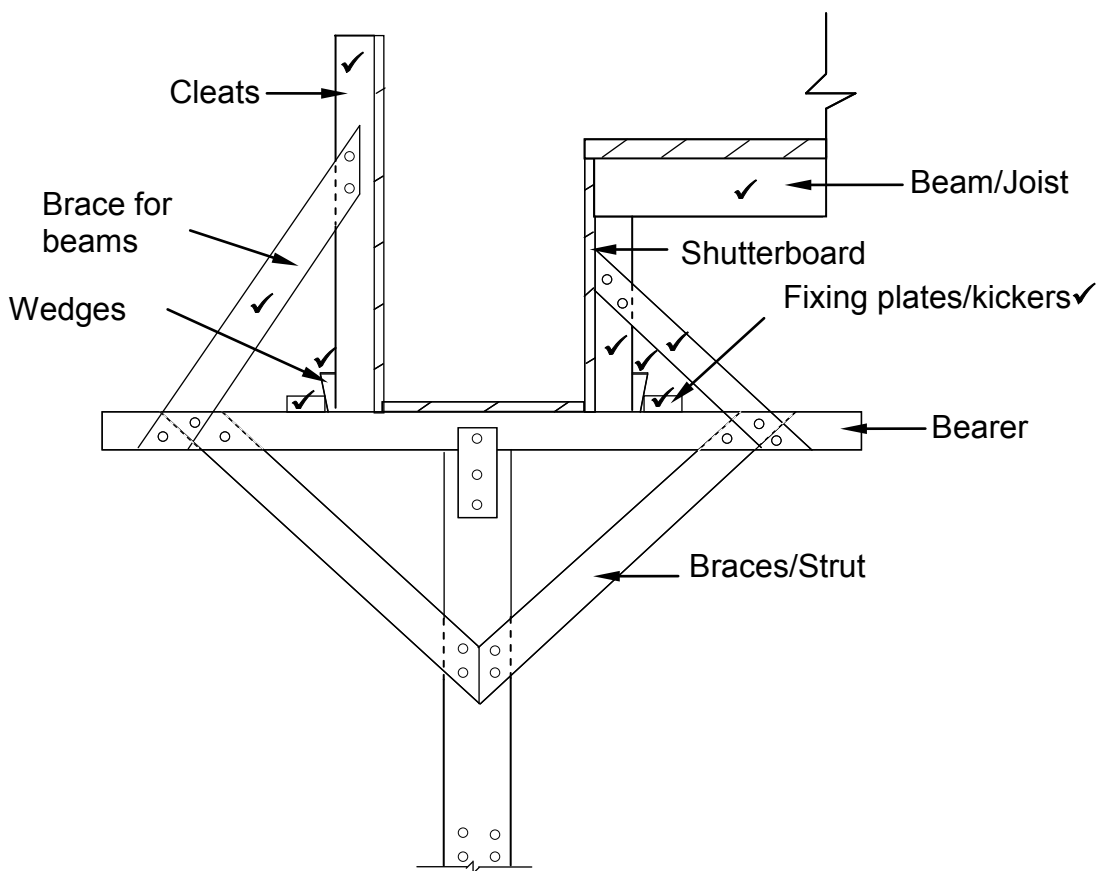
(8)

- 4.5
- The shape of folding wedges simplifies the erecting and dismantling of formwork. ✓
 - Folding wedges ease the removal/striking of formwork by knocking one away from the other.
 - Folding wedges help to keep formwork components sturdy and secured.
 - Folding wedges play an important role in the levelling of formwork for beams, floor slabs and columns.
 - Folding wedges are used as pins to strengthen adjoining concrete formwork.
 - Folding wedges are used to raise or lower the formwork to the required height.

