basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY: CONSTRUCTION

NOVEMBER 2024

MARKS: 200

TIME: 3 hours

This question paper consists of 13 pages and 6 answer sheets.

Copyright reserved

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, 3.5, 3.6, 5.7, 5.8 and 6.5 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.

Copyright reserved

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

Start this question on a NEW page.

1.1 Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question numbers. (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 Concrete.

1.1.1 Wooden scaffold standards should not be placed more than (4 m/3 m/6 m) apart. (1)

1.1.2 Trestle scaffolds must have a maximum height of (3 m/4 m/6 m). (1)

1.1.3 The material safety data sheet that accompanies hazardous chemical substances must contain (fire-fighting measures/ flame ratio/combustion rate). (1)

1.1.4 When transporting long ladders with a vehicle, (ensure that the ladder does not protrude excessively/mark the end of the ladder with a green flag/place ladder in an upright position). (1)

1.1.5 (Galvanising/Powder coating/Electrolysis) is the process of applying a plastic coating to a metal. (1)

1.1.6 Electroplating is the process in which (the thickness of undersized parts can be increased/metal becomes extremely hot/metals are coated with paint). (1)

1.1.7 The (thread and shank/head and pin/runout and shank) do not form part of the length of a bolt. (1)

1.1.8 The purpose of the nylon insert on a hexagonal nut is for (decorative purposes/easy removal from a bolt/preventing backing off). (1)

1.1.9 Wooden ladders may be treated with (oil-based paint/ wood preservatives/water-based paint) according to the Occupational Health and Safety Act (OHSA). (1)

1.1.10 Workers carrying large equipment may not use (spiral/suspended/ fire escape) stairways that are a temporary part of a structure. (1)

1.2 Which pictorial view below represents a nut with a built-in washer?

A **B** **C** **D** (1)

