basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

CIVIL TECHNOLOGY: CONSTRUCTION

MAY/JUNE 2024

MARKS: 200

TIME: 3 hours

This question paper consists of 15 pages and 6 answer sheets.

REQUIREMENTS:

1. Drawing instruments
2. A non-programmable calculator
3. ANSWER BOOK

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. Answer ALL the questions.
3. Read all the questions carefully.
4. Answer each question as a whole. Do NOT separate subsections of questions.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Start the answer to EACH question on a NEW page.
7. Do NOT write in the margins of the ANSWER BOOK.
8. You may use sketches to illustrate your answers.
9. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
10. Use the mark allocation as a guide to the length of your answers.
11. Make drawings and sketches in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the *SANS/SABS Code of Practice for Building Drawings.*
12. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
13. Use your own discretion where dimensions and/or details have been omitted.
14. Answer QUESTIONS 2, 3.6, 4.9, 5.6, 6.5 and 6.6 on the attached ANSWER SHEETS using drawing instruments, where necessary.
15. Write your CENTRE NUMBER and EXAMINATION NUMBER on every ANSWER SHEET and hand them in with your ANSWER BOOK, whether you have used them or not.
16. Drawings in the question paper are NOT to scale due to electronic transfer.
17. Google Images was used as the source of all photographs and pictures.
18. Write neatly and legibly.

QUESTION 1: OHSA, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)

Start this question on a NEW page.

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.12) in the ANSWER BOOK, e.g. 1.1.13 D.

1.1.1 Water-based paint …

A can be applied to wet wood.
B allows moisture to penetrate surfaces.
C takes days to dry.
D gives an elastic and flexible finish. (1)

1.1.2 Zinc can be applied to metals to ….

A increase the thickness of the metal.
B add strength to the original metal.
C prevent rust.
D All the above-mentioned (1)

1.1.3 … improves the engineering and mechanical properties of metal.

A Curing
B Electroplating
C Galvanising
D Painting (1)

1.1.4 Toe boards are attached to a scaffold platform to …

A fix the scaffold platform to it.
B stabilise the scaffold.
C prevent tools from falling off.
D prevent workers from falling off. (1)

1.1.5 The maximum height for a trestle scaffold:

A 6 m
B 3 m
C 8 m
D 10 m (1)

1.1.6 Suspended scaffolds can be made of …

A fibreglass.
B steel.
C graphite.
D fibre cement. (1)

1.1.7 A … can be used to dispose of waste material.

A conveyer belt and chute
B ladder
C scaffold
D None of the above-mentioned (1)

1.1.8 Properties that define a builder's hoist:

A It is a lifting device
B The type of power
C The size of the cables
D Only A and B (1)

1.1.9 Workers must not use … stairways that will be a temporary part of the structure when carrying materials.

A straight
B timber
C spiral
D half landing (1)

1.1.10 Stairways must not be installed more than … degrees from the horizontal.

A 50
B 30
C 40
D 75 (1)

1.1.11 When a ladder is placed against a wall, the angle must be at a ratio of ...

A 1 : 3
B 1 : 4
C 1 : 5
D 1 : 6 (1)

1.1.12 A/An … ladder must never be used near electrical cables.

A aluminium
B timber
C synthetic
D fibreglass (1)

1.2 You have been tasked to install a bathroom cabinet against a wall.

1.2.1 Name the joining fixture you will use to secure the cabinet. (1)

1.2.2 Motivate why you will use this joining fixture. (2)

1.2.3 Explain how you will install the cabinet with pre-drilled holes by using the joining fixture in QUESTION 1.2.1. The positions of the holes have been marked on the wall. (3)

1.3 You have been asked by a contractor to install a shower in a bathroom.

1.3.1 Name the tool to detect existing water pipes in the wall. (1)

1.3.2 Name the tool to ensure that the top of the cubicle is level. (1)
[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

Start this question on a NEW page.

FIGURE A and FIGURE B on the next page show drawings that appear on a building plan. Analyse the drawings and complete the table on ANSWER SHEET 2.

