basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2013

MEMORANDUM

MARKS: 200

This memorandum consists of 20 pages.

INSTRUCTION FOR MARKING:

1. Use a mask for marking drawings that must be drawn to scale.

QUESTION 1: CONSTRUCTION PROCESSES

1.1

1.1.1	**J**	Reinforcement found between courses of brickwork ✓
1.1.2	**A**	A restriction that prevents you from building in a specific area ✓
1.1.3	**K**	A roof covering made of grass ✓
1.1.4	**B**	A horizontal member of a roof truss ✓
1.1.5	**I**	Water-proof membrane ✓
1.1.6	**D**	A level platform on which a scaffold is erected ✓
1.1.7	**C**	A vertical member of a roof truss ✓
1.1.8	**L**	A chemical process that brings about decomposition in ferrous metals ✓
1.1.9	**E**	A tool that can be used to cut bricks ✓
1.1.10	**F**	An inclined member of a roof truss ✓

(10)

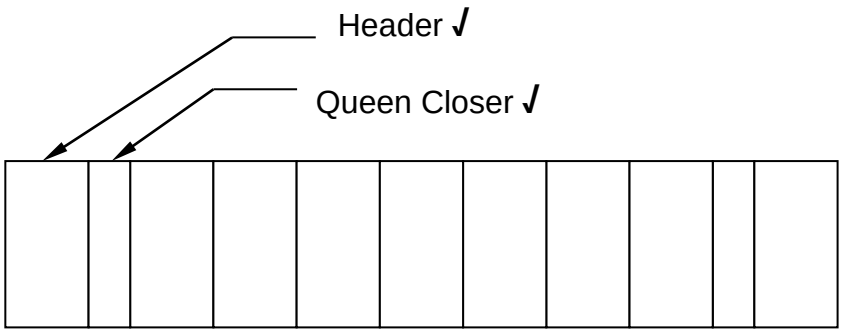
ONE '✓' FOR EACH CORRECT ANSWER. ***Do not*** penalise the candidate if the description is written.

1.2 Dust mask/respiratory mask ✓
Safety goggles ✓
Gloves ✓
Overall/ protective clothing/ apron
Safety shoes/gum boots
Hard hat/ protective headgear

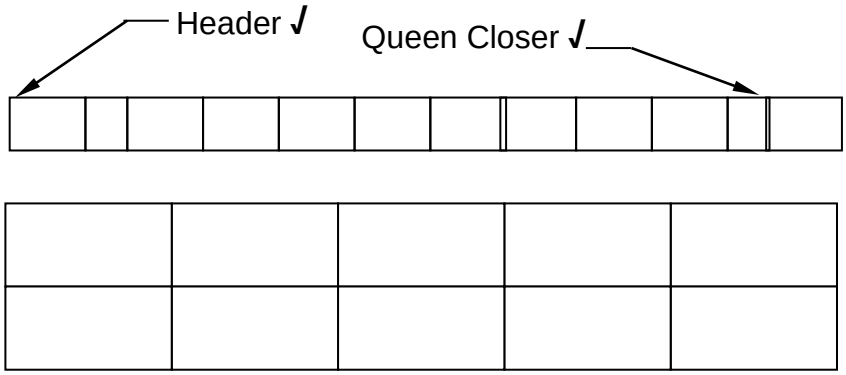
(3)

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.3



OR

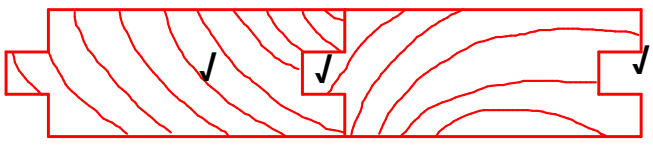


ALTERNATE PLAN COURSE OF A WALL BUILT IN ENGLISH BOND. √

Assessment criteria		**LM**
Header	1	
Queen closers	2	
Proportion & Line work	2	
Title	1	
Label: Header	1	
Label: Queen closer	1	
Total	**8**	

