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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

CIVIL TECHNOLOGY: CONSTRUCTION

2022

MARKS: 200

TIME: 3 hours



This question paper consists of 14 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, 5.10, 6.4 and 6.7 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 were used as the source of all photographs and pictures.
18. Write neatly and legibly.



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

Start this question on a NEW page.

1.1 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question numbers (1.1.1 to 1.1.5) in the ANSWER BOOK, e.g. 1.1.6 preservative.

- 1.1.1 Can be melted again because no chemical process is involved (1)
- 1.1.2 The coating of a metal by using the process of electrolysis (1)
- 1.1.3 The process of keeping freshly cast concrete moist/damp for a specific period (1)
- 1.1.4 Available in a matt and gloss finish (1)
- 1.1.5 A process used to coat steel with a layer of zinc (1)

1.2 FIGURE 1.2 below shows a ladder that is used on a construction site.



FIGURE 1.2

- 1.2.1 Why should non-skid material be fitted to the bottom end of the stiles of a ladder? (1)
- 1.2.2 Explain why it is better to use a wooden ladder when working near electrical cables. (1)
- 1.2.3 Explain why you would prefer to use an aluminium ladder instead of a wooden ladder. (1)
- 1.2.4 Name TWO methods that can be used to treat wooden ladders. (2)



- 1.3 Describe TWO safety regulations that a scaffold platform must adhere to. (2)
- 1.4 Name TWO places on a building site where safety nets should be erected to ensure the safety of the workers. (2)
- 1.5 FIGURE 1.5 below shows a joining fixture.



FIGURE 1.5

- 1.5.1 Identify the joining fixture. (1)
- 1.5.2 Explain the first THREE steps you would follow to attach a bracket to a brick wall by using the fixture above after the position of the hole has been marked. (3)
- 1.6 Complete in your ANSWER BOOK the information in the table below by indicating ONE use and ONE way to care for the tool.

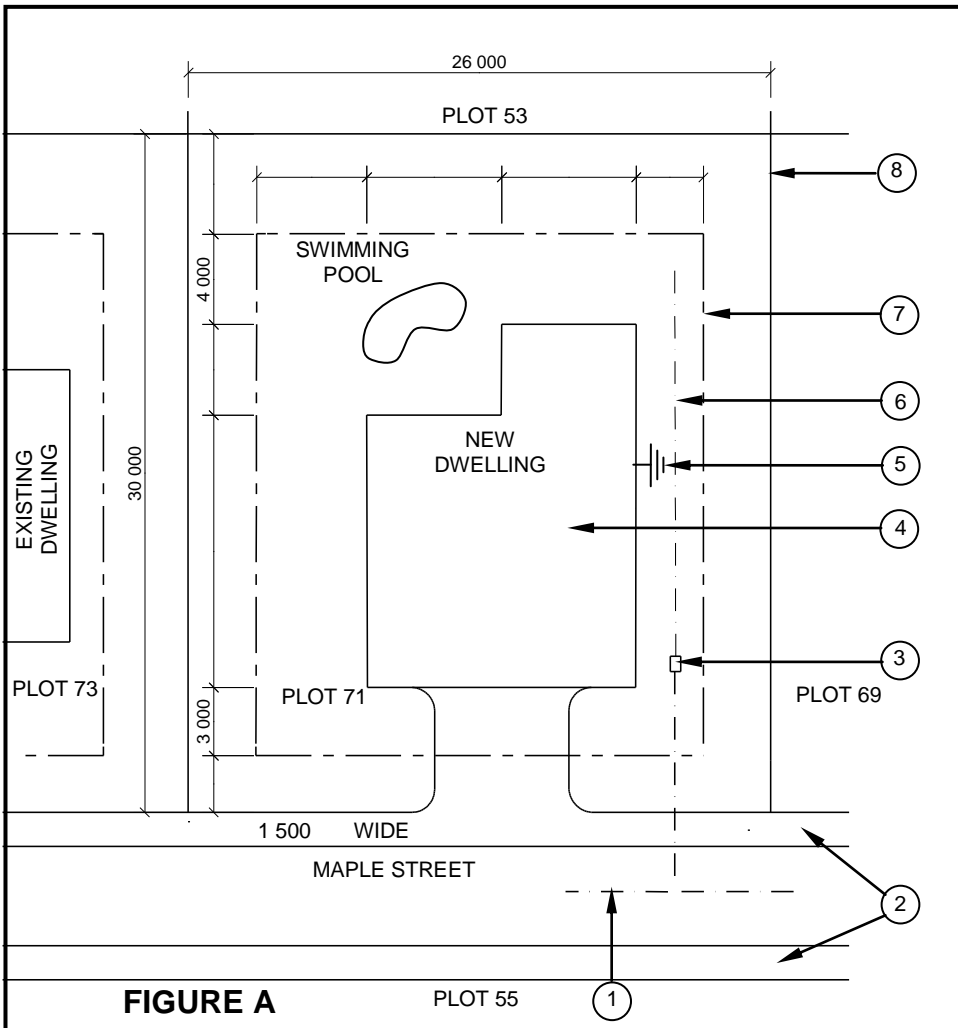
NAME OF TOOL	USE	WAY TO CARE
Dumpy level	To determine ...	Protect the dumpy level by ...

