basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

CIVIL TECHNOLOGY: CONSTRUCTION

2019

MARKS: 200

TIME: 3 hours

This question paper consists of 14 pages and 8 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. Answer each question as a whole. Do NOT separate subsections of questions.
4. Start the answer to EACH question on a NEW page.
5. Do NOT write in the margins of the ANSWER BOOK.
6. You may use sketches to illustrate your answers.
7. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
8. Use the mark allocation as a guide to the length of your answers.
9. 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.*
10. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
11. Use your own discretion where dimensions and/or details have been omitted.
12. Answer QUESTIONS 2, 3.6, 4.4, 4.6, 5.5, 5.6, 6.4 and 6.6 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, whether you have used them or not.
14. Drawings in the question paper are NOT to scale due to electronic transfer.
15. Google Images was used as the source for all photographs and pictures.

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

Start this question on a NEW page.

1.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–G) next to the question numbers (1.1.1 to 1.1.5) in the ANSWER BOOK, e.g. 1.1.6 H.

COLUMN A		COLUMN B	
1.1.1	Galvanising	A	keeps freshly cast concrete damp
1.1.2	Electroplating	B	metal dipped in lead
1.1.3	Curing	C	protects wood and other material against natural decay
1.1.4	Paint	D	a plastic finish on metal surfaces, applied with a compressed air spray gun
1.1.5	Powder coating	E	coating mild steel with a thin layer of another material by electrolysis
		F	coating timber with a thin layer of another material by electrolysis
		G	metal dipped in zinc

(5 x 1) (5)