(8)

1.4



Assessment Criteria	
End grain	1
One board showing tongue	1
One board showing groove	1
TOTAL	**3**

(3)

1.5 Screws ✓
Steel nails ✓
Wall plug with screw (Hilti)
Hammer fix nylon anchor
No more nails
Nails (2)
Rawl bolts
Epoxy glue

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.6 1.6.1 Bolts and nuts ✓ (1)

1.6.2 Gang nails ✓ (1)

1.6.3 Wall ties ✓ (1)

1.6.4 Clout nails/dry wall screws ✓ (1)
[30]

QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

2.1	2.1.1	FALSE ✓	(1)
	2.1.2	TRUE ✓	(1)
	2.1.3	FALSE ✓	(1)
	2.1.4	FALSE ✓	(1)
	2.1.5	TRUE ✓	(1)
2.2	2.2.1	Place conduit for services. ✓ Place spacer blocks between reinforcement and block ✓ Place reinforcing/welded mesh on top of the blocks ✓ Cast concrete✓ Compact concrete by hand or vibrator Render floor with screed	(4)
	2.2.2	Block and beam floor✓ In-situ concrete floor Pre-stressed hollow cored concrete slab Precast concrete floor slab **ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**	(1)
	2.2.3	Materials are highly cost effective ✓ Excellent constructional integrity Easy and time-saving construction procedures No skilled labour is required Improved sound and temperature insulation Minimal formwork is required Great reduction in the amount of concrete that is required **ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**	(1)
	2.2.4	Laminated floor boards/ tiles/ceramic tiles /porcelain tiles/PVC tiles/carpet/wooden floor blocks/oxide screed ✓ **ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**	(1)
2.3	2.3.1	Couple roof truss ✓	(1)
	2.3.2	Fink truss/W-truss ✓	(1)
	2.3.3	South African roof truss/Howe ✓	(1)
	2.3.4	Lean-to roof truss ✓	(1)

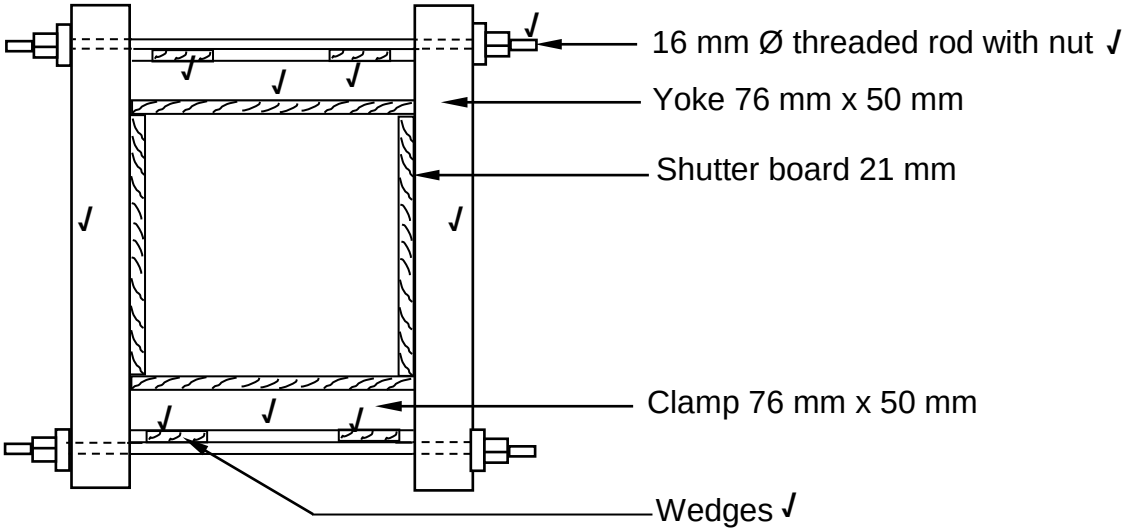
2.4 2.4.1 A – Cladding (gypsum board, chip board, veneered board) ✓ (1)
B – post/rail, timber standard ✓ (1)