1.3 The specifications for a Rawl bolt are R-RBL-M08/25. What does the *M08* represent? (1)

1.4 Cured concrete is exposed to elements.

1.4.1 Explain the effect of cured concrete on steel reinforcement. (1)

1.4.2 Explain the advantages of cured concrete in terms of the weight it can carry. (1)

1.5 Differentiate between the *multi-detector* and the *laser level* in terms of the use thereof. (2)

1.6 Describe TWO uses of the dumpy level. (2)

1.7 Describe how you will take care of a telescopic staff. (2)
[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.

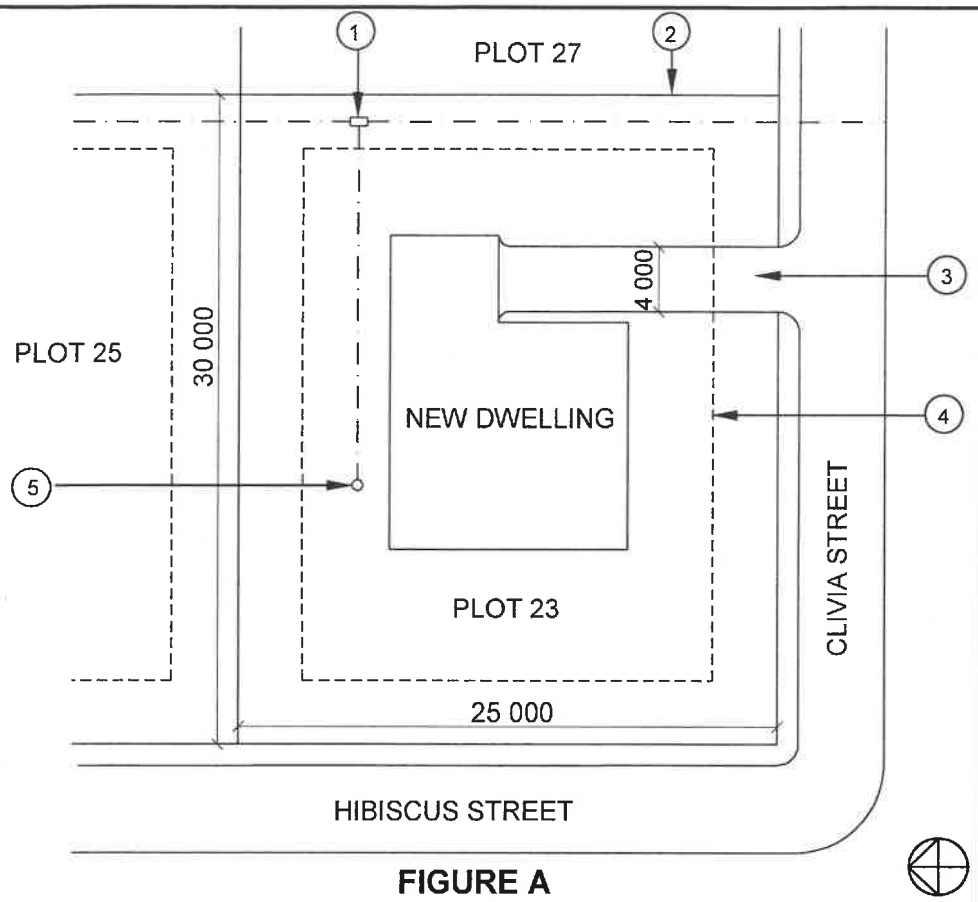


FIGURE A

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

Architects to be notified of any discrepancies immediately.

Fencing: Clear-view fencing to be used on the boundary

Architect's signature .....

Client's signature .....

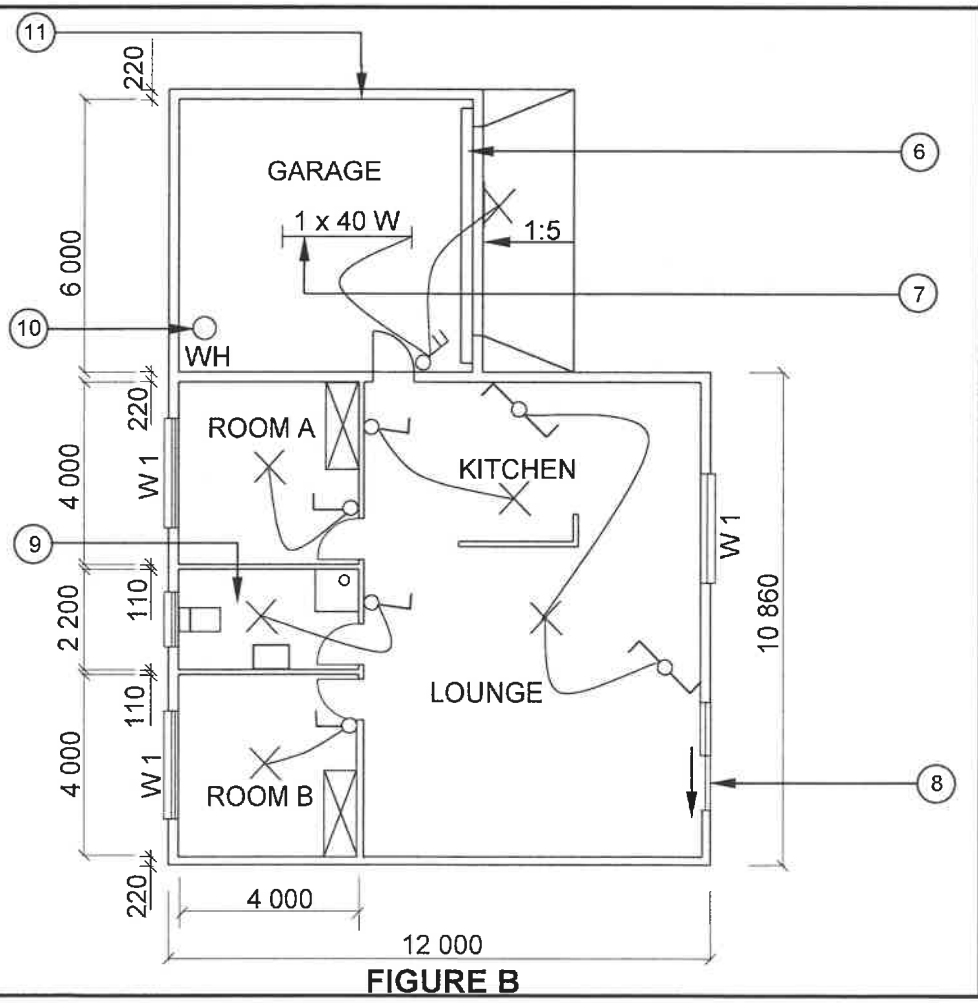
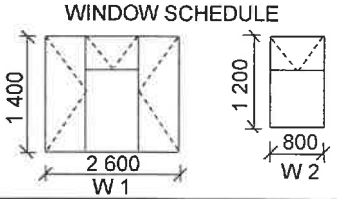


FIGURE B

REVISION 1	DATE: 14/04/2024	DRAWING OF ELECTRICAL FITTINGS
PRINTED BY: FROG PRINTERS	DATE OF PRINT: 16/04/2024	
DRAWING TITLE: SITE PLAN AND FLOOR PLAN		
PROJECT: PROPOSED DWELLING OF MS KOCK ON PLOT 23, CLIVIA STREET, MALUBU		
PROJECT NO.: GR 688-646	DRAWING NO.: 446P2	
DATE: 07/04/2024	DRAWN: SP JOB	CHECKED: P BOT
SITE PLAN	SCALE 1 : 500	
FLOOR PLAN	SCALE 1 : 100	
REFERENCE CODE QP 4 – 2024		

WINDOW SCHEDULE



[40]

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

Start this question on a NEW page.