(2)
[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

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.





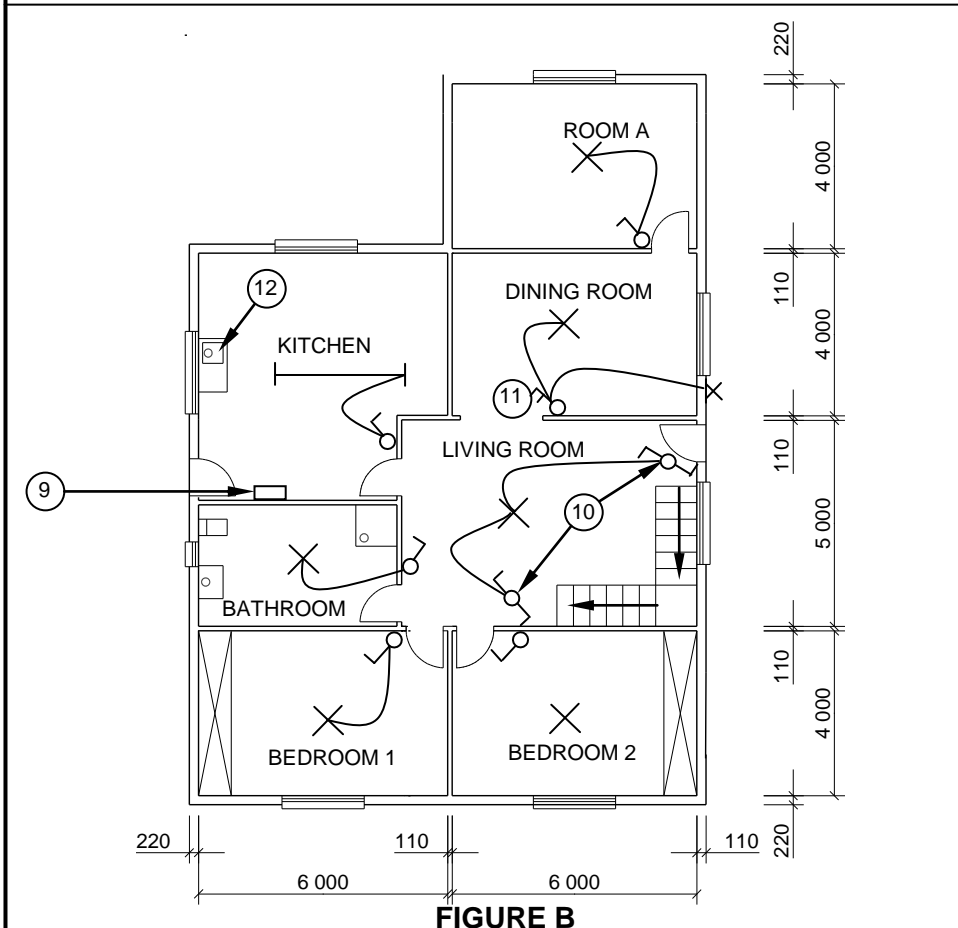
NOTES:
Contractors must verify all dimensions and levels on site before commencing work. Architects must be notified of any discrepancies immediately.