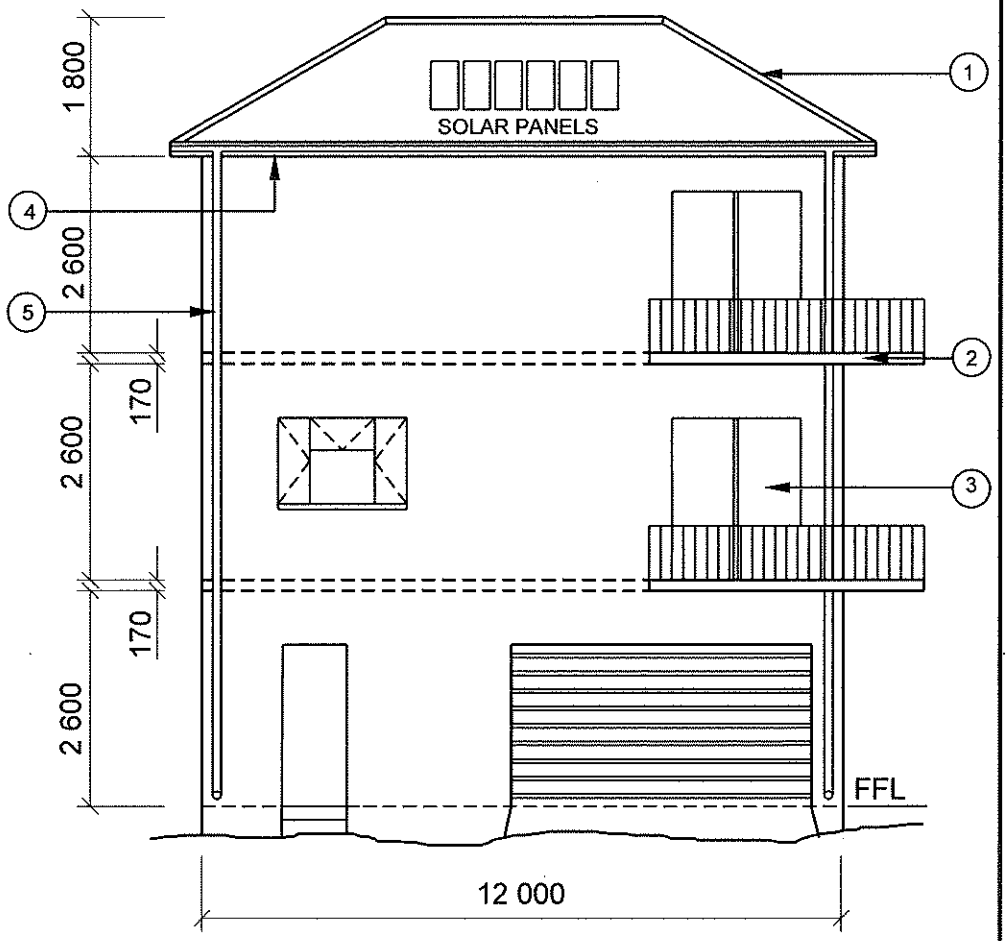


FIGURE A

NOTES:
Contractors must verify all dimensions and levels on site before commencing work.

Architects to be notified of any discrepancies immediately.

Finishing of walls: Stone cladding

Sliding doors are installed with laminated safety glass

Dimensions of sliding doors: 2 100 mm x 1 800 mm

Concrete stairs according to engineer's specifications

Balusters: To be made of 40 mm x 40 mm steel tubing and a height of 1 200 mm

Architect's signature .....

Client's signature .....