3.1 Describe the following terminology related to staircases:

3.1.1 Pitch line (1)

3.1.2 Balustrade (2)

3.1.3 Run (1)

3.2 A roof truss on a completed building should be joined to a brick wall.

3.2.1 Recommend ONE method that can be used to anchor a roof truss to a brick wall. (1)

3.2.2 Recommend ONE item that can be used to join a rafter to a tie beam. (1)

3.3 When using concrete tiles as roof covering, what is the maximum distance between the rafters? (1)

3.4 Name the type of roof covering that will be used when the spacing between the roof trusses is 1 400 mm. (1)

3.5 ANSWER SHEET 3.5 shows a drawing of a rafter that forms part of a SA (Howe) roof truss. Use ANSWER SHEET 3.5 and complete the drawing to scale 1 : 5 showing only the connection of the rafter, queen post and strut. Print any ONE label.

Use the following specifications:

- All timber used for the roof truss is 114 mm x 38 mm.
- The pitch of the roof is represented by the angle of the rafter. (8)

3.6 Use ANSWER SHEET 3.6 and draw to scale 1 : 20 a king post roof truss. The walls are indicated on the ANSWER SHEET.

Use the following specifications:

- The overhang is 250 mm.
- The roof truss is constructed of 114 x 38 mm timber.
- 114 x 38 mm timber is used for the wall plates.
- The pitch of the roof is 30°. (14)

[30]

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

Start this question on a NEW page.

4.1 Give ONE word/term for EACH of the following descriptions by choosing a word/term from the list below. Write only the word/term next to the question numbers (4.1.1. to 4.1.5) in the ANSWER BOOK, e.g. 4.1.6 Holes.

water; branch; ready-mix; hardness; hand mixed; workability; 15 MPa; boom; dust; 30 MPa; compressive strength

4.1.1 A type of pump that can pump concrete to high levels (1)

4.1.2 Concrete that has the same density throughout (1)

4.1.3 The slump test will determine this property of fresh concrete (1)

4.1.4 High-strength concrete that will have this compression strength at 28 days (1)

4.1.5 Used for curing flat surfaces, like floor slabs (1)

4.2 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 (4.2.1 to 4.2.5) in the ANSWER BOOK, e.g. 4.2.6 D.

4.2.1 Excavated material should be kept away from the trenches at a distance of at least …

A 1,2 metres.
B 800 mm.
C 1 metre.
D 600 mm. (1)

4.2.2 Shuttering for shallow trenches has 152 x 50 mm …

A backfilling.
B folding wedges.
C walling boards.
D benching. (1)

4.2.3 The depth at which trenches should be tested for atmospheric hazards is ...

A 1,2 metres.
B 900 mm.
C 600 mm.
D 1 metre. (1)

4.2.4 A suitable ... must be provided where excavations are deeper than 2 m.

A catch net
B cover
C foundation
D barrier (1)

4.2.5 Trenches should be ... at the start of each shift.

A excavated
B inspected
C filled
D cleaned (1)

4.3 Predict the consequence of the vibration caused by heavy machinery in close proximity to an excavation. (1)

4.4 Draw, in your ANSWER BOOK, a neat sketch of the vertical sectional view of the shuttering for firm soil. Print any TWO labels. (8)