Wall thickness: External = 220 mm
Internal = 110 mm

Architect's signature

Client's signature

Precast concrete fencing must be erected on the boundary of the new dwelling.



REVISION: 1	DATE: 18/04/2022	DESCRIPTION: WINDOW IN ROOM A
PRINTED BY: TEXON PRINTERS		DATE OF PRINT: 24/04/2022
DRAWING TITLE: SITE AND FLOOR PLAN PLOT 71		
PROJECT: PROPOSED DWELLING ON PLOT 71, JEFFREYS BAY		
PROJECT NO.: GR 339-670		DRAWING NO.: 443P8
DATE: 12/02/2022	DRAWN: JP COX	CHECKED: C LEE
SITE PLAN		SCALE: 1 : 500
FLOOR PLAN		SCALE 1 : 100
REFERENCE CODE QP 4 - 2022		
 [40]		

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

Start this question on a NEW page.

- 3.1 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 (3.1.1. to 3.1.5) in the ANSWER BOOK, e.g. 3.1.6 10 m.

9 metres; J-bolt; 760 mm; bolted; 38 mm x 38 mm; steel pin; clamped; 7 metres; 50 mm x 76 mm; 114 mm x 28 mm; 650 mm

- 3.1.1 Method of securing a wall plate to a brick wall (1)
- 3.1.2 Place in position while the concrete is still wet (1)
- 3.1.3 The maximum span for a king post roof truss (1)
- 3.1.4 The measurements of a purlin used for corrugated iron roof sheeting (1)
- 3.1.5 The maximum distance of the spacing between roof trusses for a fibre-cement tiled roof (1)
- 3.2 Explain the term *margin of a staircase*. (2)
- 3.3 Describe the term *pitch board of a staircase*. (2)
- 3.4 FIGURE 3.4 below shows a straight flight of stairs. Identify **A**, **B** and **C**. (3)

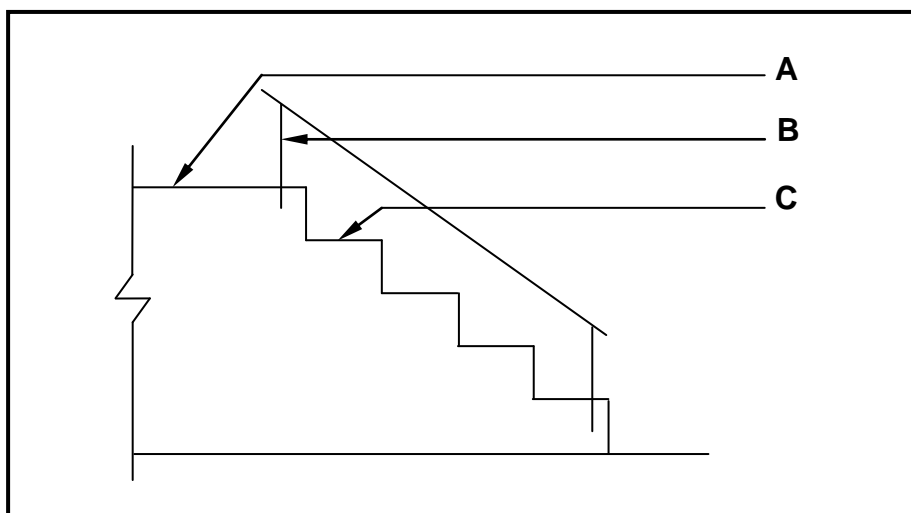


FIGURE 3.4

(3)