1.2 Explain ONE cause of injuries when handling materials. (1)

1.3 Give the angle/ratio at which a ladder should be placed against a wall. (2)

1.4 Explain TWO safety precautions that must be followed when using a builder's hoist. (2)

1.5 FIGURE 1.5 below shows tools that are used on a construction site.

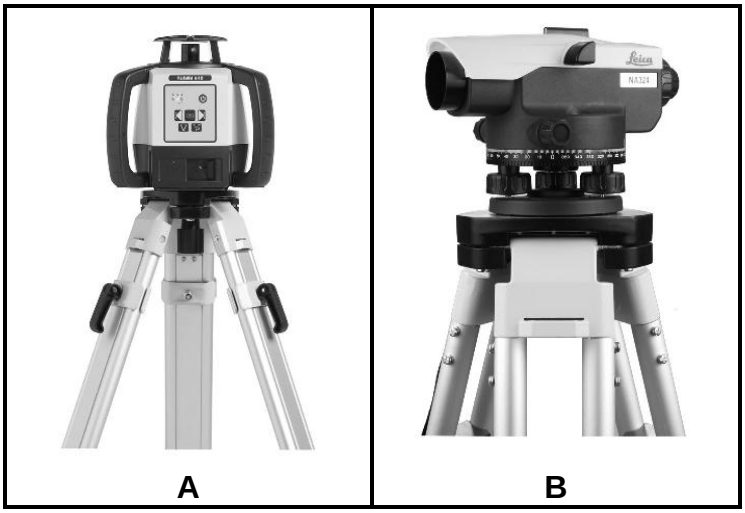


FIGURE 1.5

1.5.1 Identify both **A** and **B**. (2)

1.5.2 Name ONE use of **A** and **B** respectively. (2)

1.6 The pictures below illustrate the steps followed when fixing material to a floor with a fastener.

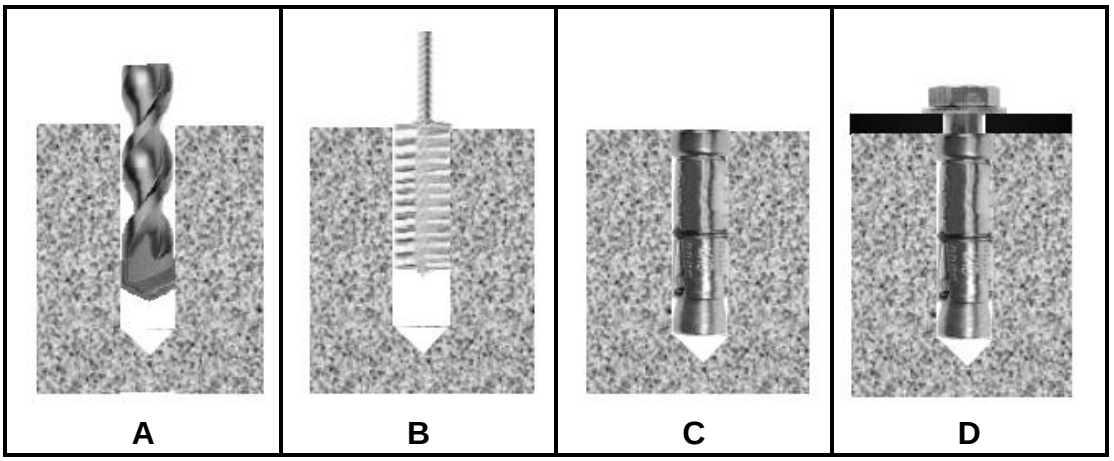


FIGURE 1.3

1.6.1 Identify the fastener that is used in **D**. (1)

1.6.2 Describe the steps in **A**–**D** above in your ANSWER BOOK. (4)

1.6.3 Justify the use of this fastener to secure the bracket of a heavy gate to a wall. (1)

[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

Start this question on a NEW page.

FIGURE 2 on the next page shows an elevation and a ground floor plan that appear on a building plan. Analyse the drawings and complete the table on ANSWER SHEET 2.