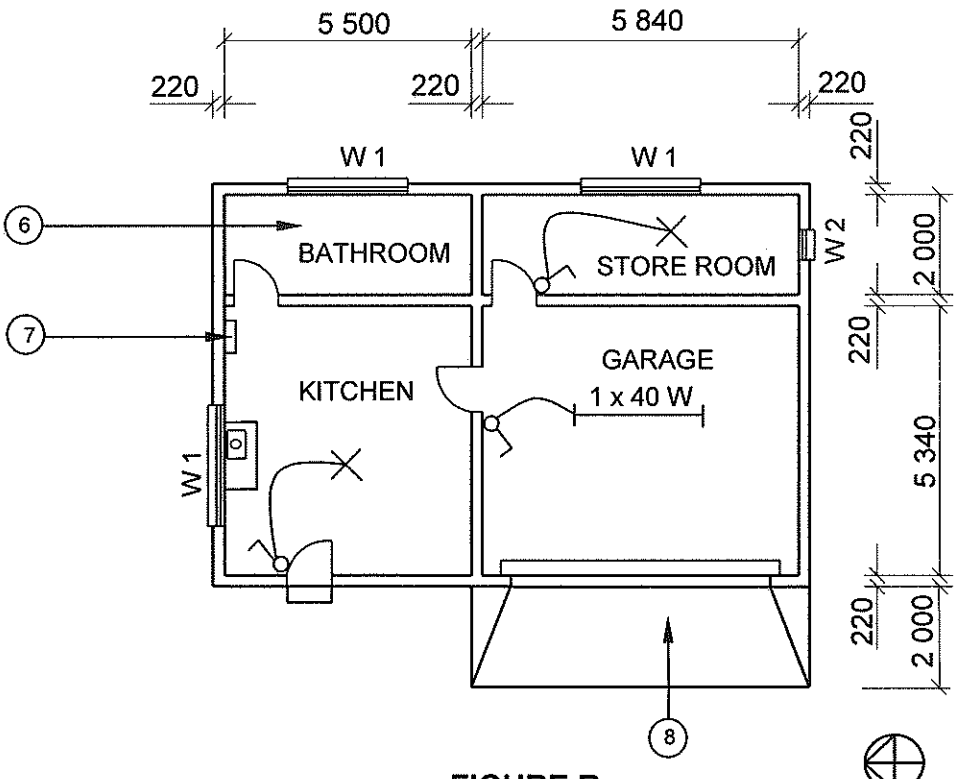
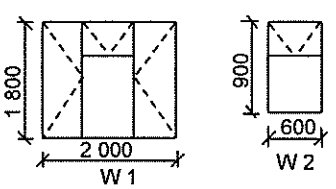


FIGURE B

REVISION 1	DATE: 20/02/2024	DRAWING OF BALUSTRADES
PRINTED BY: FOX PRINTERS		DATE OF PRINT: 22/04/2024
DRAWING TITLE: GROUND FLOOR AND WEST ELEVATION		
PROJECT: PROPOSED DWELLING OF MR P XHOSA PLOT 46, PROTEA STREET, PHOENIX		
PROJECT NO.: GR 320-224		DRAWING NO.: 446P5
DATE: 16/04/2024	DRAWN: JN KRIEL	CHECKED: E BUYS
ELEVATION AND FLOOR PLAN		SCALE 1 : 100
REFERENCE CODE QP 6 – 2024		

WINDOW SCHEDULE



[40]

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

Start this question on a NEW page.

3.1 Define the following terms related to staircases:

3.1.1 Baluster (1)

3.1.2 Run (1)

3.2 Draw in the ANSWER BOOK a neat two-dimensional sketch of a J-bolt cast-in anchor connecting a concrete section to steel. (4)

3.3 Draw in the ANSWER BOOK a staircase showing a riser and a tread/going. Label the TWO parts. (4)

3.4 Explain the purpose of a roof underlay. (2)

3.5 By means of TWO sketches, differentiate between the *timber used to fix a concrete roof tile* and the *timber used to fix iron roof sheeting*. Print the correct title and dimensions under EACH drawing. (6)

3.6 Use ANSWER SHEET 3.6 and draw to scale 1 : 20 more than half of a SA (Howe) roof truss.

Use the following specifications:

- The pitch of the roof is 30°.
- The span of the roof is 4 000 mm.
- The roof overhang is 400 mm.
- The roof trusses are constructed of 114 x 38 mm timber. (12)

[30]

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

Start this question on a NEW page.

4.1 Change the underlined words in the following to make the statements correct. Write only the appropriate word(s) next to the question numbers (4.1.1 to 4.1.5) in the ANSWER BOOK.