ANY ONE OF THE ABOVE

(1)

4.6



ASSESSMENT CRITERIA	MARK
Bearer/Joist for the soffit	1
Cleats	2
Braces for beams/struts	2
Fixing plates/Kickers	2
Wedges	2
Any ONE label	1
Proportion	1
TOTAL:	11

Proportion ✓

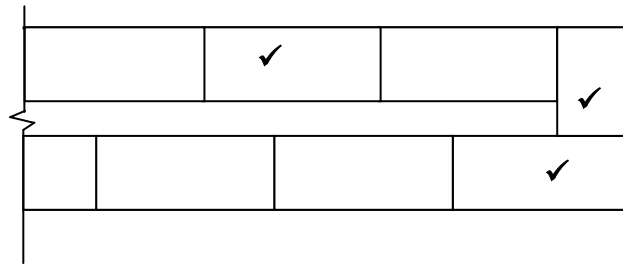
(11)

- 4.7 4.7.1 Safety precautions when using a plate compactor:
- Operate with care. ✓
 - Wear gloves and boots etc. as personal protective equipment. ✓
 - Do not place your hands or feet near the moving parts.
 - Check the controls for proper response before use.
 - Check for wear and damaged parts before use.
 - Never use a defective/faulty machine.
 - Avoid making any adjustments while the machine is vibrating.
 - Use both hands to operate the machine.
 - Ensure a firm and well balanced stance.
 - Work from side to side to achieve the best, even surface.
 - Wet the soil slightly to make it easier to compact.
- ANY TWO OF THE ABOVE** (2)
- 4.7.2 Care of a plate compactor:
- Maintain like all machinery – lubricate and adjust according to the manufacturers, instruction. ✓
 - Clean after use.
 - Store in a safe dry place/allocated place.
 - Service the plate compactor regularly.
 - Remove loose dust and soil after use.
 - Ensure that all parts are firmly attached.
 - Repair or replace damaged electric cords/parts.
- ANY ONE OF THE ABOVE** (1)
- 4.8 4.8.1 Concrete mixer (electric) ✓ (1)
- 4.8.2 Care of a concrete mixer:
- Only use parts as recommended by the manufacturer. ✓
 - Maintain like all machinery – lubricate and adjust according to the manufacturers, instruction. ✓
 - Rinse with water.
 - Clean after use.
 - Wash of any concrete residue of the body of the mixer.
 - Do not allow the water to remain inside the drum.
 - Oil the inside of the drum when stored for a long time.
 - Keep bearings, bushes and gears lubricated.
 - Replace worn parts, especially in the drum.
 - Maintain electric or internal combustion engines according to the manufacturer's instructions.
 - Store in a dry place.
 - Service the concrete mixer regularly.
 - Repair or replace damaged electric cords.
- ANY TWO OF THE ABOVE** (2)
- 4.9
- Boom pump ✓
 - Line pump ✓
- (2)
[40]

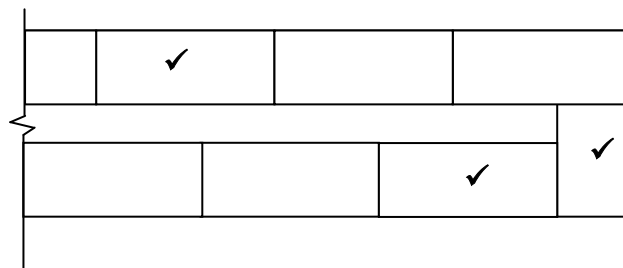
QUESTION 5: PLASTER AND SCREED, BRICKWORK AND GRAPHICS AS MEANS OF COMMUNICATION (SPECIFIC)

- 5.1 5.1.1 F ✓ (1)
- 5.1.2 D ✓ (1)
- 5.1.3 A ✓ (1)
- 5.1.4 B ✓ (1)
- 5.1.5 C ✓ (1)
- 5.2 Three wheelbarrows/2½ wheelbarrows ✓ (1)
- 5.3
 - Pavements ✓
 - Patios ✓
 - Town centres/Schools/Stadiums etc. ✓
 - Road surfaces
 - Driveways
 - Walkways
 - Any specific area suitable for paving.**ANY THREE OF THE ABOVE** (3)
- 5.4 Advantages of using paving:
 - It is more economical than concrete. ✓
 - Low initial installation cost as compared to concrete.
 - Individual pavers can be lifted to access the surface underneath while concrete must be broken up.
 - Easier to repair than concrete.
 - It is more user friendly than concrete.
 - It has a better appearance.
 - It can be laid in decorative patterns.
 - Less labour intensive.**ANY ONE OF THE ABOVE** (1)

