



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

CIVIL TECHNOLOGY

FEBRUARY/MARCH 2010

MARKS: 200

TIME: 3 hours

This question paper consists of 15 pages, 5 answer sheets and a formula sheet.

REQUIREMENTS

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

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. Answer ALL the questions.
3. Answer each question as a whole, do NOT separate subquestions.
4. Start each question on a NEW page.
5. Sketches may be used to illustrate your answers.
6. ALL calculations and written answers must be done in the ANSWER BOOK or on the attached ANSWER SHEETS. (Show ALL steps of workings.)
7. Use the mark allocation as a guide to the length of your answers.
8. Drawings and sketches must be done in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the SANS/SABS Recommended Practice for Building Drawings.
9. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
10. Use your discretion where dimensions and/or details have been omitted.
11. Non-programmable pocket calculators may be used.
12. Answer QUESTIONS 3.2.1, 3.3, 6.1, 6.2 and 6.3 on the attached ANSWER SHEETS, using drawing instruments where necessary.
13. Write your centre number and examination number on every ANSWER SHEET and hand them in with your ANSWER BOOK.
14. Drawings on the question paper are not to scale due to electronic transfer.

QUESTION 1: CONSTRUCTION PROCESSES

1.1 Someone has been burnt. The statements in QUESTIONS 1.1.1 to 1.1.5 list a number of actions that can be taken by someone administering first aid. Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1.1 – 1.1.5) in the ANSWER BOOK.

- 1.1.1 Apply baby oil to the burns. (1)
- 1.1.2 Cut away a casualty's shirt when it is clinging to the burnt skin. (1)
- 1.1.3 Apply a clean dressing to the burns and secure it in place. (1)
- 1.1.4 Remove ashes around the burn by blowing it from the skin. (1)
- 1.1.5 After you have washed your hands, remove pieces of burnt skin and clothing. (1)

1.2 FIGURE 1.2 shows a machine that is used in the built environment.



FIGURE 1.2

- 1.2.1 Identify the machine. (1)
- 1.2.2 List FIVE types of materials on which the machine can be used. (5)
- 1.2.3 Write down the names of parts 1 and 2. (2)
- 1.2.4 What is the function of part 3? (1)
- 1.2.5 Describe THREE safety measures that must be applied when using the machine in FIGURE 1.2. (3)

1.3 Copy the table below in your ANSWER BOOK and complete it by indicating ONE property and ONE use of EACH material that has been indicated.

METAL	PROPERTIES	USES
Aluminium		
Copper		

(4)

1.4 You have finished a bedside cabinet for your parents. Your parents want a back to be fitted to the cabinet to prevent dust from getting onto the content of the cabinet.

1.4.1 What material will you use for the back?

(1)

1.4.2 Show by means of a freehand orthographic sketch the top view of the cabinet indicating how the back will be fixed to the cabinet. Provide the sketch with labels.

(5)

1.5 FIGURE 1.5 below shows two consecutive plan courses of a brick wall.

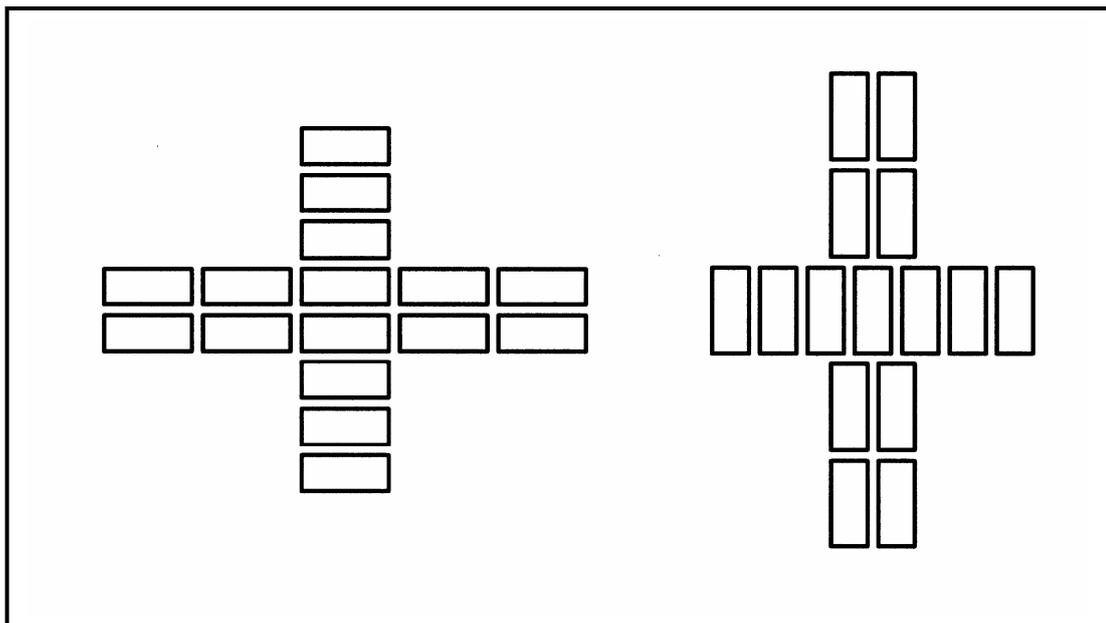


FIGURE 1.5

1.5.1 Identify the bond used in the construction of the walls.

(1)

1.5.2 What is the name given to the arrangement of the bricks in the wall?

(1)