4.5 FIGURE 4.5 below shows a machine that is used on a construction site.

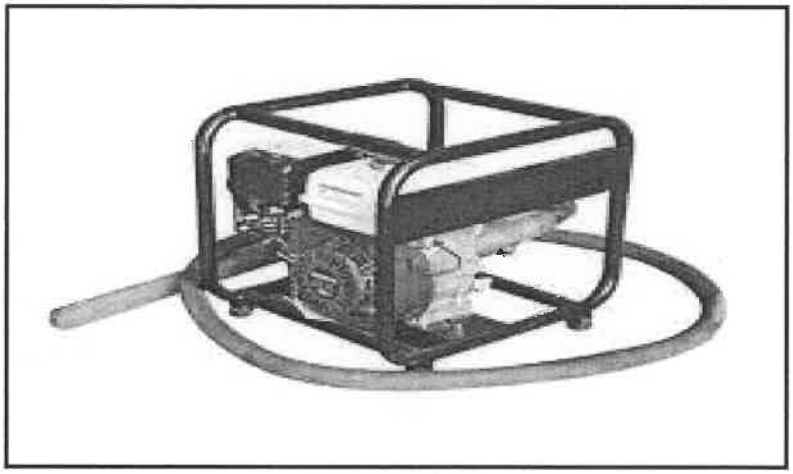


FIGURE 4.5

4.5.1 Why is it necessary to use this machine? (1)

4.5.2 Name this machine. (1)

4.6 Name the machine that you will use after the concrete has stopped bleeding to get a smooth surface. (1)

4.7 When constructing a building as in FIGURE 4.7, where large amounts of concrete is required, there are a lot of rules and regulations that need to be followed to prevent disastrous consequences, as witnessed recently. One of these is that the cube test must be performed on each mixture/batch of fresh concrete.

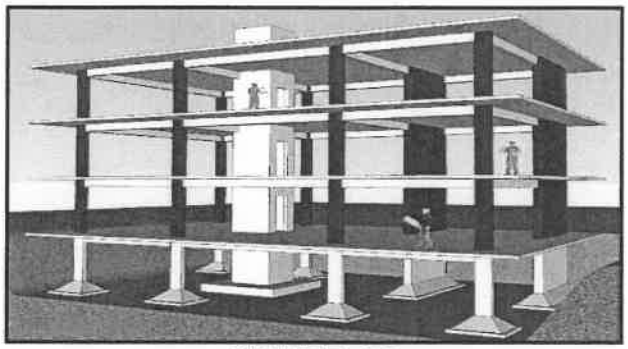


FIGURE 4.7

4.7.1 Describe the purpose of the cube test. (2)

4.7.2 Name the apparatus that you will use to get rid of any air pockets in the cube after it has been filled with concrete. (1)

4.7.3 Explain the procedure to conduct a cube test after samples have been taken and the moulds have been assembled. (5)

4.8 Study FIGURE 4.8 below. Match the word(s) in the list below with the labels in FIGURE 4.8. Write only the correct word(s) next to the label (A–J) in the ANSWER BOOK, e.g. K baseplate. Words in the list may only be used ONCE.

sole plate; shuttering board floor; prop; anchor bar; beam/joist; bearer/head tree; cleat; wedge; soffit board/shutter board; fixing plate; brace/strut; shuttering board side

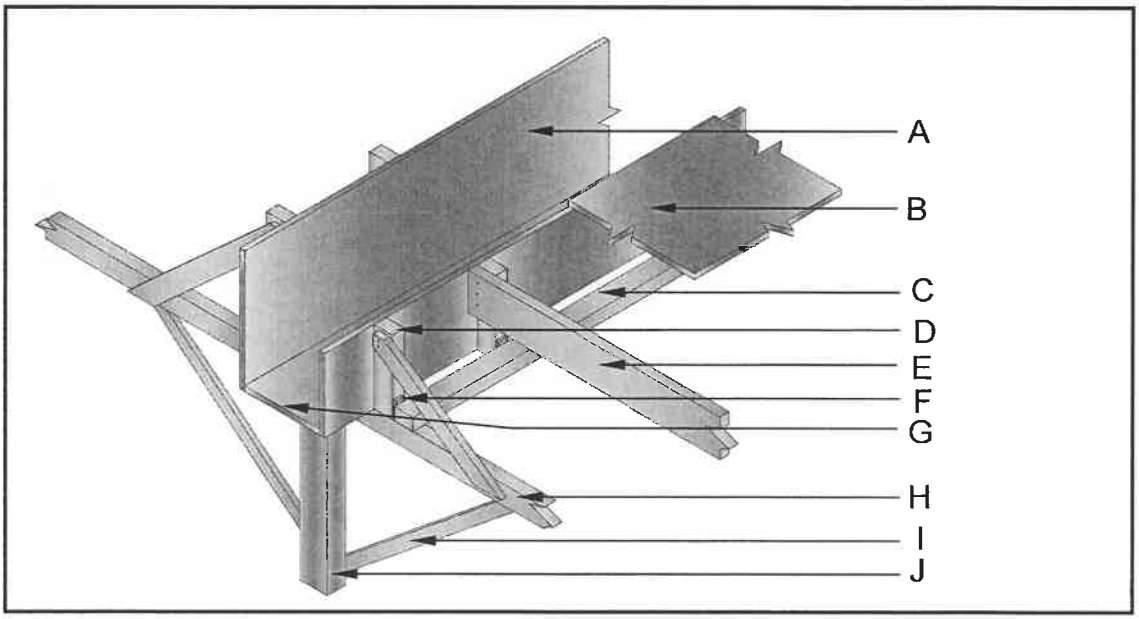


FIGURE 4.8

(10)
[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 indicates a splatter finished wall.