3.5 FIGURE 3.5 below shows a faulty lean-to roof construction.

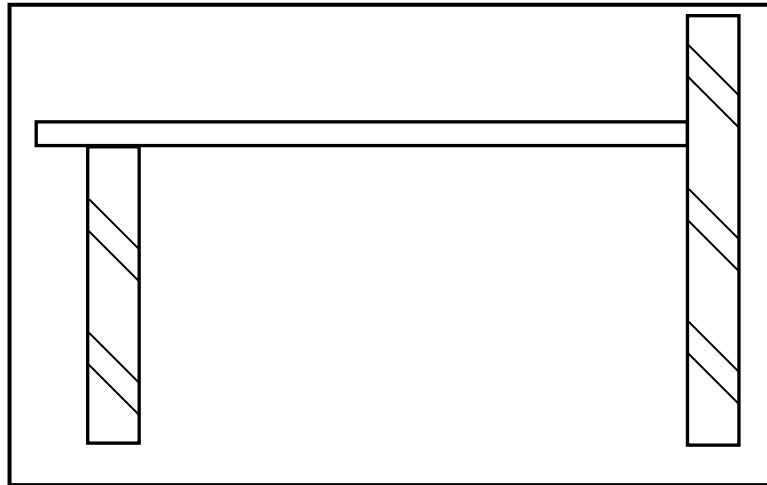


FIGURE 3.5

3.5.1 Name ONE fault and ONE consequence of this faulty construction. (2)

3.5.2 Use your ANSWER BOOK and draw a neat freehand sketch correcting the faulty construction. (3)

3.6 Use ANSWER SHEET 3.6 and draw, to scale 1 : 20, a collar-tie roof truss showing just more than half of the roof truss with a pitch of 45°. The span of the roof is 4 000 mm and the overhang is 400 mm. Print any TWO labels. (13)
[30]



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

Start this question on a NEW page.

- 4.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–L) next to the question numbers (4.1.1 to 4.1.8) in the ANSWER BOOK, e.g. 4.1.9 N.

COLUMN A		COLUMN B	
4.1.1	Advantage of ready-mixed concrete	A	uses flexible or steel hoses to place concrete
4.1.2	Disadvantage of ready-mixed concrete	B	thin layers of natural stone
4.1.3	Boom pump	C	used to determine the compressive strength of concrete
4.1.4	Slump test	D	too much water was added to the concrete mix
4.1.5	Collapsed slump	E	compressive strength of 20 MPa after 21 days
4.1.6	Cube test	F	used to determine the workability of concrete
4.1.7	Line pipe concrete pump	G	uses a remote-controlled robotic arm to place concrete
4.1.8	High-strength concrete	H	delivery and pouring delays may affect the quality of the concrete
		I	concrete has the same density throughout
		J	thin layers of masonry
		K	compressive strength of 30 MPa after 28 days
		L	not enough water was added to the concrete mixture

(8 x 1)

(8)



- 4.2 State the minimum distance that excavated soil should be kept away from the edge of a trench. (1)
- 4.3 Explain THREE safety factors that should be considered before excavation begins. (3)
- 4.4 Describe TWO properties of steel shuttering. (2)
- 4.5 Describe THREE methods that can be used to level a site. (3)
- 4.6 Name THREE components of shuttering that is used to support trenches. (3)
- 4.7 Name ONE property of block board used in formwork. (1)
- 4.8 FIGURE 4.8 below shows a machine used on a building site.



FIGURE 4.8

- 4.8.1 Identify the machine shown in FIGURE 4.8. (1)
- 4.8.2 Explain safe handling with regard to hands and feet when operating the machine. (2)
- 4.8.3 Motivate why it is important to clean the parts of the machine after it has been used. (1)
- 4.9 Use ANSWER SHEET 4.9 and complete, in good proportion, the drawing of a vertical sectional view of the formwork for a concrete beam with the floor slab on both sides. (15)

[40]



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

Start this question on a NEW page.