2.4.2 Timber ✓ (1)

2.4.3 Stability/Rigidity ✓ (1)

2.4.4 Cover strips ✓
Skimming /gypsum plaster ✓ (2)

2.5

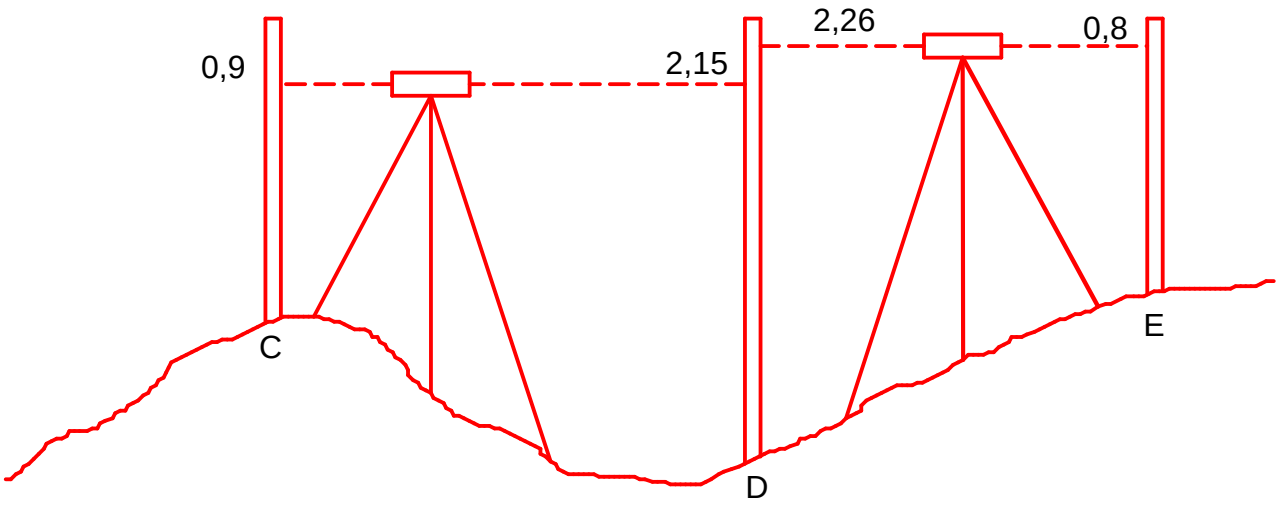


Formwork for a square column ✓

Assessment Criteria	
16 mm Ø threaded rod	1
Yokes	2
Clamps	2
Wedges	2
Labels	2
Title	1
Application of scale	2
TOTAL	**12**

(12)

ANSWER SHEET 2.6



2.6

BS	FS	RISE	FALL	REMARK
0,9				Peg A
	2,15		**1,25 √**	Peg B
2,26				Peg C
	0,8	**1,46 √**		Peg D
3,16	2,95	1,46	1,25	**TOTAL**
3,16 – 2,95 √		**1,46 – 1,25 √**		**DIFFERENCE**
0,21 √		**0,21√**		**RESULT**

(6)
[40]

QUESTION 3: CIVIL SERVICES

3.1 3.1.1 Wind/wind power/moving air ✓ (1)