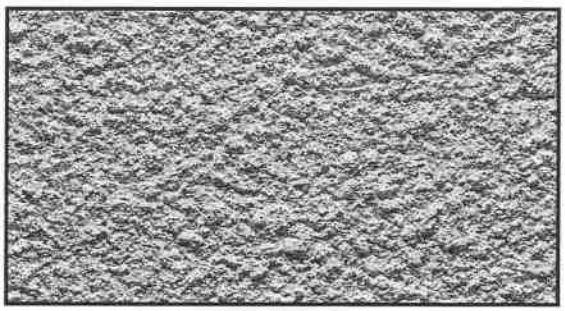


FIGURE 5.1

5.1.1 State the mixing ratio of a splatter finish. (1)

5.1.2 What is the alternative description of a splatter finish/splatter-dash finish? (1)

5.1.3 State another method to obtain a splatter finish if a Tyrolean machine is not available. (1)

5.2 Skimming plaster is usually a two-coat application for walls.

5.2.1 Describe the purpose of skimming plaster. (1)

5.2.2 Name ONE tool that can be used to float/polish skimmed plaster. (1)

5.3 Define the term *dry screed*. (2)

5.4 Name TWO materials that you will mix with water to obtain a dry screed. (2)

5.5 State TWO advantages of beam filling. (2)

5.6 Describe the shape of the bricks and the joints of a gauged arch. (2)

5.7 ANSWER SHEET 5.7 shows an incomplete drawing of the construction of paving blocks with a restrained edge. Complete the drawing and print any TWO labels. Indicate the symbol for concrete. (8)

5.8 ANSWER SHEET 5.8 shows the incomplete first and second courses of a one-and-a-half brick pier attached to a one-brick wall in English bond. Use ANSWER SHEET 5.8 and complete the drawing of the brick pier on EACH course. (9)

[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	Tensile force	A	is placed in compression areas for strength
6.1.2	Stirrups	B	is positioned where tensile stresses take place
6.1.3	Anchor bar	C	forces pile foundation into the ground
6.1.4	Shear force	D	occurs where a beam is inclined to stretch
6.1.5	Main bar	E	occurs where a beam is inclined to shorten
		F	used to prepare holes for short-bored piles
		G	placed around main bars to counteract forces
		H	is inclined to cause a diagonal stress fracture

(5 x 1) (5)