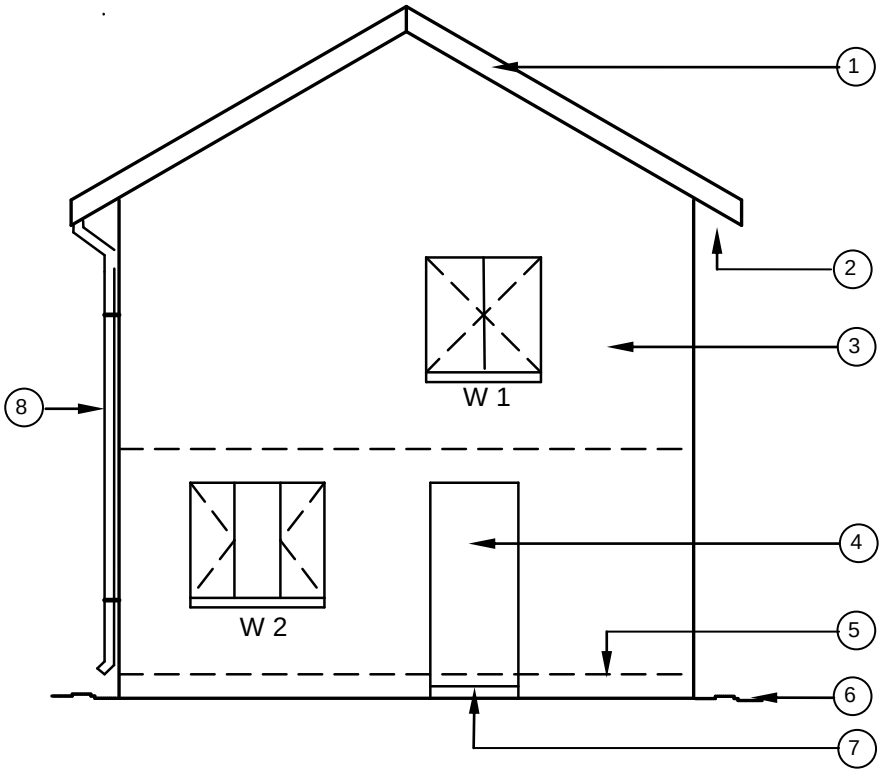


FIGURE A
SCALE 1 : 100

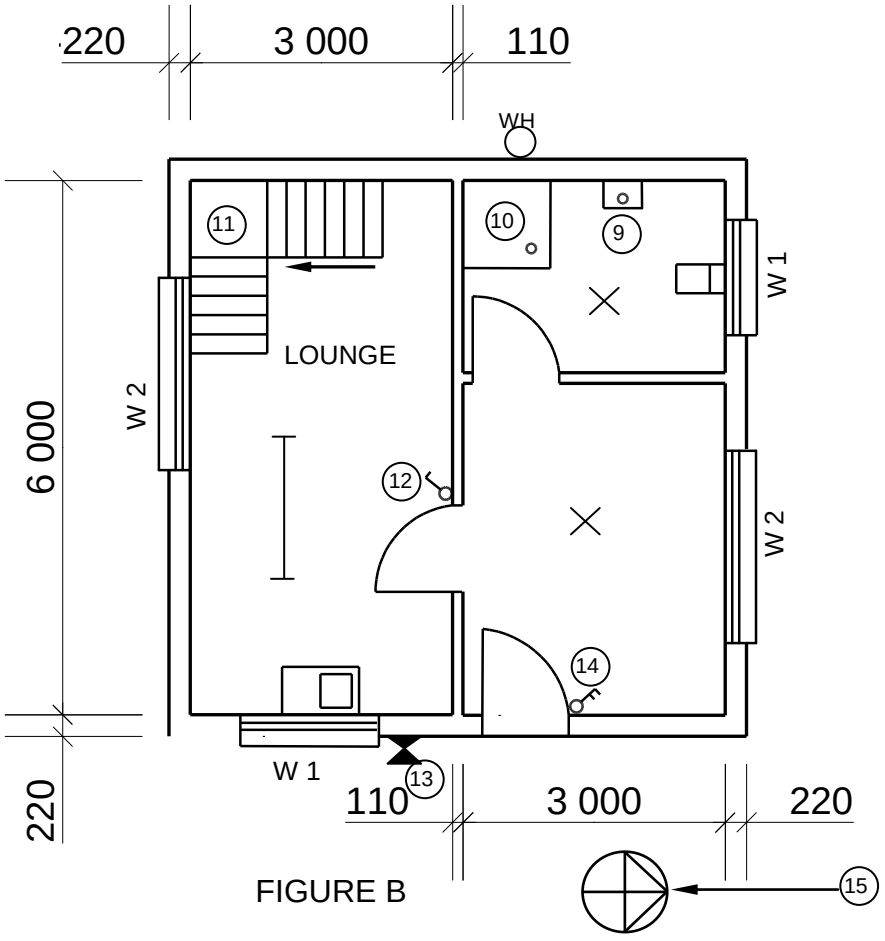


FIGURE B

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

ARCHITECT'S SIGNATURE .....
CLIENT'S SIGNATURE .....

The following must be placed at a long passage or a staircase:

Symbol to be placed at the entrance door of the house:

REVISION	DATE	DESCRIPTION

PRINTED BY:	DATE OF PRINT:
QUALITY PRINTERS	2019/06/16

DRAWING TITLE:
SITE PLAN STAND 1445

PROJECT:
PROPOSED NEW DWELLING OF
MR H SMITH ON STAND 1445,
JUPITER STREET, GERMISTON

PROJECT NO.	DRAWING NO.
GR 447-104	337P7

DATE	DRAWN	CHECKED	SCALE
25/04/2019	JP BOTHA	P BLADE	1 : 100

REFERENCE CODE:
QP 2-2019

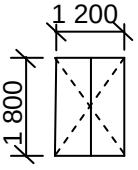
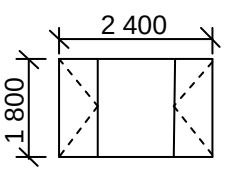
WINDOW 1	WINDOW 2
	

FIGURE 2 **[40]**

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

Start this question on a NEW page.