- 5.1 Name the first step you will follow when plastering a wall. (1)
- 5.2 Describe the main function of water when mixing plaster. (1)
- 5.3 Name the mixing ratio of cement and sand that is used in plaster for a wavy surface. (1)
- 5.4 For which type of plaster finish is the Tyrolean machine used? (1)
- 5.5 Name TWO types of screed. (2)
- 5.6 Name the admixture you will add to reduce the water/cement ratio. (1)
- 5.7 FIGURE 5.7 below shows the bottom part of a cavity wall.

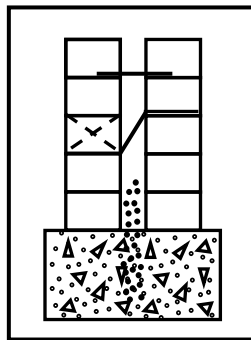


FIGURE 5.7

- 5.7.1 Explain the purpose of the cavity. (2)
- 5.7.2 Use a freehand drawing to differentiate between a *nylon wall tie* and a *twisted pattern wall tie*. (4)
- 5.8 What material is used for grouting between paving bricks? (1)



5.9 Describe the reason for the construction failure in FIGURE 5.9 below.



FIGURE 5.9

(1)

5.10 Use ANSWER SHEET 5.10 and draw, in good proportion, a detailed vertical sectional view showing the closed eave, roof covering and rainwater system. Print any TWO labels.

(15)
[30]



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

Start this question on a NEW page.

6.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (6.1.1 to 6.1.5) in the ANSWER BOOK, e.g. 6.1.6 D.

- 6.1.1 Which ONE of the following is a force that can act on a structure?
- A Shear force
 - B Compression force
 - C Tensile force
 - D All the above-mentioned (1)
- 6.1.2 Reinforcement on a construction drawing is indicated using a code. In the code 9R 16 01 150, the 150 indicates the ...
- A centre-to-centre spacing of the bars.
 - B diameter of the bar.
 - C number of bars in the group.
 - D bar number. (1)
- 6.1.3 What does a steel-tube caisson pile use?
- A Wet concrete plug
 - B Casing driven into the ground
 - C Steel tip attached to the front
 - D Precast concrete pile (1)
- 6.1.4 The average striking time for the formwork of a suspended concrete floor is ... days.
- A 62
 - B 28
 - C 7
 - D 14 (1)
- 6.1.5 The bars for a 100 mm thick reinforced concrete floor slab should be ...
- A 10 mm bars with 112 mm spacing.
 - B 12 mm bars with 150 mm spacing.
 - C 10 mm bars with 150 mm spacing.
 - D 12 mm bars with 112 mm spacing. (1)



- 6.2 In the correct sequence, explain in FOUR steps how driven in-situ piles can be installed. (4)
- 6.3 FIGURE 6.3 below shows material used in a specific concrete floor construction.

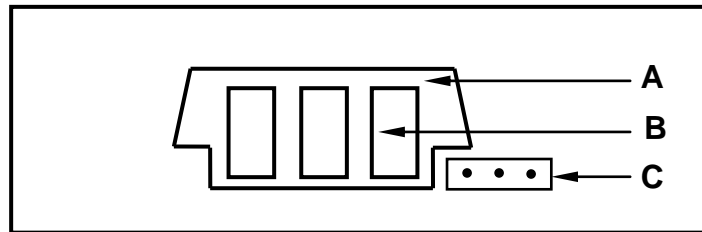


FIGURE 6.3

- 6.3.1 Identify parts **A** and **C**. (2)
- 6.3.2 Describe the purpose of the hole at **B**. (1)
- 6.3.3 Describe TWO disadvantages of this type of floor construction. (2)
- 6.3.4 State THREE components, other than parts **A** and **C**, which are used for this type of floor construction. (3)
- 6.4 FIGURE 6.4 below shows an incomplete vertical sectional view through a continuously supported beam.