3.1.2 Coal/coal power ✓ (1)

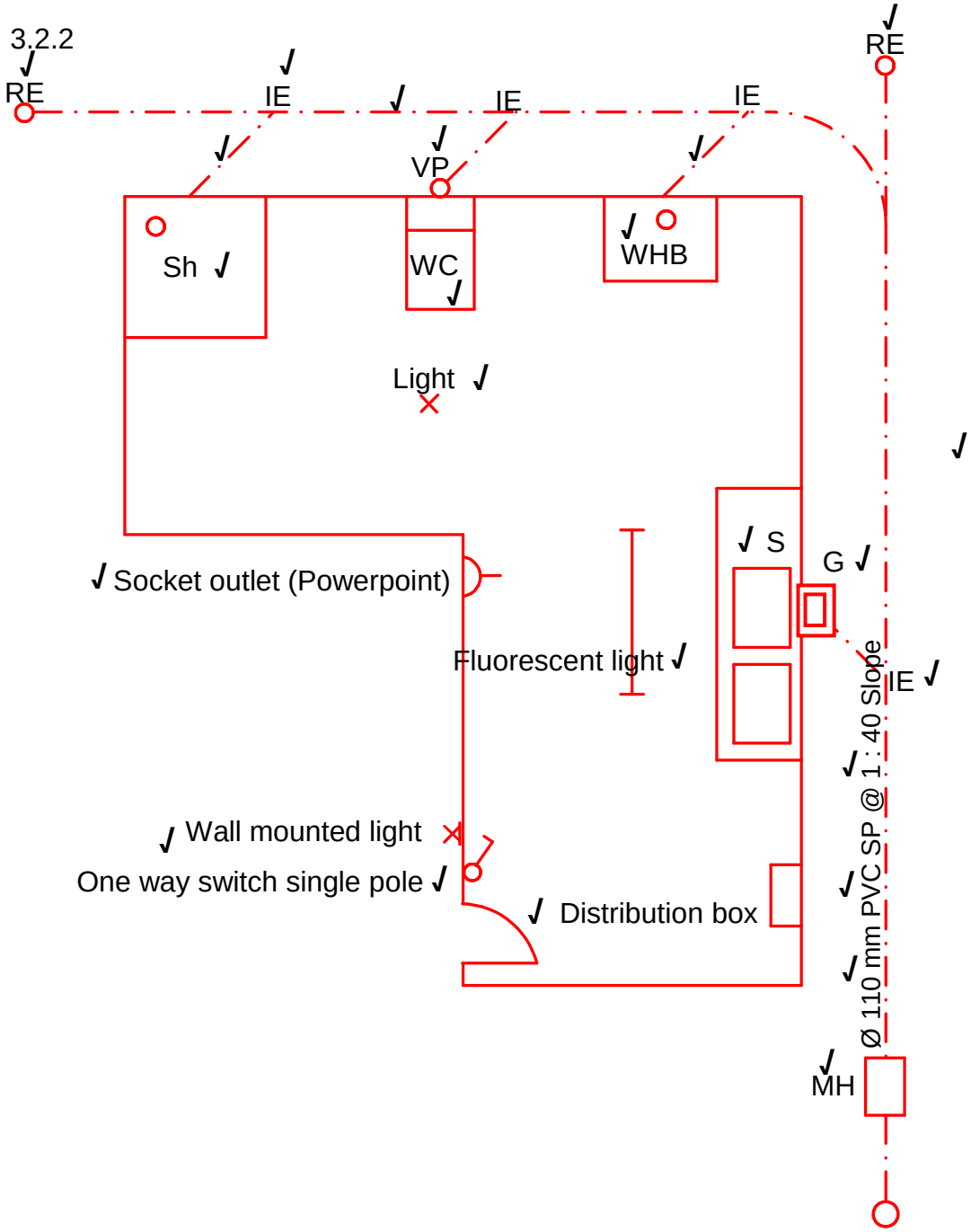
3.1.3 Wind power is free energy ✓
Wind power is a clean source of energy ✓
Very little maintenance is required (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.1.4 Water pollution – water pumped back to rivers are warm and affects the marine ecology ✓
Adds to air pollution and eventually global warming ✓
These plants release sulphur oxide and nitrogen oxide into the atmosphere which may lead to acid rain.
Huge amounts of coal required for the process. Depletion of natural resources, e.g. coal. Is getting scarcer and more expensive. (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.2 3.2.1 & 3.2.2