3.1 Give the minimum pitch of a roof when concrete tiles are used as roof covering. (1)

3.2 Give the dimensions of a purlin that is used for corrugated iron sheeting. (2)

3.3 Give the maximum spacing between roof trusses if the roof is covered with concrete tiles. (1)

3.4 Name the first batten on a roof that is covered with concrete tiles. (1)

3.5 FIGURE 3.5 below is a drawing of a line diagram of a South African (Howe) roof truss. Identify parts **A**–**E**.

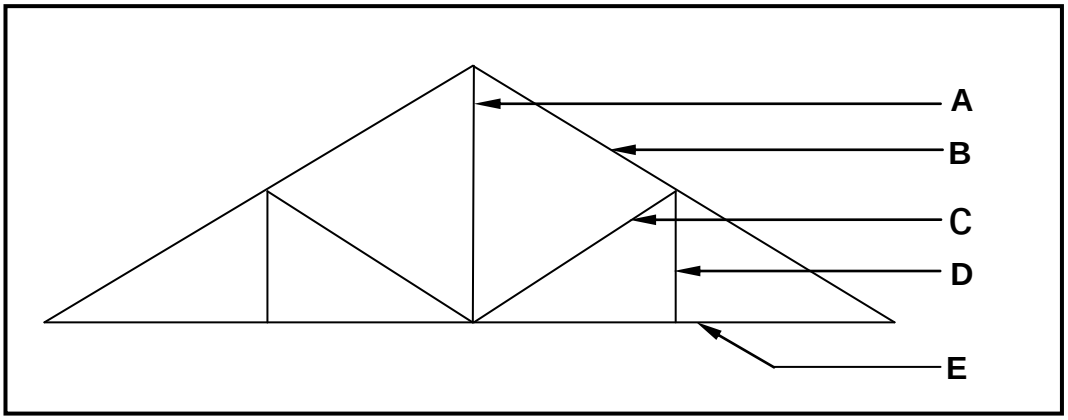


FIGURE 3.5 (5)

3.6 Use ANSWER SHEET 3.6 and draw, in good proportion, a neat sketch of a lean-to roof supported by two walls.

Show the following on your drawing:

- Span
- Walls
- Wall plate
- Rafter
- Any TWO labels (8)

3.7 Recommend a suitable depth that wire or galvanised steel straps should be embedded into the wall for a roof covered with concrete tiles. (1)

3.8 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 (3.8.1 to 3.8.5) in the ANSWER BOOK, e.g. 3.8.6 Flight.

stair well; apron; pitch board; rise; handrail; nosing; tread/going; margin

3.8.1 Overhang at the front end of the tread (1)

3.8.2 A timber board used to cover the floor joist of the landing (1)

3.8.3 Template used to set out a step of a staircase (1)

3.8.4 Open space between flights of stairs (1)

3.8.5 A member that forms part of the balustrade (1)

3.9 What is the maximum pitch for stairs used by the public? (1)

3.10 Describe how to fix a steel column to a concrete base. (5)
[30]

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

Start this question on a NEW page.

4.1 State TWO properties of EACH of the following metals:

4.1.1 Steel (2)

4.1.2 Lead (2)

4.2 Explain TWO functions of a concrete cube test. (2)

4.3 Excavation of soil on a building site is necessary to establish a firm foundation.

4.3.1 Explain THREE safety factors that should be considered before excavation commences. (3)

4.3.2 Describe THREE factors that can cause an excavation to collapse. (3)

4.4 FIGURE 4.4 on ANSWER SHEET 4.4 shows a trench that has been excavated. Use ANSWER SHEET 4.4 and draw a neat sectional drawing, in good proportion, of the shuttering for a shallow trench.

Show the following on your drawing:

- Poling boards
- Walling boards/Wailing boards
- Folding wedge
- Struts
- Any ONE label (8)

4.5 Describe ONE use of folding wedges in formwork. (1)

4.6 FIGURE 4.6 on ANSWER SHEET 4.6 shows an incomplete drawing of the formwork for a concrete beam with an attached floor on the right-hand side. Use ANSWER SHEET 4.6 and complete the drawing.

Show the following on your drawing:

- Bearer/Joist for the soffit
- Cleats
- Braces for beams/struts
- Fixing plates/Kickers
- Wedges
- Any ONE label (11)

4.7 FIGURE 4.7 below shows a plate compactor that is used on a building site. Study FIGURE 4.7 and answer the questions that follow.

FIGURE 4.7

4.7.1 Describe TWO safety precautions that must be observed when using the plate compactor in FIGURE 4.7. (2)

4.7.2 Explain in your own words how you will take care of the plate compactor. (1)

4.8 FIGURE 4.8 below shows a construction machine that is used on a building site.

FIGURE 4.8

4.8.1 Identify the construction machine. (1)

4.8.2 Describe TWO ways in which you will take care of this construction machine. (2)

4.9 Name TWO methods that can be used to pump concrete to higher levels in a building. (2)
[40]

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

Start this question on a NEW page.

5.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–G) next to the question numbers (5.1.1 to 5.1.5) in the ANSWER BOOK, e.g. 5.1.6 H.