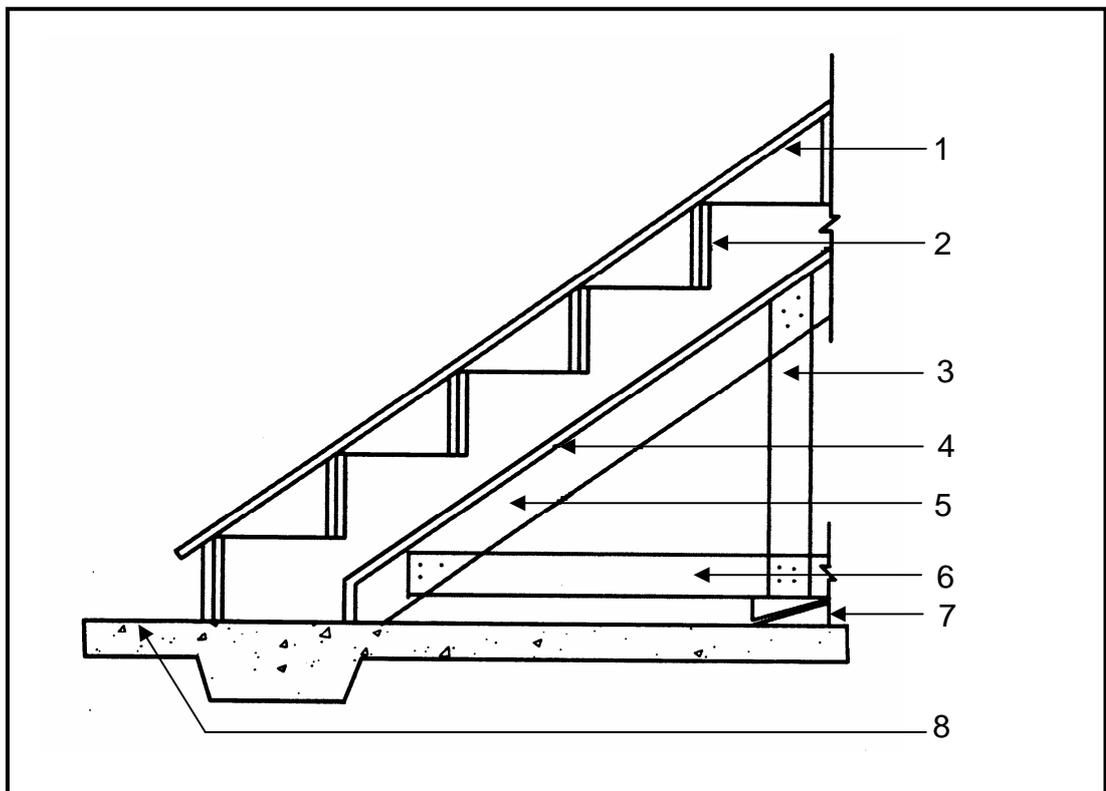
1.5.3 Recommend ONE situation where this construction can be used.

(1)

[30]

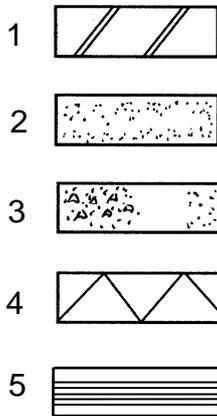
QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

- 2.1 As a potential home owner you have appointed an architect to select a stand in a residential area to build your new house.
- 2.1.1 List FIVE factors that must be considered when buying a new stand. (5)
- 2.1.2 The contractor that is responsible for developing the site is also responsible for implementing safety measures on the building site.
Describe FIVE safety measures the contractor must take to ensure that the site is safe to prevent injuries to workers and the public. (5)
- 2.2 You are an architect and your client needs advice about cavity walls and solid walls. Explain TWO advantages of each type of wall. (4)
- 2.3 Motivate which option, cavity wall or solid wall, you would recommend to your client. (1)
- 2.4 FIGURE 2.4 shows the formwork of part of a staircase. (8)

**FIGURE 2.4**

Write down numbers 1 to 8 in your ANSWER BOOK and write next to each number the correct name of the corresponding member. (8)

2.5 Symbols are an important feature on plans drawn by architects. They help to simplify the reading of drawings. Write down the numbers 1 to 5 in your ANSWER BOOK and write next to each number the meaning of the corresponding symbol from the list below.



(5)

2.6 FIGURE 2.6 below shows a reading of the top stage and bottom stage lines as viewed through a dumpy level. Calculate the distance from the dumpy level to the measuring staff.

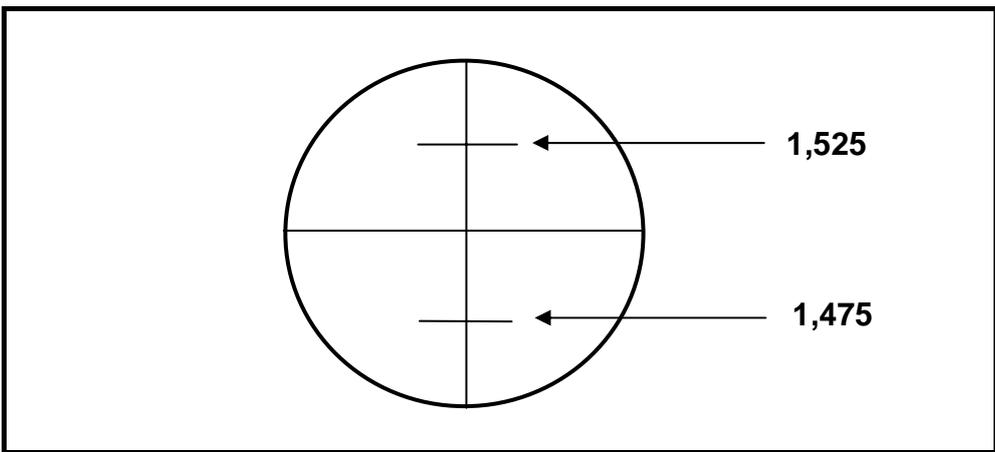


FIGURE 2.6

(6)