5.5



FIRST COURSE



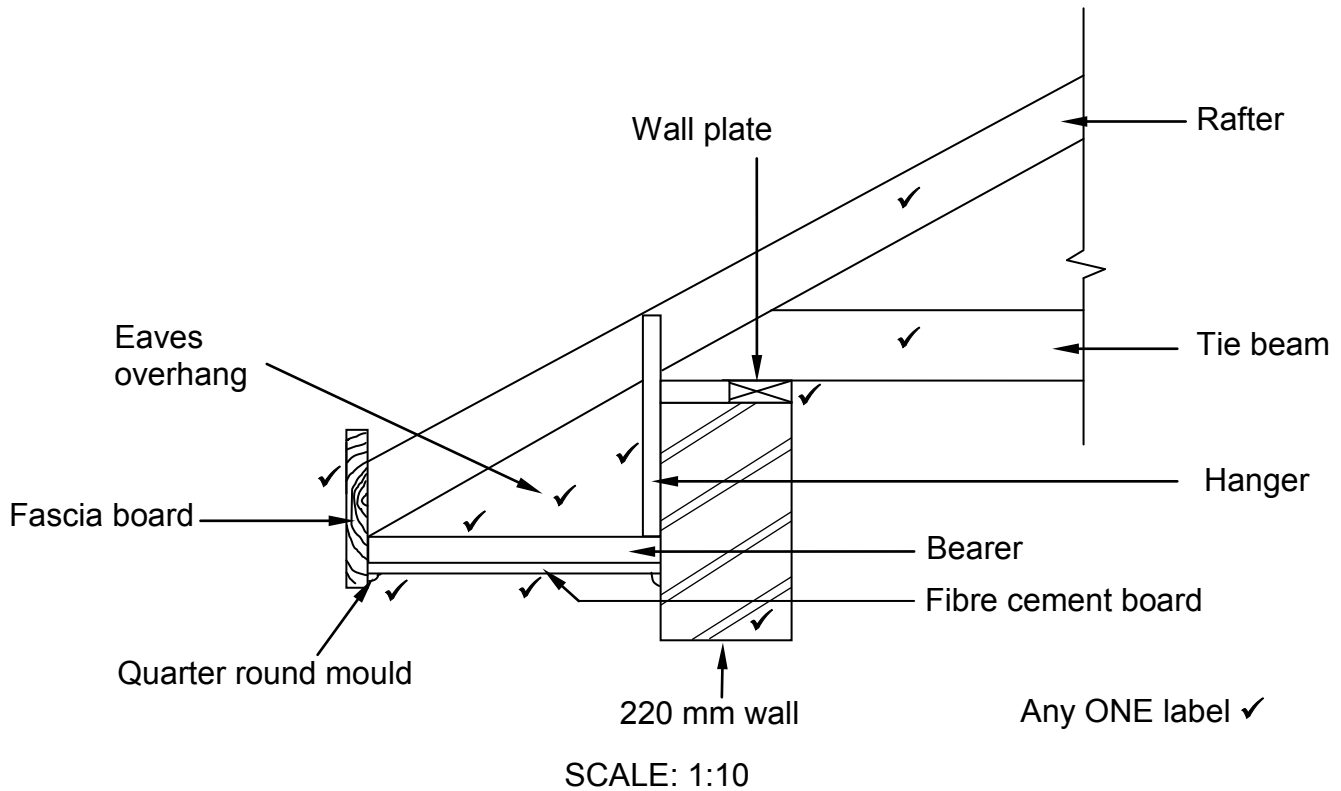
SECOND COURSE

Proportion ✓

ASSESSMENT CRITERIA	MARK
One full brick on outer skin of first course	1
One full brick on inner skin of first course	1
Brick on first course to close cavity	1
One full brick on outer skin on second course	1
One full brick on inner skin on second course	1
Brick on second course to close cavity	1
Proportion	1
TOTAL:	7