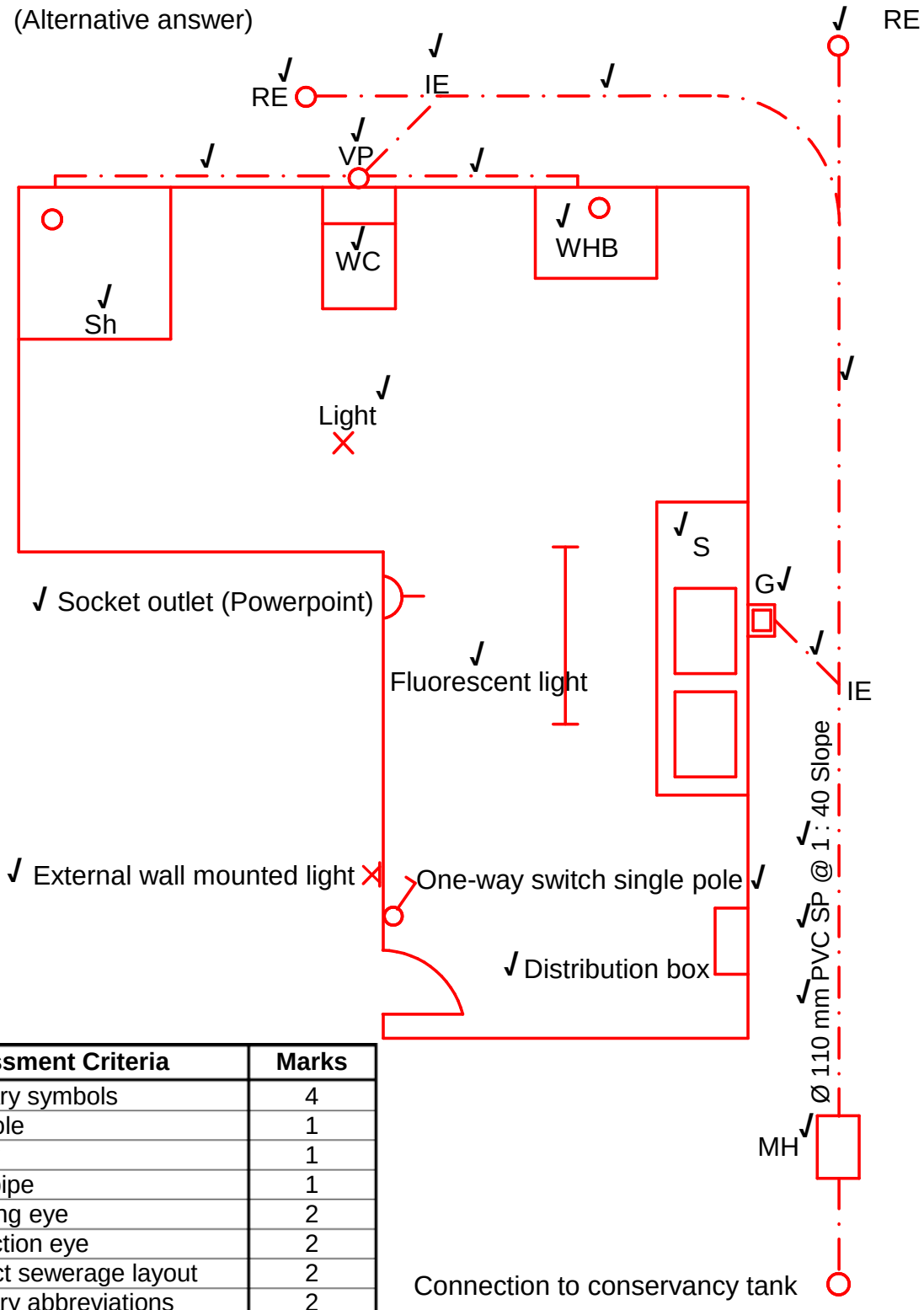


	Assessment Criteria	Marks
3.2.1	Sanitary symbols	4
3.2.2	Manhole	1
	Gulley	1
	Vent pipe	1
	Rodding eye	2
	Inspection eye	2
	Correct sewerage layout	2
	Sanitary abbreviations	2
3.2.3	Description of pipe	3
3.2.4	Electrical symbols	6
	Total	**24**