4.1.1 The purpose of the slump test is to determine the compression and consistency of the batches that are mixed. (1)

4.1.2 The cubes of the cube test must rest in the laboratory for at least 12 hours before testing can commence. (1)

4.1.3 Casting ready-mix concrete wastes time. (1)

4.1.4 If freshly cast concrete is kept dry, it will last longer. (1)

4.1.5 Galvanised sheet metal has a shiny bluish-grey colour. (1)

4.2 FIGURE 4.2 below shows people working in excavations.

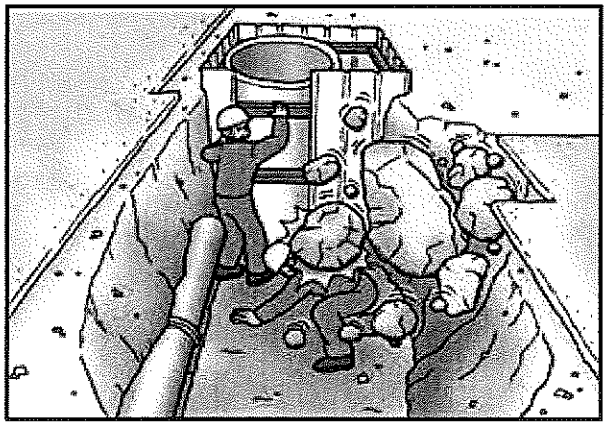


FIGURE 4.2

4.2.1 Describe TWO factors that can cause an excavation to collapse. (2)

4.2.2 Explain TWO factors that should be considered when excavating to clear a site. (2)

4.2.3 When should trenches be inspected to ensure the safety of workers? (1)

4.2.4 Why will you use benching in an excavation? (1)

4.3 FIGURE 4.3 below shows the foundation walls of a building that has been completed and workers are busy with backfilling.

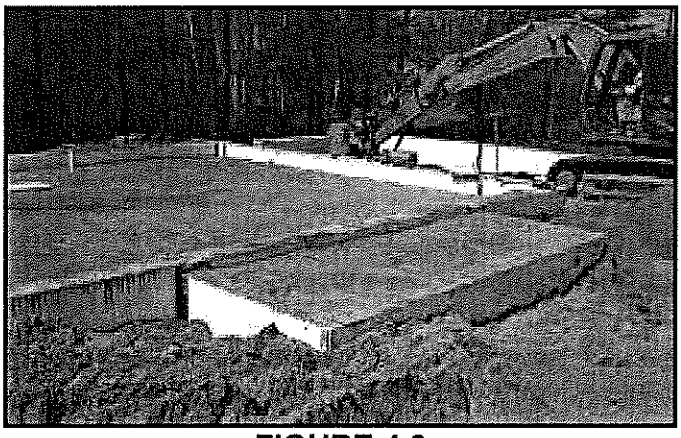


FIGURE 4.3

4.3.1 Recommend TWO machines that can be used to compact the loose soil. (2)

4.3.2 Name TWO factors that the worker is exposed to while working with this machine. (2)

4.3.3 Safety precautions should be considered when backfilling is in progress to prevent injury to other workers on site. Name TWO safety precautions. (2)

4.4 Explain why a portable concrete vibrator with a petrol engine should NOT be laid on its side. (1)

4.5 State why it is important to clean a construction machine after use. (2)

4.6 State TWO advantages of installing metal sheet cladding. (2)

4.7 Describe *proprietary fixing* when fixing cladding to a wall. (2)

4.8 Name the type of metal that you will use to withstand blows and knocks. (1)

4.9 FIGURE 4.9 below shows the incomplete drawing of a vertical section through a concrete beam with floor slabs that is supported by a continuous head tree/bearer with adjustable props.

Use ANSWER SHEET 4.9 and draw the omitted formwork for the beam and floor slabs on both sides. Print any TWO labels.