(7)

5.6



Application of scale ✓✓

USE A MASK TO MARK THIS QUESTION

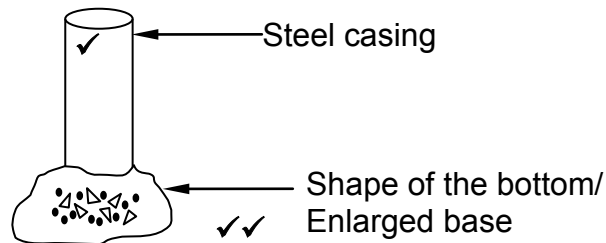
ASSESSMENT CRITERIA	MARK
Wall: 220 mm wide	1
Tie beam: 114 x 38 mm	1
Wall plate: 114 x 38 mm	1
Eaves overhang: 400 mm	1
Rafter: 114 x 38 mm	1
Fascia board: 228 x 28 mm	1
Bearer: 38 x 38 mm	1
Hanger: 38 x 38 mm	1
6 mm fibre-cement board on closed eaves	1
Two quarter-round mouldings below fibre-cement board	1
Any ONE label	1
Application of scale	2
TOTAL:	13

[30]

QUESTION 6: REINFORCEMENT IN CONCRETE, FOUNDATIONS, CONCRETE FLOORS AND QUANTITIES (SPECIFIC)

- 6.1 6.1.1 C ✓ (1)
- 6.1.2 D ✓ (1)
- 6.1.3 C ✓ (1)
- 6.1.4 C ✓ (1)
- 6.1.5 A ✓ (1)