(24)

OR

3.2.2 (Alternative answer)



	Assessment Criteria	Marks
3.2.1	Sanitary symbols	4
3.2.2	Manhole	1
	Gulley	1
	Vent pipe	1
	Rodding eye	2
	Inspection eye	2
	Correct sewerage layout	2
	Sanitary abbreviations	2
3.2.3	Description of pipe	3
3.2.4	Electrical symbols	6
	Total	**24**

(24)

[30]

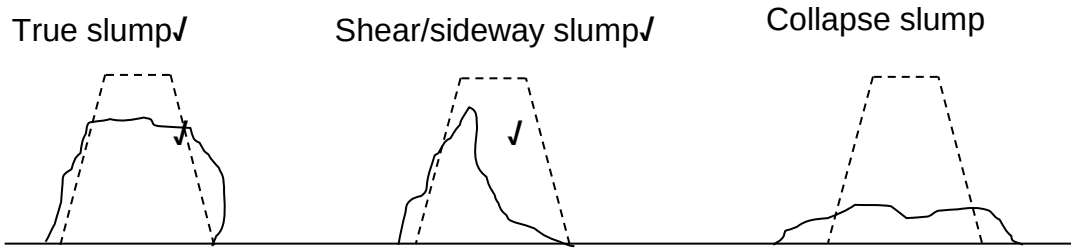
100 mm PVC pipe is also acceptable

QUESTION 4: MATERIALS AND QUANTITIES

4.1 4.1.1 Slump test ✓ (1)

4.1.2 ✓ ✓ ✓
Shear/sideway slump, Collapse slump, True slump (3)

4.1.3



(4)

ANY TWO OF THE ABOVE SKETCHES

4.2

A	B	C	D
1/	8,0 ✓		Area of rectangular wall up to wall plate level.
	2,7 ✓	21,6 m²✓	8 000 mm x 2 700 mm
1/	0,5 ✓		Area of gable (triangular) part of wall
	8,0		0,5 x 8 000 mm x 1 800 mm
	1,8 ✓	7,2 m²✓	
			Total area of wall without window opening
			21,6 m²+ 7,2 m² = 28,8 m²✓
1/	1,8 ✓	✓	Area of window
	1,2 ✓	2,16 m²	1 800 mm x 1 200 mm
			Area of wall minus window opening
			28,8 m² - 2,16 m² = 26,64 m² ✓
1/	26,64 ✓	✓	Number of bricks
	110 ✓	2 930,4	2 931 bricks✓
OR			
2/	26,64		
	55	2 930,4	
1/	2 931		5% breakages and cutting
	5% ✓		146,55 bricks✓

(15)

(2)

NOTE: Two marks must be deducted if the dimension paper is not used. One mark must be deducted if the appropriate columns are not used

ALTERNATE ANSWER

4.2

A	B	C	D
1/	8,0 ✓		Area of rectangular wall up to wall plate level.
	2,7 ✓	21,6 m²✓	8 000 mm x 2 700 mm
1/	0,5 ✓		Area of gable (triangular) part of wall
	8,0		0,5 x 8 000 mm x 1 800 mm
	1,8 ✓	7,2 m²✓	
			Total area of wall without window opening
			28,8 m² - 2,16 m² = 26,64 m² ✓
1/	1,8 ✓	✓	Area of window
	1,2 ✓	2,16 m²	1 800 mm x 1 200 mm
			Area of wall minus window opening
			21,6 m²+ 7,2 m² = 28,8 m²✓
1/	26,64 ✓	✓	Number of bricks
	110 ✓	2 930,4	2 931 bricks✓
OR			
2/	26,64		
	55	2 930,4	
1/	2 931		5% breakages and cutting
	5% ✓		146,55 bricks✓