6.2 FIGURE 6.2 below illustrates two types of beams.

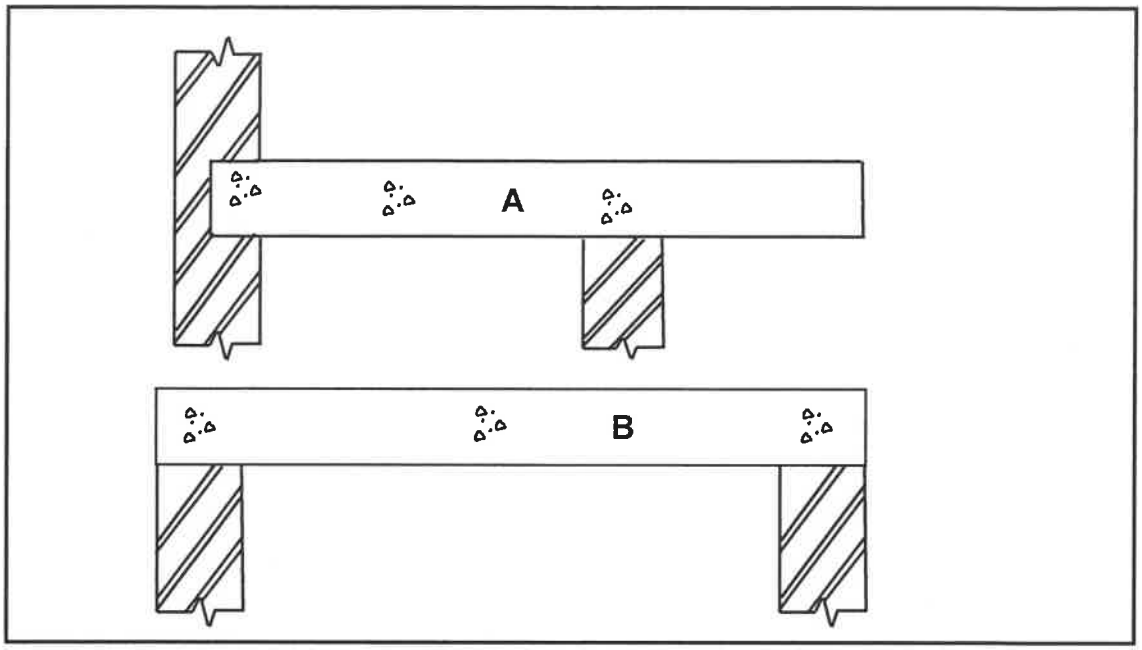


FIGURE 6.2

6.2.1 Identify the types of beams illustrated by **A** and **B**. (2)

6.2.2 State ONE advantage of reinforcing concrete beams. (1)

6.2.3 State TWO disadvantages of reinforcing concrete beams. (2)

6.2.4 Explain TWO purposes of using spacers in reinforcing. (2)

6.3 Piles are used for foundations under special circumstances.

6.3.1 In your ANSWER BOOK, sketch in good proportion, a steel tube caisson pile that is being driven into the ground. Label any TWO parts or accessories. (7)

6.3.2 Explain TWO circumstances that will NOT require the use of piles. (2)

6.4 FIGURE 6.4 below illustrates a rib and block floor.

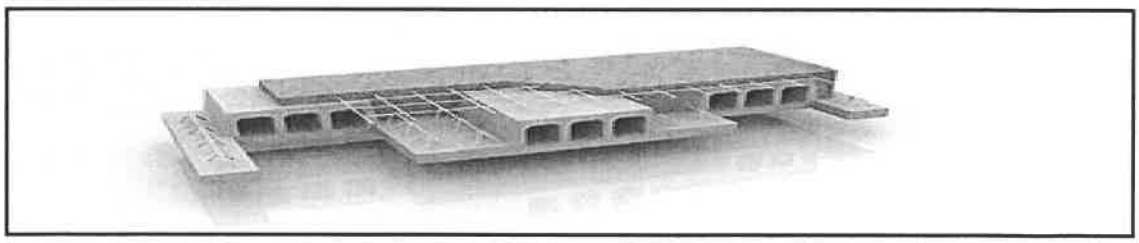


FIGURE 6.4

6.4.1 How wide must the double layer DPC be underneath the ribs to allow for movement? (1)

6.4.2 State TWO safety factors to consider after installing a rib and block floor. (2)

6.5 FIGURE 6.5 below shows the floor plan of a small store room.

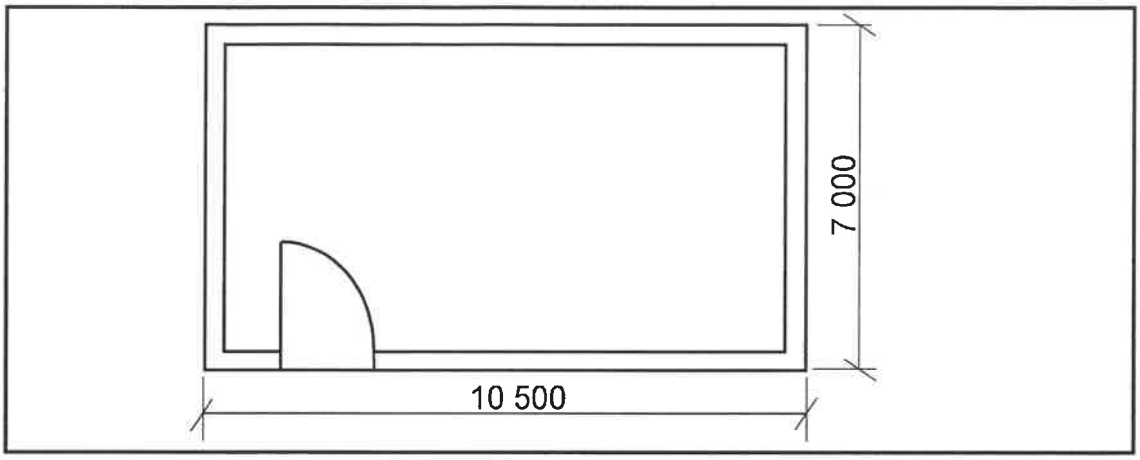


FIGURE 6.5

Use the following specifications:

- The superstructure is a one-brick wall, 220 mm wide and 2 700 mm high.
- The door opening is 2 000 mm high x 900 mm wide.
- Use 50 bricks per square metre for a half-brick wall.
- The centre line for the superstructure is 34 120 mm.