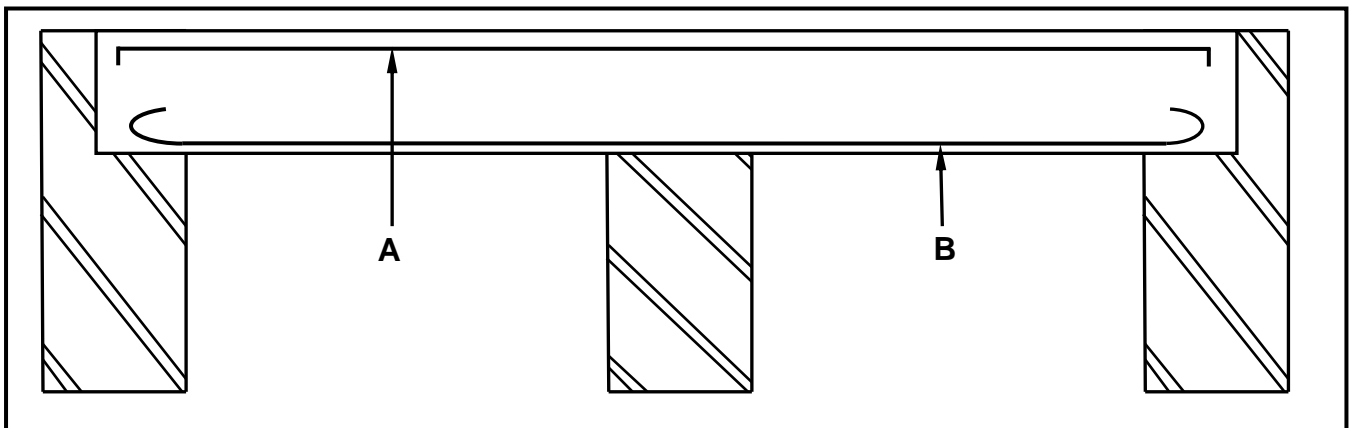


FIGURE 6.4

- 6.4.1 Identify parts **A** and **B**. (2)
- 6.4.2 Use ANSWER SHEET 6.4 and draw the reinforcing of the part encircled. Show and label the minimum concrete cover depth. (7)
- 6.5 Describe TWO reasons why minimum concrete cover depth is important for concrete reinforcement. (2)



6.6 Reinforcing that is exposed to severe conditions must be protected by a minimum concrete cover of 40 mm. State TWO elements against which this reinforcing must be protected. (2)

6.7 FIGURE 6.7 below shows the floor plan of a store room with a window and a door.

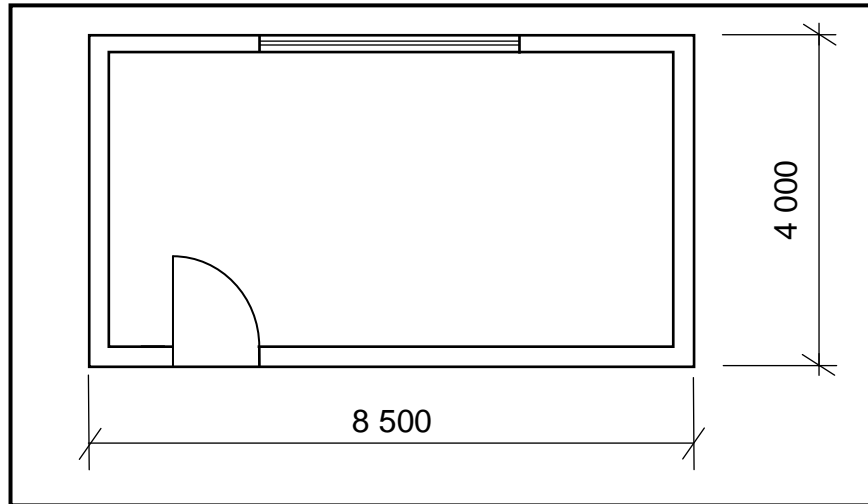


FIGURE 6.7

Use the following specifications:

- The external walls are 220 mm thick.
- The size of the door is 2 100 x 900 mm.