COLUMN A	COLUMN B
5.1.1 	A plastering chased pipes
5.1.2 	B floating of screed
5.1.3 	C skim coat
5.1.4 	D power floating
5.1.5 	E wet the wall
	F application of plaster
	G drying of concrete

(5 x 1) (5)

5.2 How many wheelbarrows of sand will you use to mix plaster for interior walls when using ONE bag of cement? (1)

5.3 Recommend THREE areas that can be covered with paving. (3)

5.4 Give ONE reason for using paving instead of concrete. (1)

5.5 ANSWER SHEET 5.5 shows the outlines and a part of the cavity of each alternative plan course of the dead end of a cavity wall. Use ANSWER SHEET 5.5 and draw, in good proportion, the two alternative plan courses of the dead end of a cavity wall. (7)

5.6 Use ANSWER SHEET 5.6 and draw, to scale 1 **:** 10, a detailed vertical section through the foot of a roof truss showing the closed (concealed) eaves.

Show the following on your drawing:

- Wall: 220 mm wide
- Tie beam: 114 x 38 mm
- Wall plate: 114 x 38 mm
- Eaves overhang: 400 mm
- Rafter: 114 x 38 mm
- Fascia board: 228 x 28 mm
- Bearer: 38 x 38 mm
- Hanger: 38 x 38 mm
- 6 mm fibre-cement board on closed eaves
- Two quarter-round mouldings below fibre-cement board
- Any ONE label (13)

[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 C.

6.1.1 Reinforcement is indicated on construction drawings with a code. What does 20 indicate in the following code: 4 R 20 03 250?

A Number of bars in the group
B Bar number
C Diameter of the bar
D Centre-to-centre spacing (1)

6.1.2 Pile foundations consist of …

A precast piles.
B steel-tube piles.
C driven in-situ piles.
D All the above-mentioned (1)

6.1.3 What type of foundation will be used in unstable ground?

A Strip foundation
B Raft foundation
C Pile foundation
D Step foundation (1)

6.1.4 A concrete floor is classified as a reinforced floor when it consists of …

A concrete and anchor bars.
B concrete and main bars.
C concrete and welded mesh.
D All the above-mentioned (1)

6.1.5 Precast concrete piles are driven into the ground by a … hammer.

A drop
B club
C claw
D sledge (1)

6.2 Draw, by means of a neat freehand sketch, the shape of the bottom part of a driven in-situ pile.

Show the following on your drawing:

- Steel casing
- Shape of the bottom part
- Any ONE label (4)

6.3 Explain the purpose of the steel capping on a precast concrete pile. (1)

6.4 FIGURE 6.4 on ANSWER SHEET 6.4 shows the outline of three sides of an L-shaped concrete column. Use ANSWER SHEET 6.4 and draw a neat sectional view of an L-shaped reinforced concrete column in good proportion.

Show the following on your drawing:

- L-shaped column
- 8 main bars
- Stirrups/Binders
- Minimum concrete cover
- Any TWO labels (10)