Use the dimension paper on ANSWER SHEET 6.5 and calculate the following. Round off your answer to TWO decimals.

6.5.1 The area of the walls of the superstructure before deductions (4)

6.5.2 The area of the door (4)

6.5.3 The area of the walls of the superstructure of the building after deductions (3)

6.5.4 The number of bricks needed to build the superstructure of the building (4)

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

TOTAL: 200

Copyright reserved

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 2

NO.	QUESTIONS	ANSWERS	MARKS
1.	What is the measurement of the dwelling facing Hibiscus Street?		1
2.	Identify number **1**.		1
3.	Identify the number indicating the building line.		1
4.	Identify number **2**.		1
5.	Identify number **3**.		1
6.	Write down the abbreviation for number **5**.		1
7.	Explain the purpose of number **6**.		1
8.	How many fluorescent tubes are used in number **7**?		1
9.	How many one-way switch single-pole switches are in the dwelling?		1
10.	How many built-in cupboards are in the dwelling?		1
11.	What is omitted in terms of electrical installation in the bedrooms?		1
12.	Name TWO access points into the dwelling.		2
13.	How do you know in which direction the door at number **8** will open?		1
14.	Name ONE other fixture that can be installed in the bathroom indicated by number **9**.		1
15.	Identify number **10**.		1

Copyright reserved

CENTRE NUMBER:							

EXAMINATION NUMBER:													

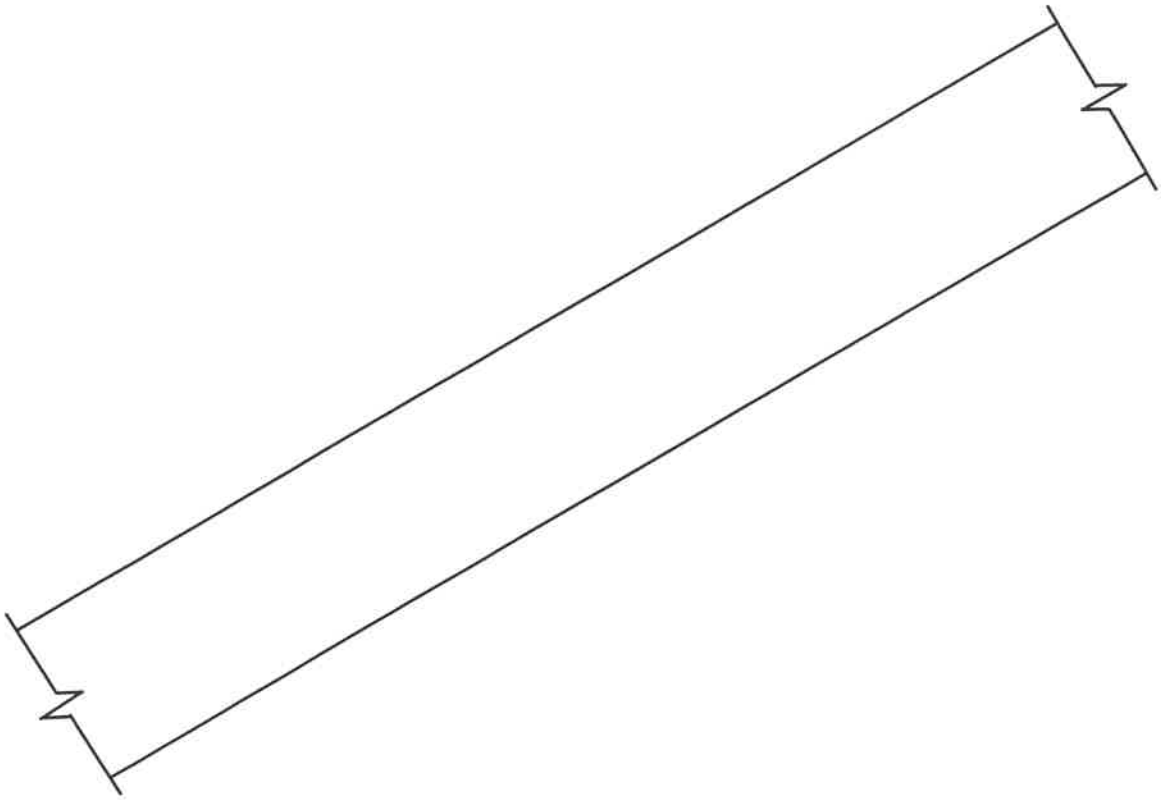
16.	Which plot is on the eastern side of plot number 23?		1
17.	How many inside doors are in the building?		1
18.	How many 2 600 mm x 1 400 mm windows are in the building?		1
19.	Who checked the drawing of the new dwelling?		1
20.	Why will it be difficult to enter the dwelling at number **8** if the NGL is 300 mm lower than the FFL?		1
21.	Who was responsible for the printing of the building plan?		1
22.	Deduce from the notes column the date that revision **1** took place.		1
23.	In which town will the new dwelling be erected?		1
24.	Draw the symbol for a sink unit – double.		5
25.	Draw the symbol for hardcore filling.		2
26.	Calculate the metres of clear-view fencing that would be needed to fence plot number 23, excluding the driveway. Give your answer in metres and show ALL calculations.		6
27.	The internal area of the garage is 39,6 m². Calculate the internal length of number **11**. Give your answer in mm and show ALL calculations.		3
		TOTAL:	**40**