2.7 Explain what is meant by the following:

2.7.1 Piling (2)

2.7.2 Underpinning (2)

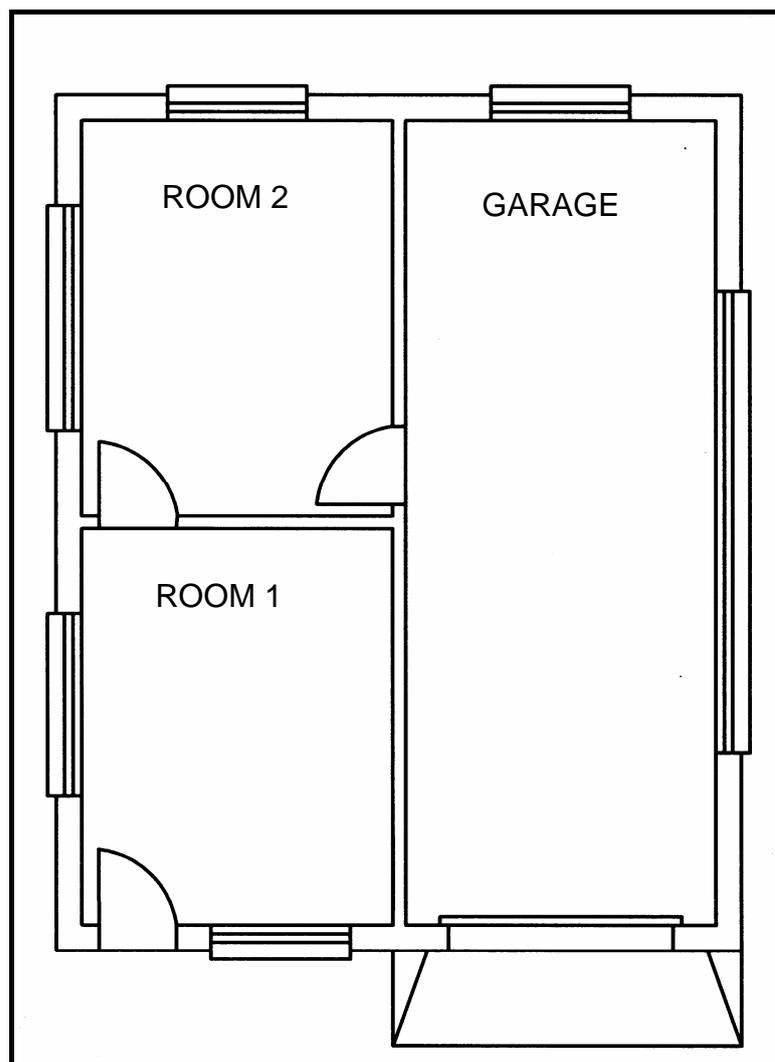
2.8 State TWO safety precautions that must be adhered to when working with scaffolds.

(2)

[40]

QUESTION 3: CIVIL SERVICES

- 3.1 Name ONE factor that should be taken into consideration when installing a solar water heating system. (1)
- 3.2 FIGURE 3.2 on ANSWER SHEET 3.2.1 shows the single-line plan of a dwelling with an outbuilding.
- 3.2.1 Use ANSWER SHEET 3.2.1 and design a sewerage layout for the building to conform to regulations and principles of sewerage systems. Show ALL abbreviations and pipe details for the sewerage system. (16)
- 3.2.2 Name ONE part of the sewerage system that will allow you to access the sewerage system in case of a blockage. (1)
- 3.3 A client has provided you with a sketch of a floor plan for a garage with store room facilities, as illustrated in FIGURE 3.3 below.

**FIGURE 3.3**

Use ANSWER SHEET 3.3 and draw the symbols for the following electrical fittings on the plan. Use the correct symbols for ALL components.

Use the following specifications:

- Each room and the garage must have a power socket. (3)
 - Rooms 1 and 2 must each have a light and a one-way light switch. (4)
 - The garage must have a double fluorescent tube light with a one-way light switch. (2)
 - Show the distribution board. (1)
 - An outside light with a one-way light switch must be fitted at the entrance of the garage. (2)
- [30]**

QUESTION 4: MATERIALS

- 4.1 A slump test is conducted to determine the workability of concrete.
- 4.1.1 List THREE items that form part of the slump test apparatus. (3)
- 4.1.2 What does the distance between the top of the concrete and the underside of the tamping rod represent, when measured during the slump test? (1)
- 4.2 Explain ONE way in which you would treat formwork material after dismantling to ensure that it will stay in a good condition for future use. (1)
- 4.3 You are a cabinet maker, and you have recommended to a client to use melamine boards in the construction of a built-in cabinet. What was the basis of your recommendation? Give TWO reasons. (2)
- 4.4 FIGURE 4.4 shows the floor plan of a building of which the floor must be tiled and the inside walls must be painted.

Study FIGURE 4.4 carefully and answer the questions that follow.

(The wall of the building is 220 mm thick.)