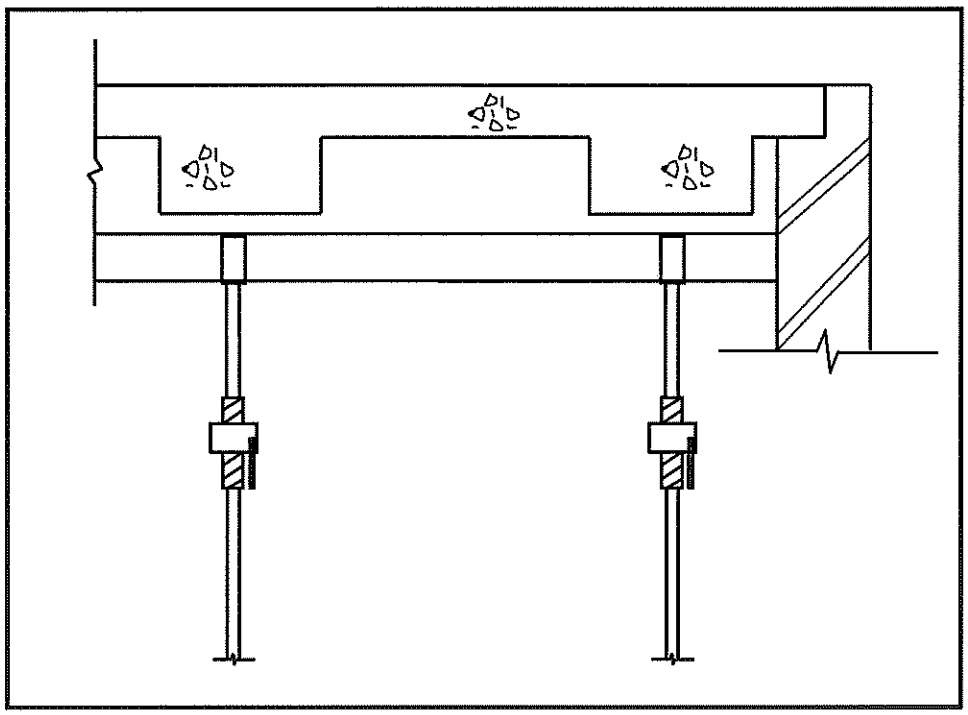


FIGURE 4.9

(15)
[40]

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

Start this question on a NEW page.