Use the dimension paper on ANSWER SHEET 6.7 and calculate the quantities of the following materials. Round off your answer to TWO decimals.

6.7.1 Total length of the skirting for the store room (ignore the reveals) (6)

6.7.2 Volume of screed for the floor if the screed is 25 mm thick (4)
[40]

TOTAL: 200



CENTRE NUMBER:									
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EXAMINATION NUMBER:																			
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ANSWER SHEET 2

NO.	QUESTIONS	ANSWERS	MARKS
1.	Identify the scale that was used for the site plan and the floor plan respectively.		2
2.	Who is responsible for checking the building plan?		1
3.	What type of fencing does the architect recommend for the new dwelling?		1
4.	Name the town where the new dwelling will be erected.		1
5.	What was done as revision 1?		1
6.	Identify number 1.		1
7.	Identify number 3 by giving the abbreviation.		1
8.	Identify number 4.		1
9.	Identify number 5.		1
10.	Identify number 9.		1
11.	Identify number 11.		1
12.	Identify number 12.		1
13.	Identify the number that indicates the boundary line.		1
14.	Describe the purpose of number 2.		1
15.	Deduce the plot number of the existing dwelling from FIGURE A.		1
16.	What is omitted in Maple Street with reference to number 6?		1



17.	What leisure feature is located on the site plan?		1
18.	Draw the north symbol to show that the driveway side is facing east.		3
19.	What is the purpose of the north symbol on a house plan?		1
20.	Which feature indicates that this is a double-storey building?		1
21.	Deduce THREE faults from bedroom 2.		3
22.	Draw the symbol for a wash tub.		2
23.	Draw the symbol for a bath.		2
24.	Draw the symbol for a water meter.		2
25.	Describe TWO reasons why the local municipality would not approve FIGURE A.		2
26.	Calculate the length of the house. Give your answer in m. Show ALL calculations.		6
		TOTAL:	40



CENTRE NUMBER:									
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EXAMINATION NUMBER:														
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ANSWER SHEET 3.6



ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	9	
Any TWO labels	2	
Application of scale	2	
TOTAL:	13	



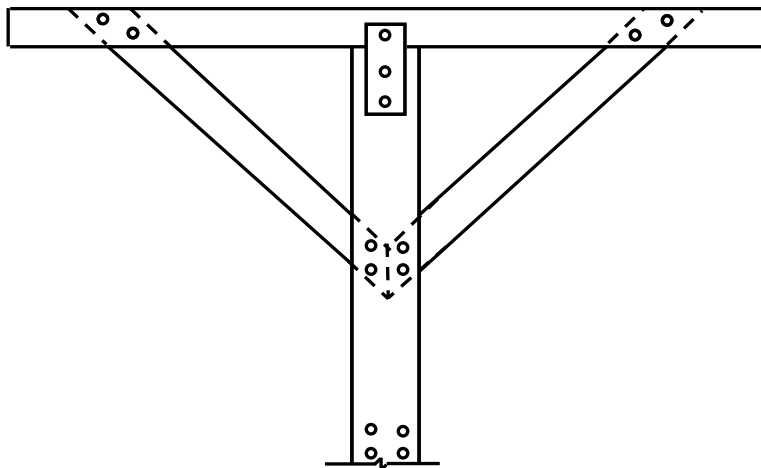
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EXAMINATION NUMBER:

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ANSWER SHEET 4.9



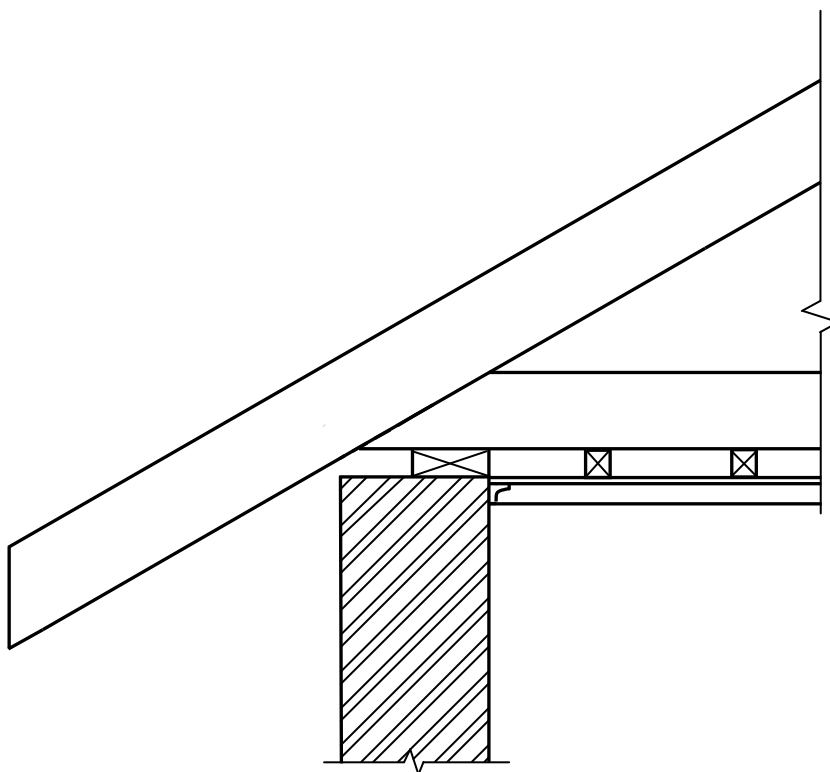
ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	15	
TOTAL:	15	



CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 5.10



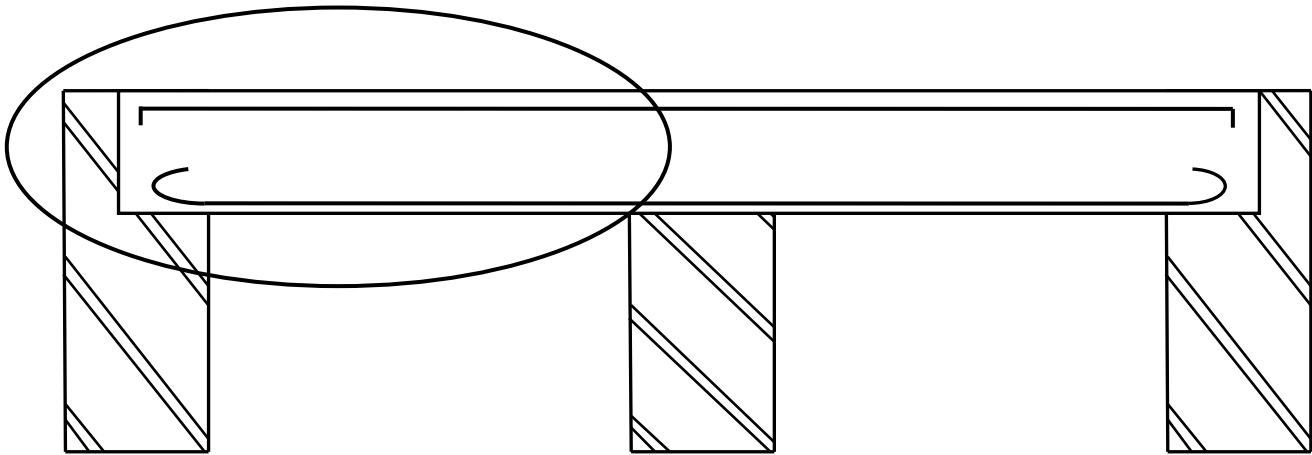
ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing:	13	
Any TWO labels	2	
TOTAL:	15	



CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.4



(7)

ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	5	
Minimum concrete cover depth	2	
TOTAL:	7	



CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 6.7

	A	B	C	D
6.7.1				
6.7.2				

(6)

(4)