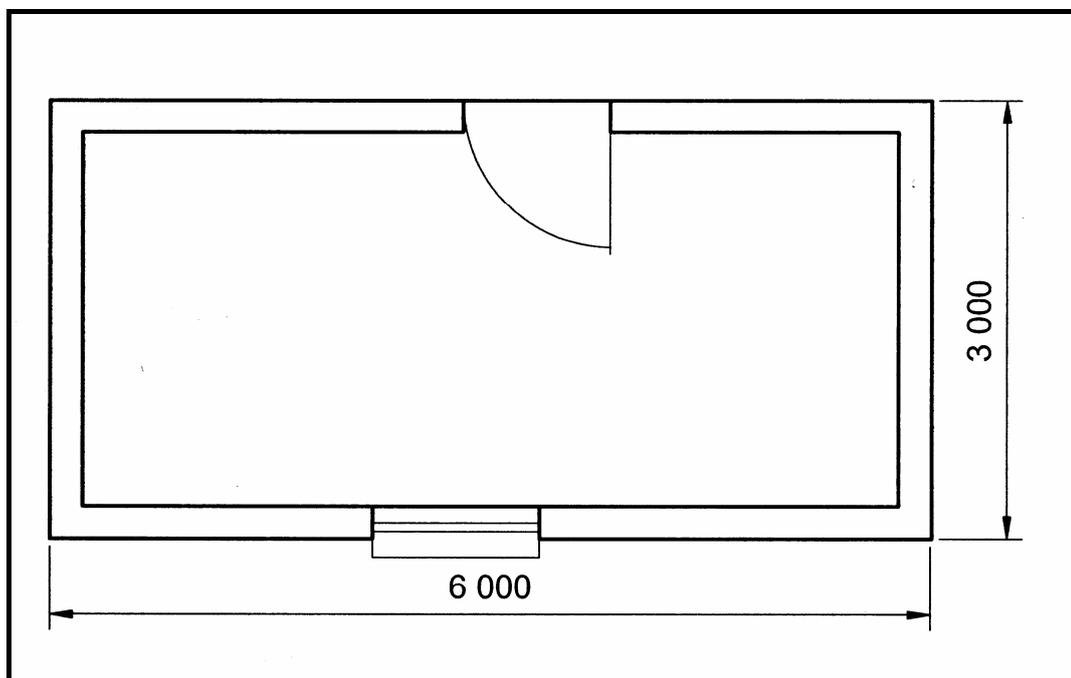


FIGURE 4.4

- 4.4.1 You are a quantity surveyor. Calculate the quantity of tiles required to cover the floor of the building. (Ignore the space for grout.) Allow 5% for cutting and waste.

HINT: Round off your calculations to TWO decimal places before the final answer.

SPECIFICATIONS:

Size of one floor tile = 250 mm x 250 mm (11)

- 4.4.2 Calculate the area of the inside walls that have to be painted. (Ignore reveals.)

SPECIFICATIONS:

- Walls are 220 mm thick.
- Outside measurements of building = 6 000 mm (long) x 3 000 mm (wide)
- Height of wall on inside (floor to ceiling) = 2 700 mm
- Size of window = 900 mm (wide) x 600 mm (high)
- Size of a door = 2 000 mm (high) x 910 mm (wide)

(12)
[30]

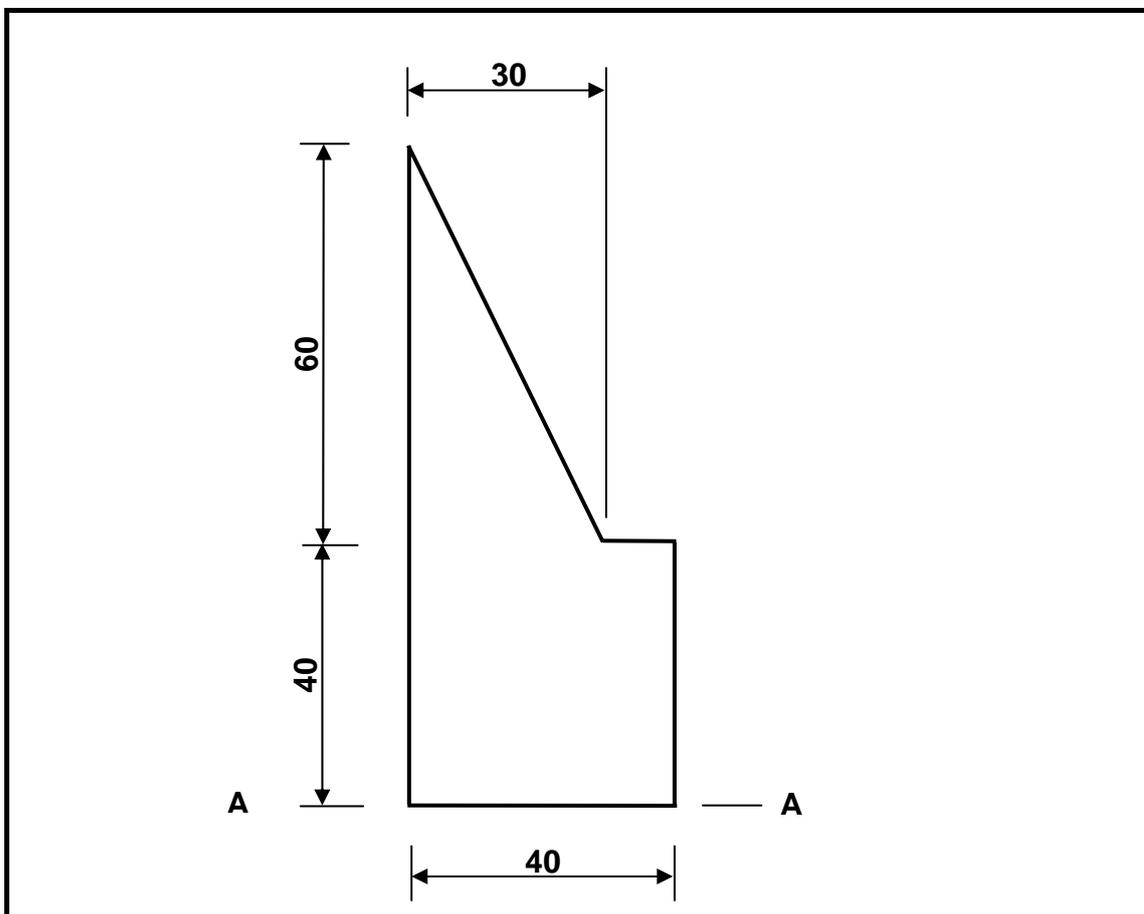
QUESTION 5: APPLIED MECHANICS

- 5.1 Write down the numbers 5.1.1 to 5.1.5 in your ANSWER BOOK and give the correct name or symbol for the unit in the table below.

BASE UNIT	UNIT	SYMBOL
Length	metre	5.1.1
Stress	5.1.2	Pa
Mass	kilogram	5.1.3
Force	5.1.4	N
Moment of force	newton metre	5.1.5

(5)

- 5.2 A shaped lamina is shown in the figure below. Calculate the position of the centroid from the A-A line. (ALL measurements are in mm.)