6.5 FIGURE 6.5 below shows a part of a floor construction. Study FIGURE 6.5 and answer the questions that follow.

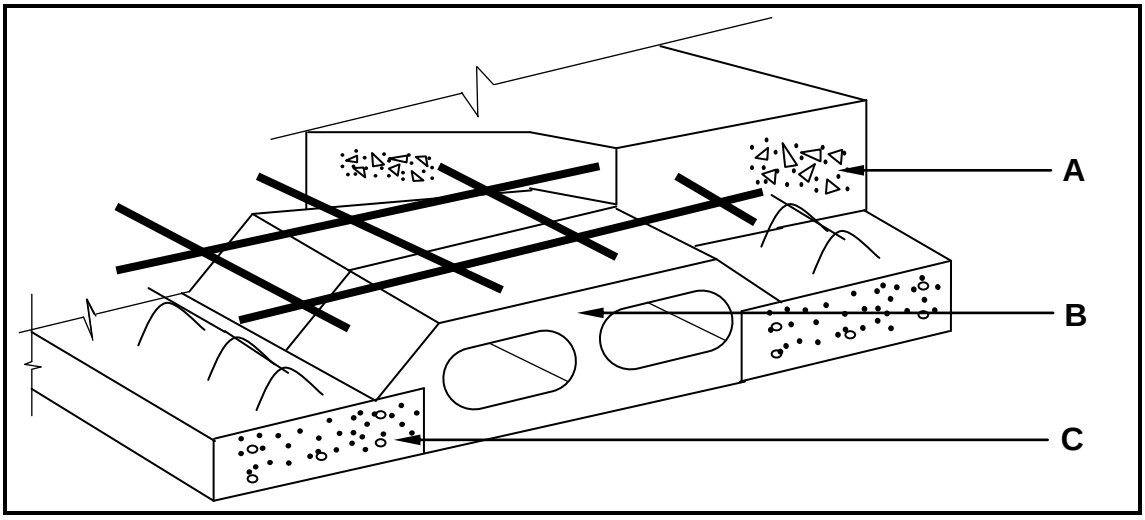


FIGURE 6.5

6.5.1 Name parts **A**, **B** and **C**. (3)

6.5.2 Explain the purpose of **C**. (1)

6.5.3 State THREE factors that must be considered when planning this type of construction in FIGURE 6.5. (3)

6.5.4 Before the installation of this type of floor construction, provision should be made for civil and electrical services to be installed. Name THREE services that must be considered. (3)

6.6 FIGURE 6.6 below shows the foundation of a single garage.

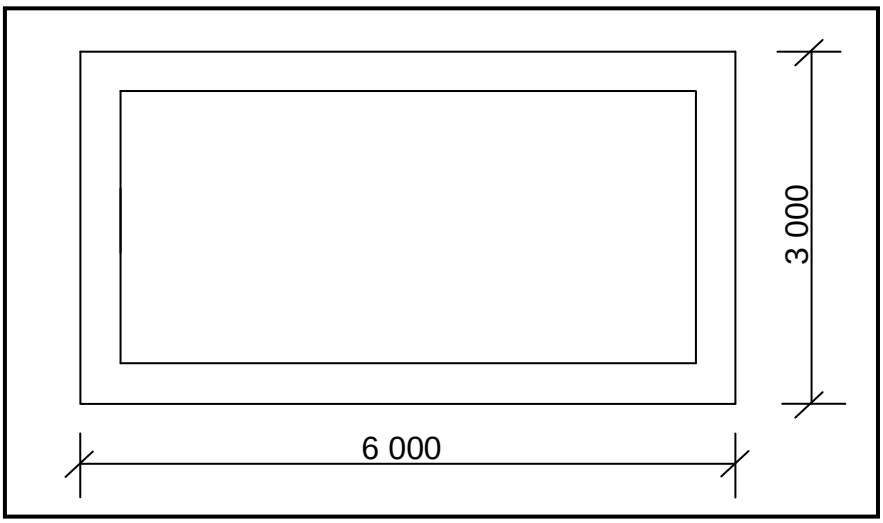


FIGURE 6.6

SPECIFICATIONS:

- Outside measurements of foundation of garage: 6 000 mm x 3 000 mm
- The foundation is 600 mm wide and 250 mm thick.

Use ANSWER SHEET 6.6 and calculate the volume of concrete needed for the foundation. Round off your answers to TWO decimal places. (10)
[40]

TOTAL: 200

CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 2

NO.	QUESTION	ANSWER	MARKS
1	Identify the elevation shown in FIGURE A.		1
2	Name the scale of FIGURE B.		1
3	Identify number 1.		1
4	Identify number 2.		1
5	Recommend a suitable finish for number 3.		1
6	What is indicated by number 4?		1
7	Identify the drawing symbol indicated by number 5.		1
8	Identify the drawing symbol indicated by number 6.		1
9	What is indicated by number 7?		1
10	Give the date on which the building plan was printed.		1
11	Who checked the building plan?		1
12	Name the electrical drawing symbol in the column for the notes in FIGURE 2 that must be placed at a staircase.		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.		1

14	Identify the type of roof that is used on the building in FIGURE A.		1
15	Explain the purpose of number 1.		1
16	Who is the owner of this house?		1
17	In which street is the proposed dwelling situated?		1
18	Identify number 8.		1
19	What is the sanitary fitting indicated by number 9 used for?		1
20	Recommend an alternative sanitary fitting to replace number 10 that will serve a similar purpose.		1
21	Explain the purpose of number 11 as indicated on the staircase.		1
22	What is indicated by number 13?		1
23	What is indicated by number 15?		1
24	Deduce the height of window 1 from the window schedule.		1
25	Deduce the width of window 2 from the window schedule.		1
26	Name the elevations of the building on which the staircase is situated.		2
27	Differentiate between the electrical symbols indicated by numbers 12 and 14.		2