5.1 FIGURE 5.1 below shows a worker busy on a construction site.

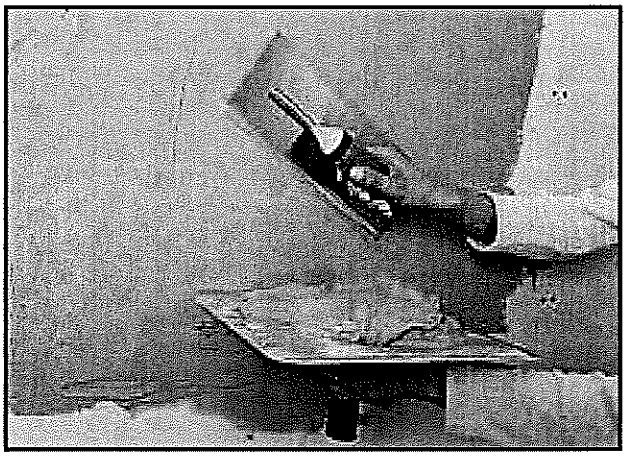


FIGURE 5.1

5.1.1 Describe what the worker is doing. (1)

5.1.2 Name the TWO tools that the worker is using. (2)

5.1.3 Name the recommended mix proportions for plastering dams or pools. (2)

5.2 How many bags of lime can be recommended for use with ONE bag of cement to increase the workability of plaster? (1)

5.3 Describe the function of screed. (1)

5.4 Name TWO factors to be considered when preparing ground to pave a small area. (2)

5.5 FIGURE 5.5 below shows an arch in a wall.

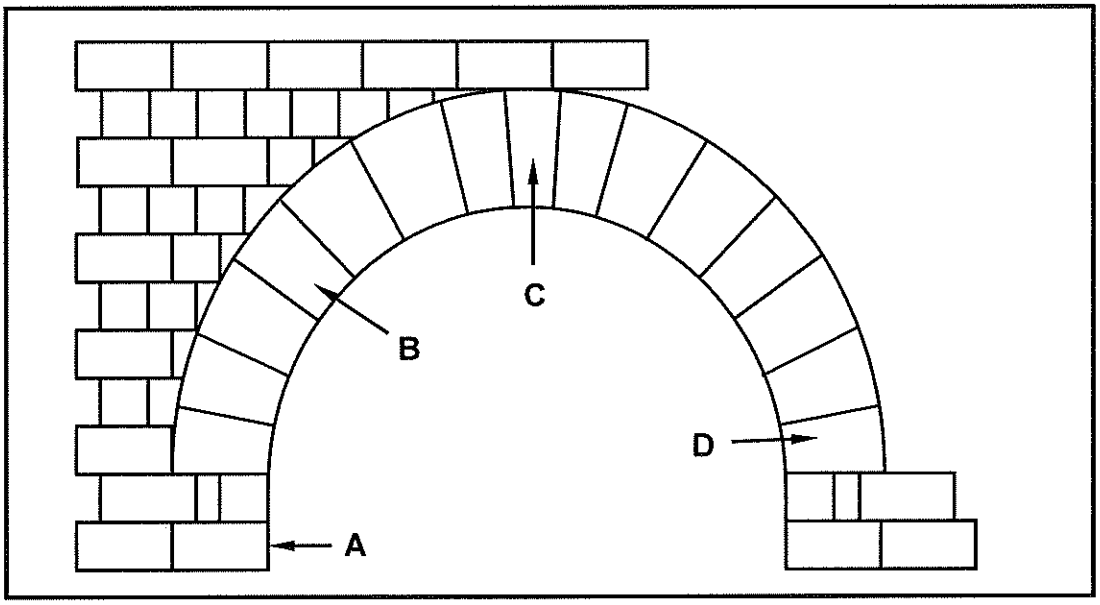


FIGURE 5.5

5.5.1 Identify the arch. (1)

5.5.2 Identify **A** to **D**. (4)

5.5.3 Name the brick bond used around the arch. (1)

5.5.4 Describe TWO disadvantages of the arch. (2)

5.6 USE ANSWER SHEET 5.6 and draw a cavity wall with a concrete floor to scale 1 : 10. Print any TWO labels on your drawing.

Use the following specifications:

- The floor is 75 mm thick.
- There are THREE layers of bricks below the floor.
- There are THREE layers of bricks above the floor.
- ADD ALL the other detail of the cavity wall.

NOTE: The size of a brick is 75 mm x 100 mm x 220 mm. (13)
[30]

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

Start this question on a NEW page.

6.1 Choose a description from COLUMN B that matches the item in COLUMN A. Write only the letter (A–H) next to the question numbers (6.1.1 to 6.1.5) in the ANSWER BOOK, e.g. 6.1.6 J.

COLUMN A		COLUMN B	
6.1.1	Ribbed bar	A	done by an engineer
6.1.2	Reinforcement design	B	placed in compression area
6.1.3	Main bar	C	works against shearing forces
6.1.4	Crosswise	D	method of placing bars
6.1.5	Anchor bar	E	works against tensile forces
		F	placed in the middle of a beam
		G	method of joining reinforcement bars
		H	patterns ensure better bonding with concrete

(5 x 1) (5)