**FIGURE 5.2**

(14)

5.3 FIGURE 5.3 shows the space diagram and the force diagram of a frame. Write down the numbers 5.3.1 to 5.3.6 in your ANSWER BOOK and indicate the nature of the forces in the corresponding members, as illustrated in the table below, by using the given information from the diagrams.

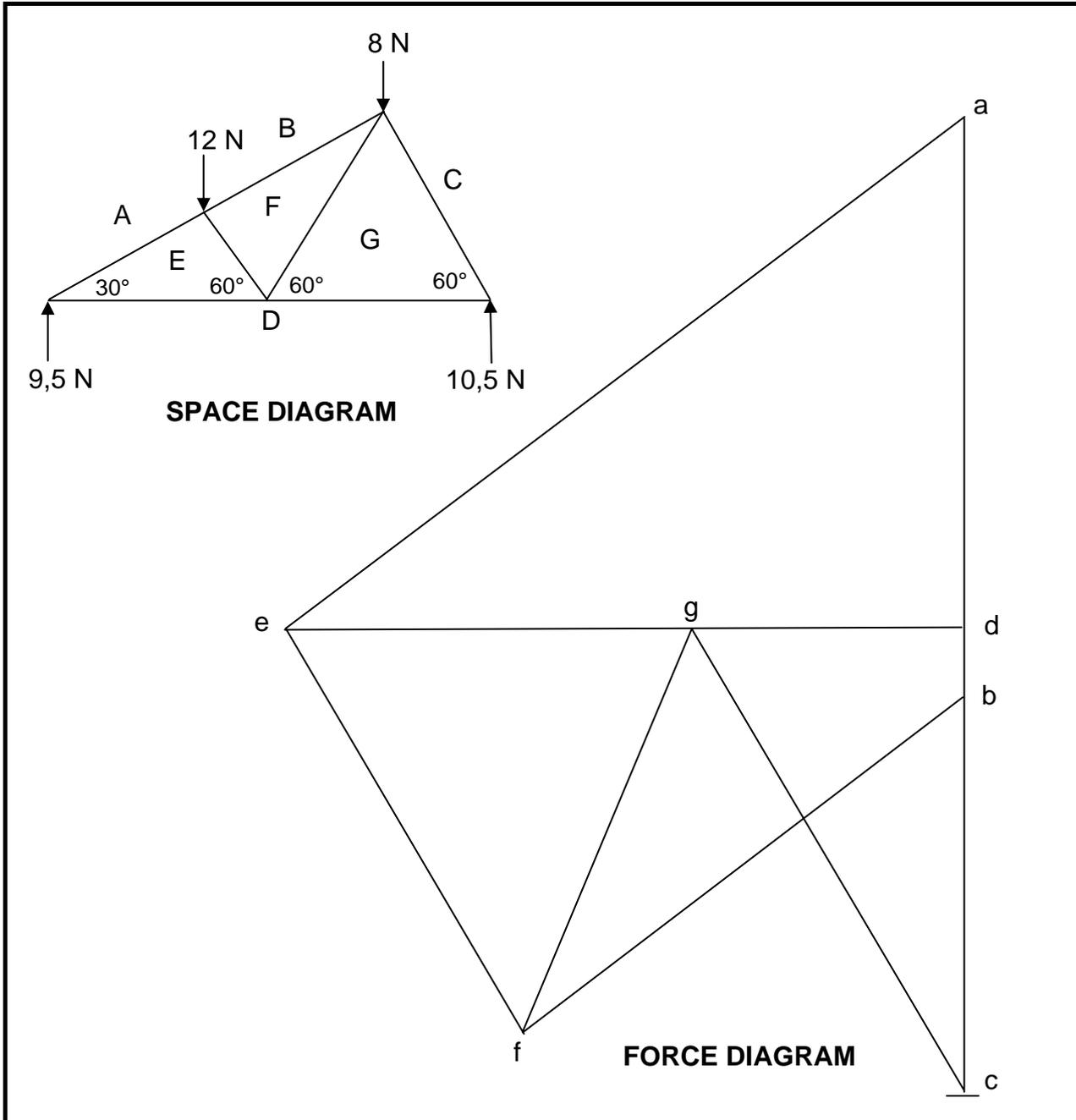


FIGURE 5.3

(6)

NO.	MEMBER	NATURE
5.3.1	AE	
5.3.2	BF	
5.3.3	CG	
5.3.4	DE	
5.3.5	DG	
5.3.6	EF	

- 5.4 A simple supported beam with a span of 8 metres, loaded with one point load and one uniformly distributed load (UDL), is shown in FIGURE 5.4.

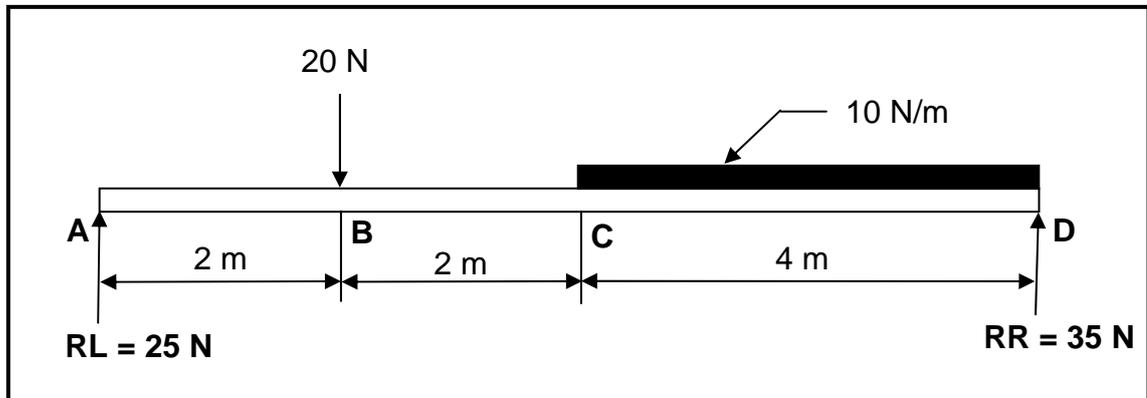


FIGURE 5.4

- 5.4.1 Use the information in FIGURE 5.4 and draw to scale $1 \text{ mm} = 1 \text{ N}$ only a shear force diagram in your ANSWER BOOK.