28	Recommend a suitable floor covering for the lounge.		1
29	Calculate the area of the lounge in m². Show ALL calculations.		3
30	Calculate the perimeter of the building. Show ALL calculations.		7
		TOTAL:	**40**

CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 3.6

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

CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 4.4

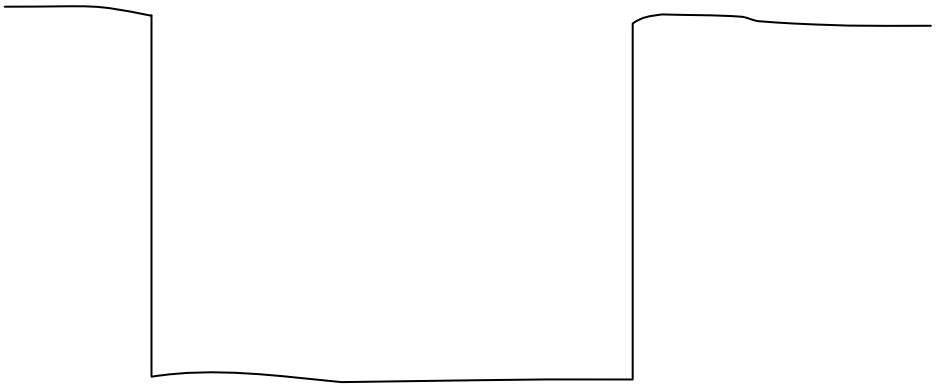


FIGURE 4.4

ASSESSMENT CRITERIA	**MARK**	**CANDIDATE'S MARK**
Folding wedges	1	
Walling boards/Wailing boards	1	
Poling boards	2	
Struts	1	
Shuttering correctly drawn	1	
Any ONE label	1	
Proportion	1	
TOTAL:	**8**	

CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 4.6

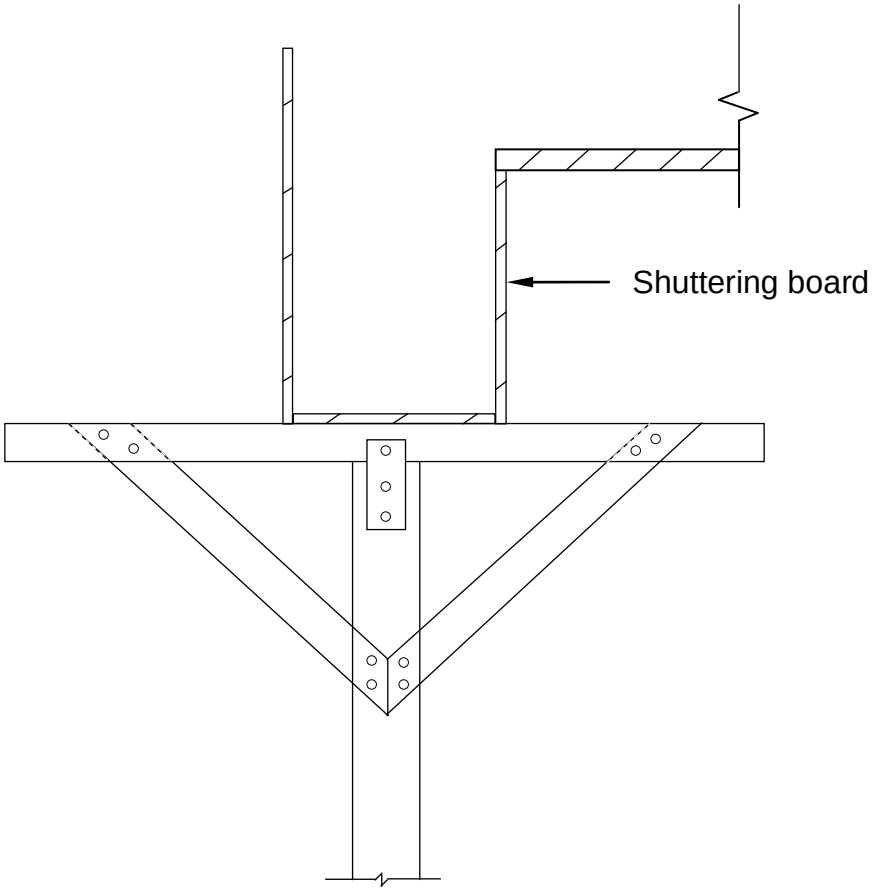


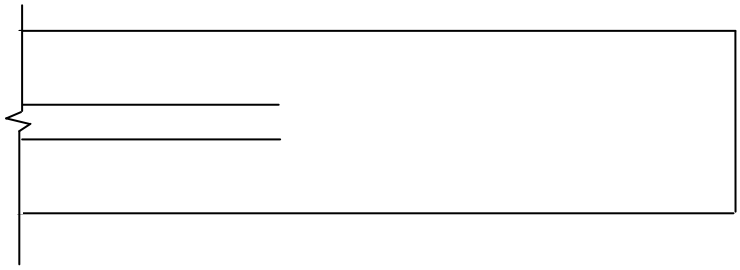
FIGURE 4.6

ASSESSMENT CRITERIA	**MARK**	**CANDIDATE'S 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**	

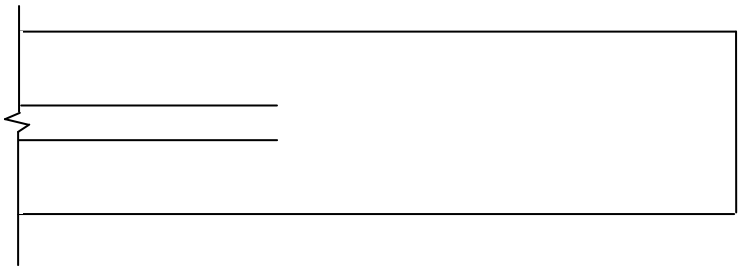
CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 5.5



FIRST COURSE



SECOND COURSE

ASSESSMENT CRITERIA	**MARK**	**CANDIDATE'S 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**	

CENTRE NUMBER:								

EXAMINATION NUMBER:													

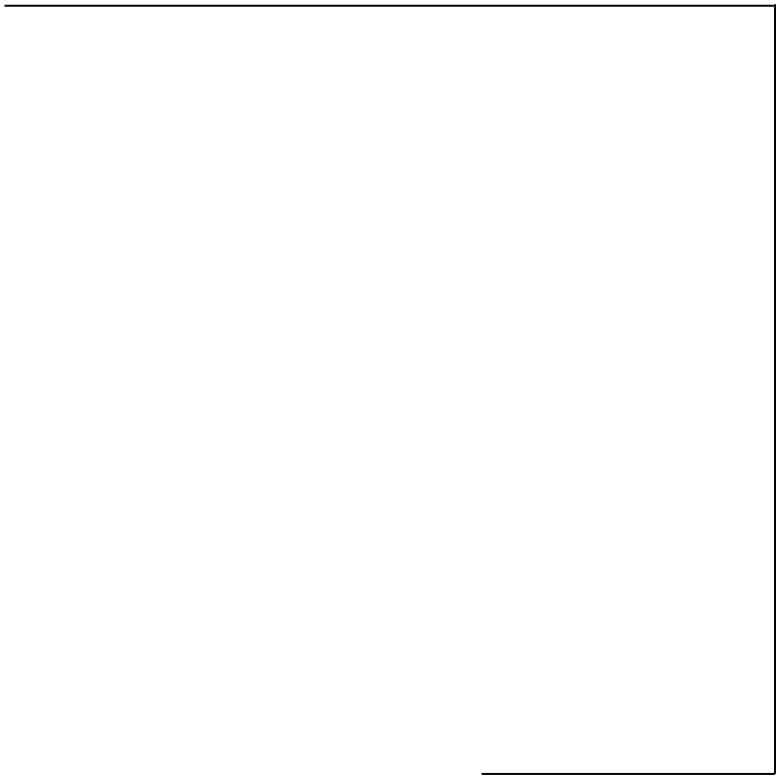
ANSWER SHEET 5.6

ASSESSMENT CRITERIA	**MARK**	**CANDIDATE'S 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	
Facia 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**	

CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 6.4



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

CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 6.6

A	B	C	D
			Concrete for foundations
			Centre line
			2/ _____ = _____ mm
			2/ _____ = _____ mm
			Total = _____ mm
			Minus 4/_____= _____ mm
			Total centre line = _____ m
1/	_____		
	_____		
	_____	_____	