6.2 FIGURE 6.2 below shows components used in reinforcement.

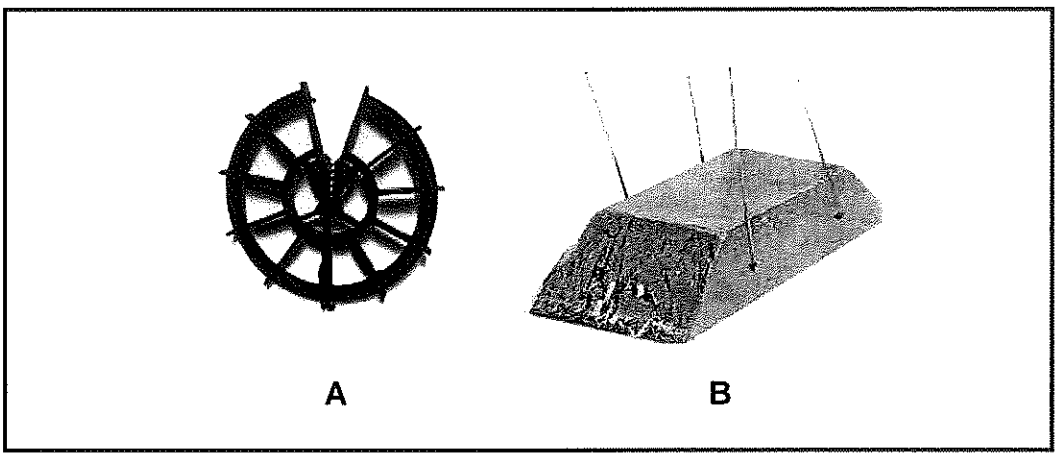


FIGURE 6.2

6.2.1 Identify **A** and **B**. (2)

6.2.2 What is the purpose of the wires at **B**? (1)

6.2.3 What is the main purpose of the components? (1)

6.3 FIGURE 6.3 below shows an incomplete suspended floor.

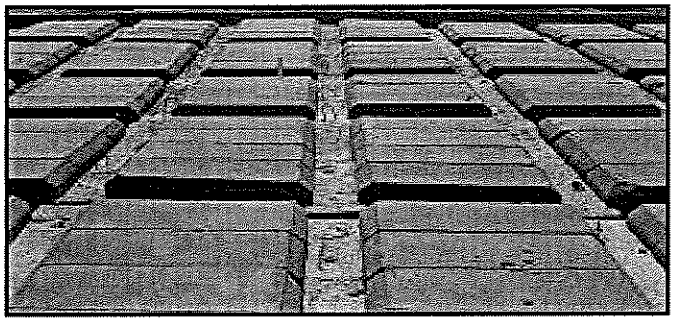


FIGURE 6.3

6.3.1 Identify this type of floor. (1)

6.3.2 Name ONE material that you will use to complete this floor up to finished floor level. (1)

6.3.3 How long should the concrete for this type of floor be cured? (1)

6.3.4 Draw a pictorial view of the supporting member on which the hollow core blocks can be placed. (4)

6.4 FIGURE 6.4 below shows a pile being driven into the ground.

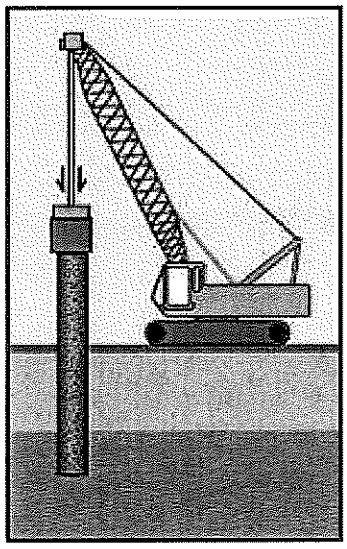


FIGURE 6.4

6.4.1 Identify the type of pile foundation installation. (1)

6.4.2 Name the device the crane is using to drive the pile into the ground. (1)

6.4.3 Name ONE other method that can be used to install pile foundations. (1)

6.4.4 Name TWO soil conditions where this type of foundation will be recommended above normal strip foundations. (2)

6.5 ANSWER SHEET 6.5 shows the front view of the reinforcement in a round concrete column. Project and draw the top view of the concrete column with reinforcement. Indicate the minimum concrete cover and print any ONE label. (7)

6.6 FIGURE 6.6 below shows the floor plan of a new building.

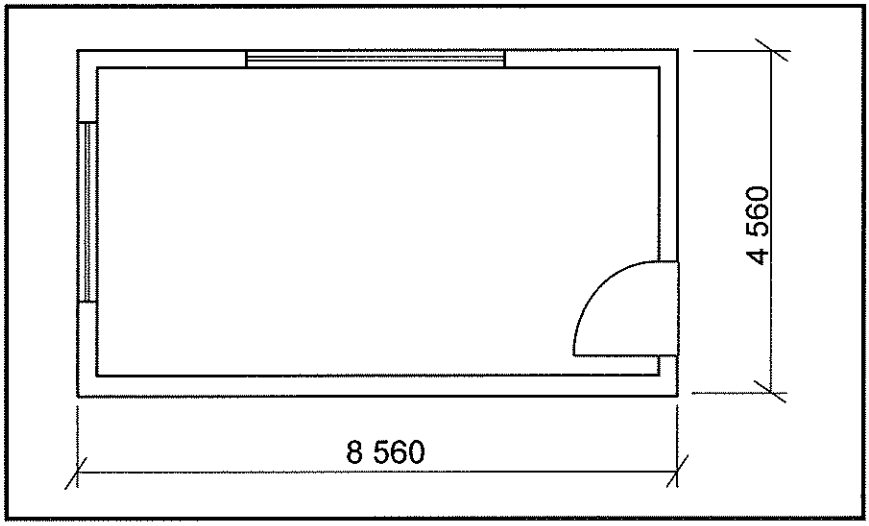


FIGURE 6.6

Use the following specifications:

- The screed is 30 mm thick.
- The width of the external wall is 220 mm.

Use the dimension paper on ANSWER SHEET 6.6 and calculate the following. Round off your answer to TWO decimals.

6.6.1 The reinforcing for the floor between the external walls (7)

6.6.2 The volume of the screed needed between the external walls (4)

NOTE: A mark will be awarded for the correct use of the dimension paper. (1)
[40]

TOTAL: 200