HINTS:

Do not draw the space diagram.

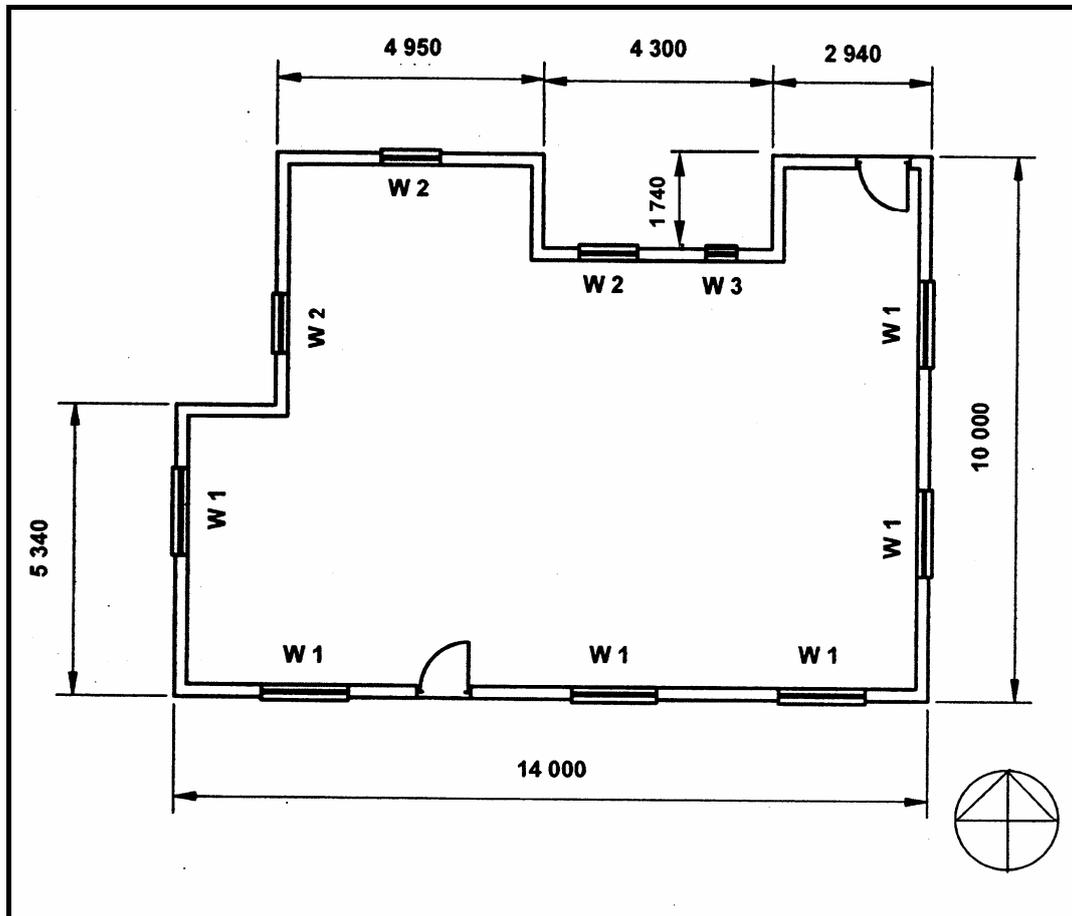
Use scale $10 \text{ mm} = 1 \text{ m}$ on the reference line (baseline) of the shear force diagram to determine points A, B, C and D. (4)

- 5.4.2 By using the shear force diagram, determine the shear force at point B. (1)

[30]

QUESTION 6: GRAPHICS AND COMMUNICATION

- 6.1 FIGURE 6.1 shows the floor plan of a dwelling. Use ANSWER SHEET 6.1 and design a hipped roof for this building. The eaves overhang is 500 mm on all sides. (Use scale 1:100 to draw the eaves overhang.)

**FIGURE 6.1**

(15)

6.2 FIGURE 6.1 shows the floor plan of a dwelling. Use ANSWER SHEET 6.2 and draw to scale 1:100 the south elevation of the building without the roof. Also show the following labels on your drawing:

- Natural ground level (NGL)
- Finished floor line (FFL)
- South elevation
- Scale 1:100

The following must also be visible on your drawing:

- Opening parts of windows
- Step at the door
- Window sills

SPECIFICATIONS:

- Window 1: 1 600 mm wide x 1 200 mm high
- Window 2: 1 100 mm wide x 1 200 mm high
- Window 3: 600 mm wide x 1 200 mm high
- Doors: 2 000 mm high x 900 mm wide
- Height between top level of floor slab and underside of wall plate is 2 600 mm
- Height between natural ground level and top level of floor slab is 150 mm

(17)

6.3 FIGURE 6.3 on ANSWER SHEET 6.3 shows the site plan of a building site. Use the floor plan as shown in FIGURE 6.1 and draw it correctly on the site plan.

Use the following specifications:

- Scale 1: 250
- The proposed building must be placed 7 m from the building line, parallel to MAUREEN STREET and ON the EASTERN BUILDING LINE.