Copyright reserved

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 3.5



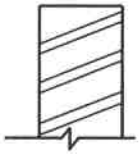
ASSESSMENT CRITERIA		
NO.	**MARK**	**CANDIDATE'S MARK**
1	2	
2	2	
3	1	
4	1	
5	2	
TOTAL:	**8**	

Copyright reserved

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 3.6



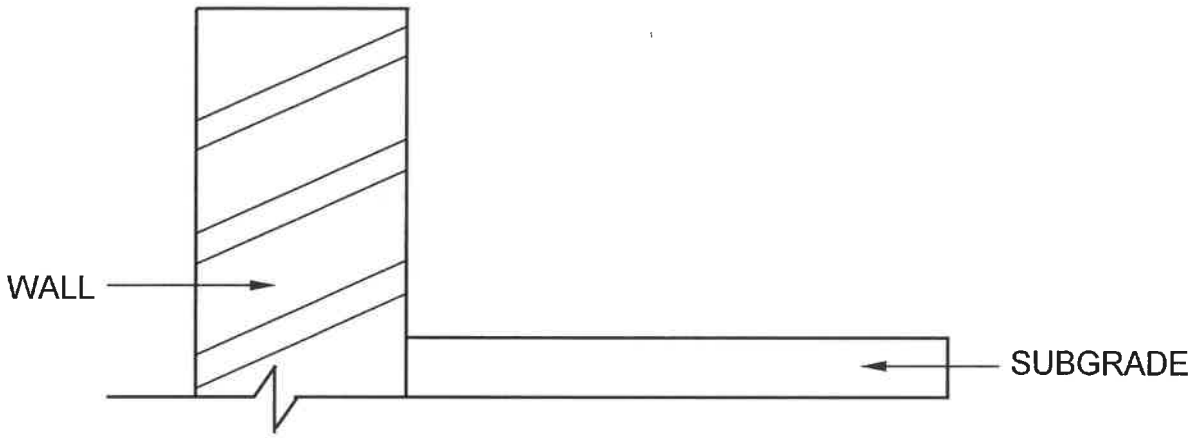
ASSESSMENT CRITERIA		
NO.	**MARK**	**CANDIDATE'S MARK**
1	4	
2	2	
3	2	
4	2	
5	2	
6	2	
TOTAL:	**14**	

Copyright reserved

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 5.7



ASSESSMENT CRITERIA		
NO.	**MARK**	**CANDIDATE'S MARK**
1	1	
2	1	
3	1	
4	1	
5	1	
6	1	
7	2	
TOTAL:	**8**	

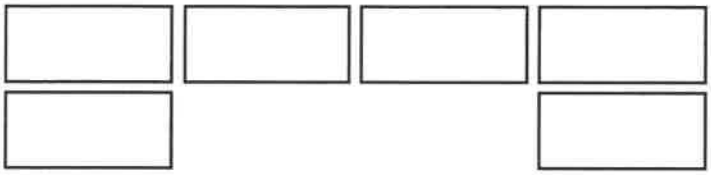
Copyright reserved

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 5.8

FIRST COURSE



SECOND COURSE

ASSESSMENT CRITERIA		
NR.	**MARK**	**CANDIDATE'S MARK**
1	3	
2	1	
3	3	
4	2	
TOTAL:	**9**	

Copyright reserved

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 6.5

DIMENSION PAPER

6.5

	A	B	C	D	
6.5.1					(4)
6.5.2					(4)
6.5.3					(3)
6.5.4					(4)
				Correct use of dimension paper	(1)

[40]

Copyright reserved