4.3 The bars can rust ✓
The bars will not bond properly with the concrete ✓
Heat and fires can cause the bars to lose its tensile strength and distort
Its prone to attack from harsh weather conditions (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

4.4 It is resistant to water. ✓
It is resistant to heat. ✓
It is resistant to stains. ✓
Is not easily scratched.
It enhances the appearance of the timber. (3)
Protection against attack from insects
ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

[30]

QUESTION 5: APPLIED MECHANICS

5.1 **On ANSWER SHEET 5.1**

5.1.1 BMa 6,5 kN x 0 m = 0 ✓ (1)

5.1.2 BMb = 6,5 x 2 OR (6,5 x 2) – (5 x 0) ✓
= 13 = 13 – 0
= 13 kNm = 13 kNm (1)

5.1.3 BMc = (6,5 x 4) – (5 x 2) OR (6,5 x 4) – (5 x 2) – (4 x 0) ✓
= 26 – 10 = 26 – 10 – 0
= 16 kNm = 16 kNm (1)

5.1.4 BMd = 5,5 x 2
= 11 kNm (1)
OR

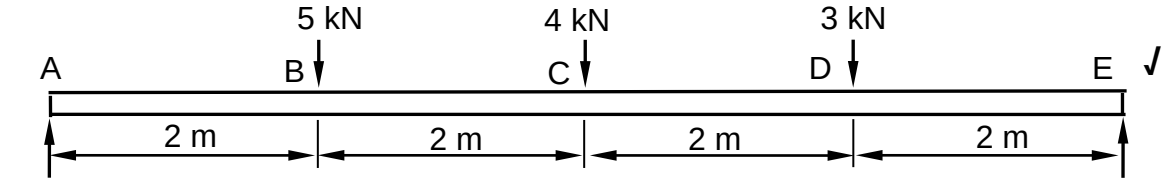
BMd = (6,5 x 6) – (5 x 4) – (4 x 2) – (3 x 0) ✓
= 39 – 20 – 8 – 0
= 11 kNm

5.1.5 BMe = 5,5 x 0
= 0 kNm (1)
OR

BMe = (6,5 x 8) – (5 x 6) – (4 x 4) – (3 x 2) + (5,5 x 0) ✓
= 52 – 30 – 16 – 6 + 0
= 0 kNm