(8)
[40]

TOTAL: 200



ANSWER SHEET 3.2.1

QUESTION 3.2.1

CENTRE NUMBER:

EXAMINATION NUMBER:

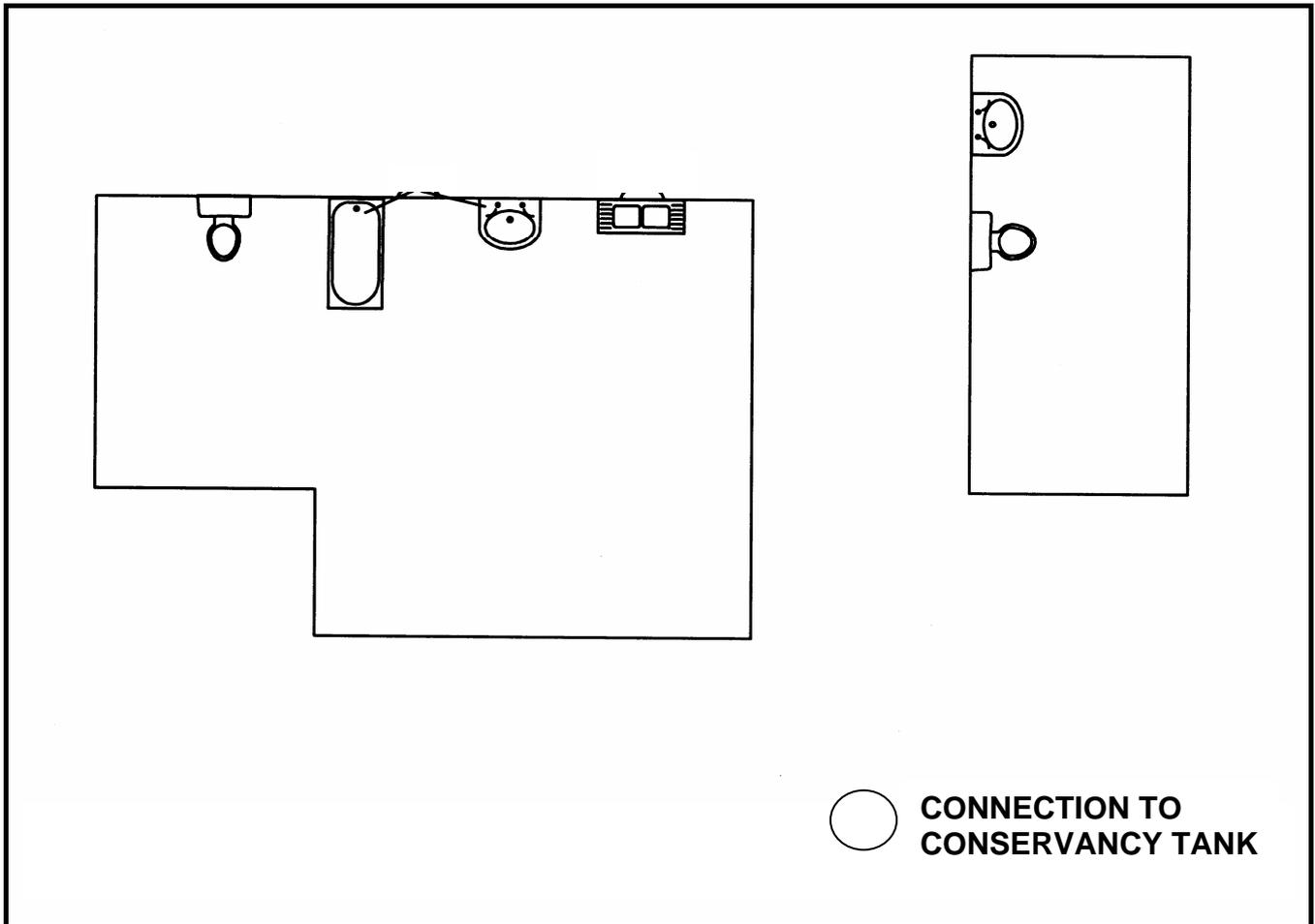


FIGURE 3.2

RE (Rodding eye)	2	
IE (Inspection eye)	5	
G (Gulley)	1	
VP (Vent pipe)	2	
Description of pipe	4	
Manhole/RE near connection to conservancy tank	1	
Correct line type for drain	1	
TOTAL	16	

ANSWER SHEET 3.3

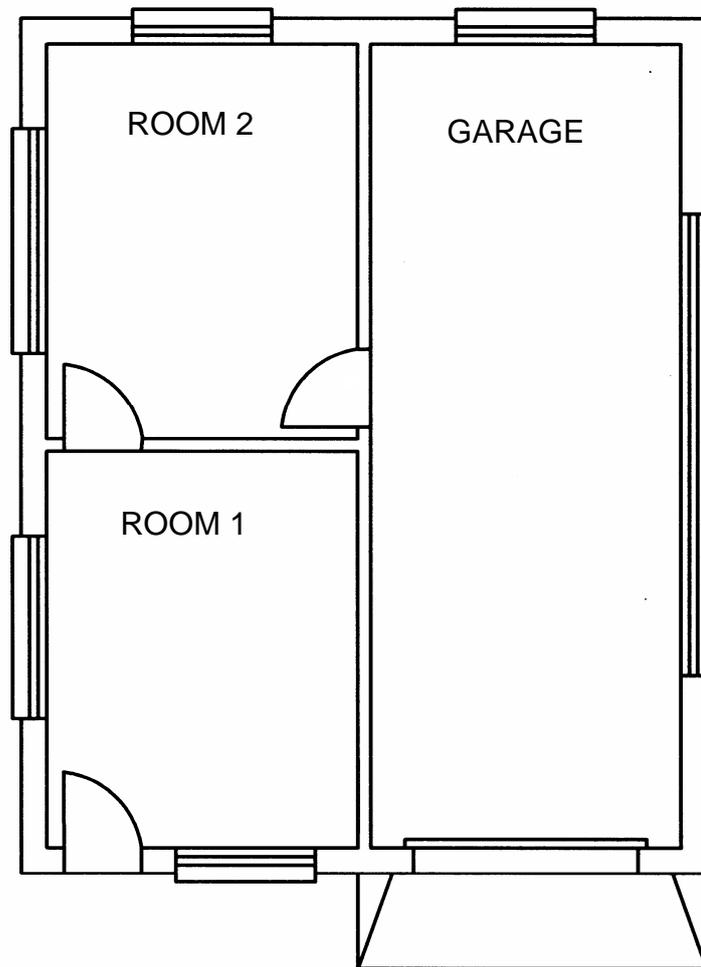
QUESTION 3.3

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 6.2

QUESTION 6.2

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 6.3

QUESTION 6.3

CENTRE NUMBER:

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EXAMINATION NUMBER:

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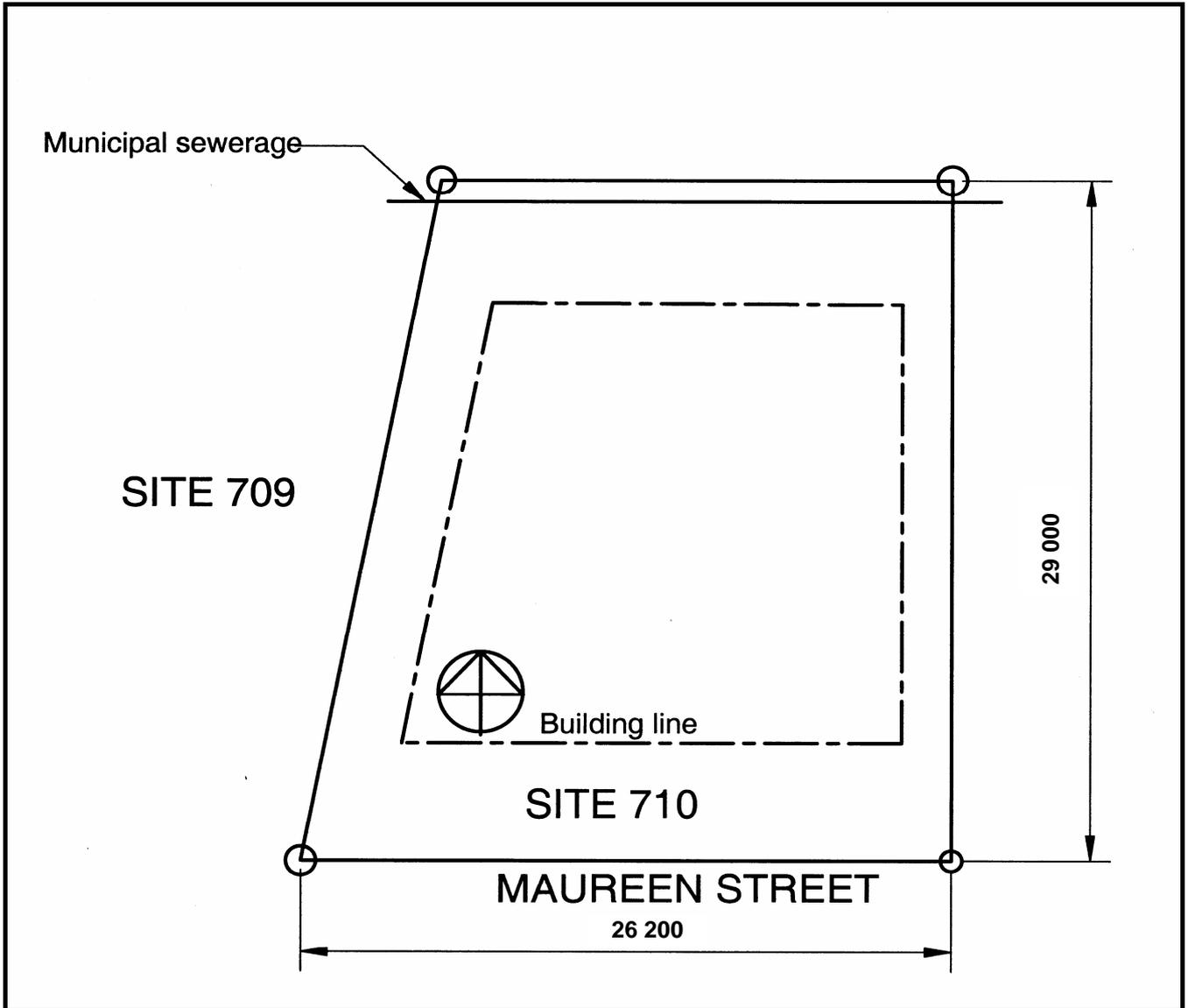


FIGURE 6.3

FORMULA SHEET

IMPORTANT ABBREVIATIONS

SYMBOL	DESCRIPTION	SYMBOLS	DESCRIPTIONS	SYMBOL	DESCRIPTION
G	Centre of gravity	h	Height	d	Diameter
C	Centroid	b	Breadth/Width	r	Radius
L	Length	s	Side	A	Area
π	Pi = $\frac{22}{7} = 3,142$	\emptyset	Diameter	V	Volume

FORMULAE

AREA OF	FORMULA (in words)	FORMULA (in symbols)	FORMULA FOR THE POSITION OF CENTROIDS	
			X-axis	Y-axis
Square	Length x Breadth	$l \times b$	$\frac{l}{2}$	$\frac{b}{2}$
Rectangle	Length x Breadth	$l \times b$	$\frac{l}{2}$	$\frac{b}{2}$
Right-angled triangle	$\frac{1}{2} \times \text{base} \times \text{height}$	$\frac{1}{2}b \times h$	$\frac{b}{3}$	$\frac{h}{3}$
Equilateral triangle/ Pyramid	$\frac{1}{2} \times \text{base} \times \text{height}$	$\frac{1}{2}b \times h$	$\frac{b}{2}$	$\frac{h}{3}$
Circle	$\pi \times \text{radius} \times \text{radius}$	πr^2	Centroid in the centre	
Circle	$\pi \times \text{diameter} \times \text{diameter} \div 4$	$\frac{\pi d^2}{4}$		
Semi-circle	$\pi \times \text{radius} \times \text{radius} \div 2$	$\frac{\pi r^2}{2}$		

$$\text{Position of centroid} = \frac{(A1 \times d) + (A2 \times d)}{\text{Total area}}$$

OR

$$X = \frac{\sum Ay}{\sum A}$$