- 6.2



Driven in-situ pile

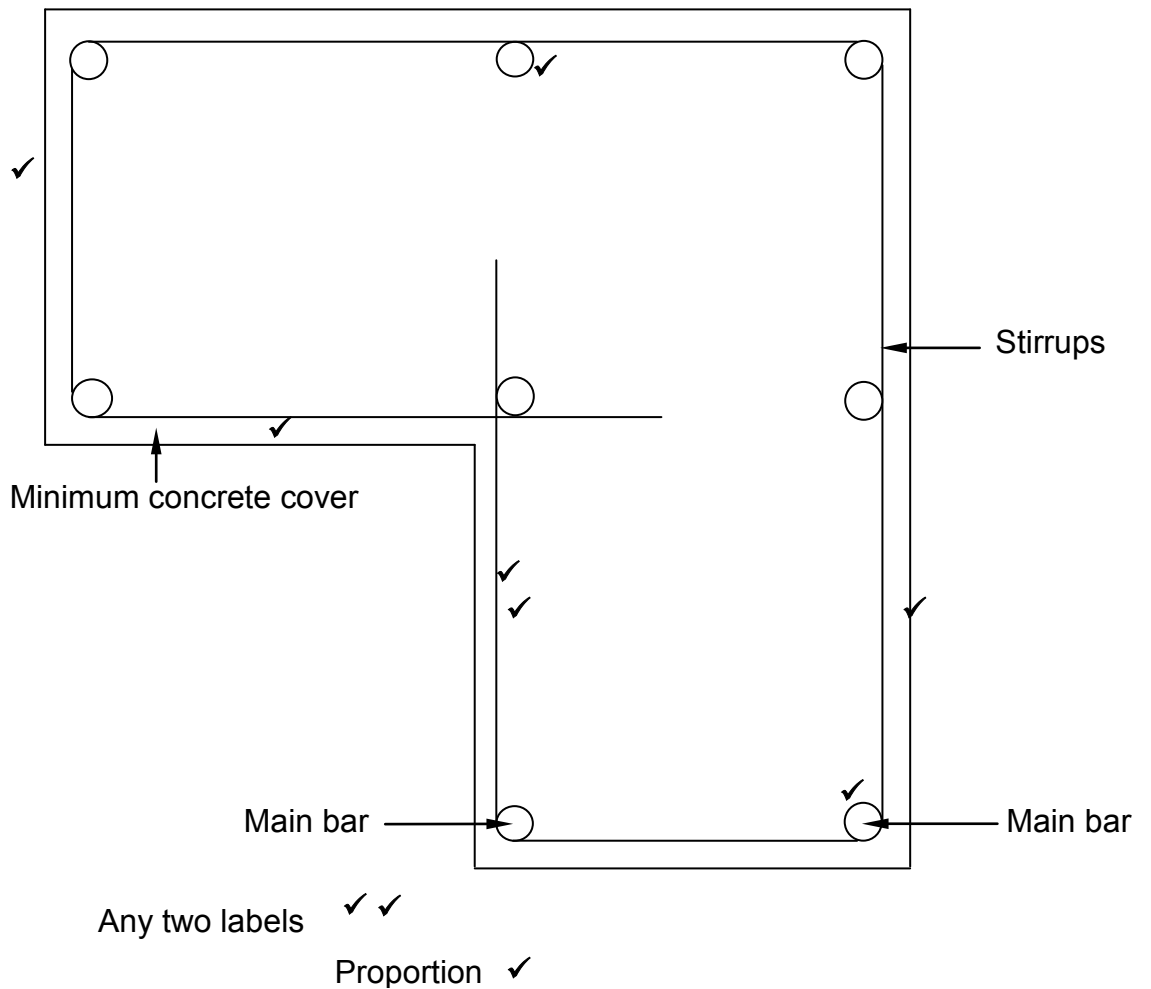
Any ONE label ✓

ASSESSMENT CRITERIA	MARK
Steel casing	1
Shape of the bottom	2
Any ONE label	1
TOTAL:	4

(4)

- 6.3 The purpose of the steel capping is to protect the top of the pile from breaking when it is driven into the ground with the drop hammer. ✓ (1)

6.4



ASSESSMENT CRITERIA	MARK
L-shaped column	2
8 main bars	2
Stirrups/Binders	2
Minimum concrete cover	1
Any TWO labels	2
Proportion	1
TOTAL	10

(10)

- 6.5 6.5.1 A – In-situ cast concrete ✓
 B – Concrete hollow block ✓
 C – Precast ribs ✓

(3)

- 6.5.2 The rib is used to:
- support the weight of the floor and any other loads imposed on it. ✓
 - support the hollow blocks that form part of the construction.
 - prevents the hollow blocks from moving.
- ANY ONE OF THE ABOVE** (1)
- 6.5.3 Factors to consider when planning a rib- and block floor:
- Maximum span ✓
 - Unit weight ✓
 - Nature of props ✓
 - Sound insulation
 - Thickness of units
 - Pre-stressed units
 - Fire resistance
 - Construction speed
 - Reinforcement properties
 - Support and formwork required
 - Safety features
 - Weight reduction
 - Volume reduction
 - Precast top layer
- ANY THREE OF THE ABOVE** (3)
- 6.5.4 Services:
- Electrical services/Conduits ✓
 - Plumbing/Hot water/Cold water/Waste pipes/Sewerage pipes ✓
 - Communication/Telephone/Tele camera ✓
 - Security services/Alarm/Camera
- ANY THREE OF THE ABOVE** (3)

6.6

A	B	C	D
			Concrete for foundations
			Centre line
			$\frac{2}{6} 000 = \underline{12\ 000\ \text{mm}} \checkmark$
			$\frac{2}{3} 000 = \underline{6\ 000\ \text{mm}} \checkmark$
			Total = $\underline{18\ 000\ \text{mm}} \checkmark$
			Minus $\frac{4}{600} = \underline{2\ 400\ \text{mm}} \checkmark$
			Total centre line = $\underline{15,6\ \text{m}} \checkmark$
1/	$\underline{15,6} \checkmark$		
	$\underline{0,6} \checkmark$		
	$\underline{0,25} \checkmark$	$\underline{2,34} \checkmark \text{m}^3 \checkmark$	

(10)
[40]**TOTAL: 200**