5.1.6 Upward forces = downward forces
6,5 kN + 5,5 kN = 5kN + 4kN + 3kN
12kN = 12kN ✓ (1)

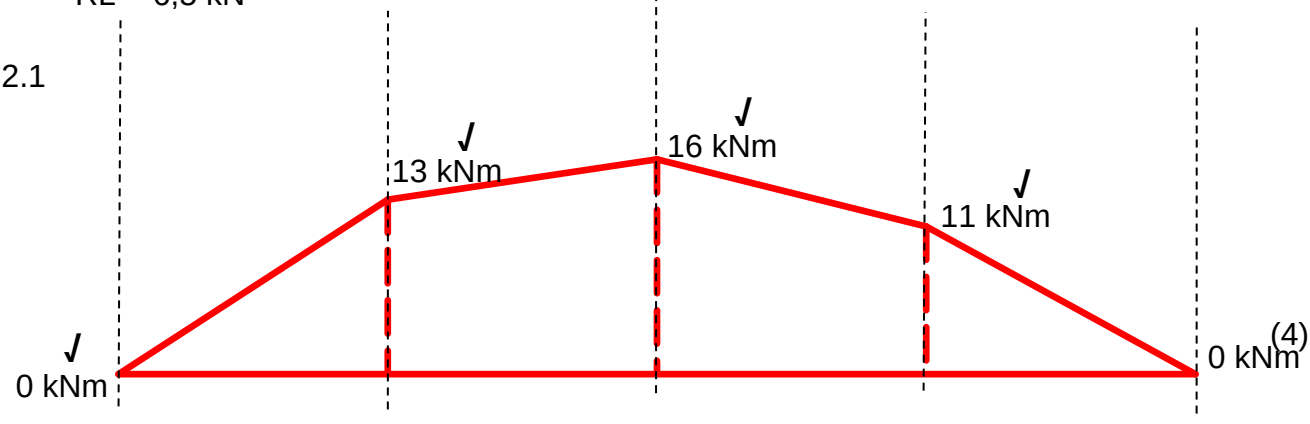
5.2



(1)

RL = 6,5 kN RR = 5,5 kN

5.2.1



(4)

5.3 Position of centroid from A- A = $\frac{\text{(Area 1 x d) - (Area 2 x d)}}{\text{Total Area}}$

$= \frac{(½ \times 60 \times 90 \times 20) - (30 \times 10 \times 25)}{(½ \times 60 \times 90) - (30 \times 10)}$

✓ ✓ ✓ ✓

$= \frac{(2\,700 \times 20) - (300 \times 25)}{2\,700 - 300\ mm^2}$ ✓

$= \frac{54\,000 - 7\,500\ mm^3}{2\,400\ mm^2}$

$= \frac{46\,500\ mm^3}{2\,400\ mm^2}$ ✓

$= 19{,}375\ mm$

$= 19{,}38\ mm$ ✓✓ (8)

OR

Take moments about A on the X-axis

✓ ✓ ✓ ✓

$2\,400\ mm^2 \times X = (½ \times 60 \times 90 \times 20) + (30 \times 10 \times 25)\ mm^3$

$2\,400\ mm^2 \times X = 54\,000 + 7\,500\ mm^3$

$= \underline{46\,500\ mm^3}$ ✓

$= 2\,400\ mm^2$ ✓

$= 19{,}375\ mm$

or

$= 19{,}38\ mm$ ✓✓

OR

Part	AREA (A)	X	AREA OF X Ax
Triangle	2 700 mm² ✓	20 ✓	54 000
Rectangle	300 mm² ✓	25 ✓	7 500
Σ	2 400 mm² ✓		46 500 mm³

$\frac{\Sigma AX}{\Sigma A}$

$= \frac{46\,500\ mm^3}{2\,400\ mm^2}$ ✓

$= 19{,}375\ mm$

or

$= 19{,}38\ mm$ ✓✓

5.4 5.4.1

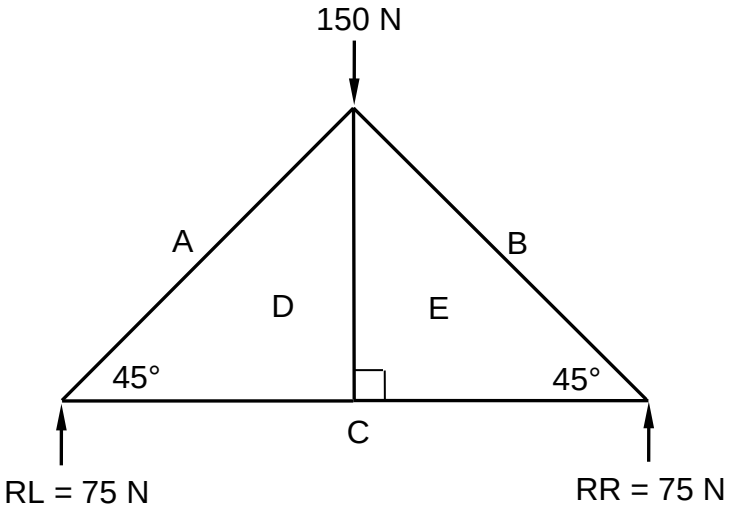
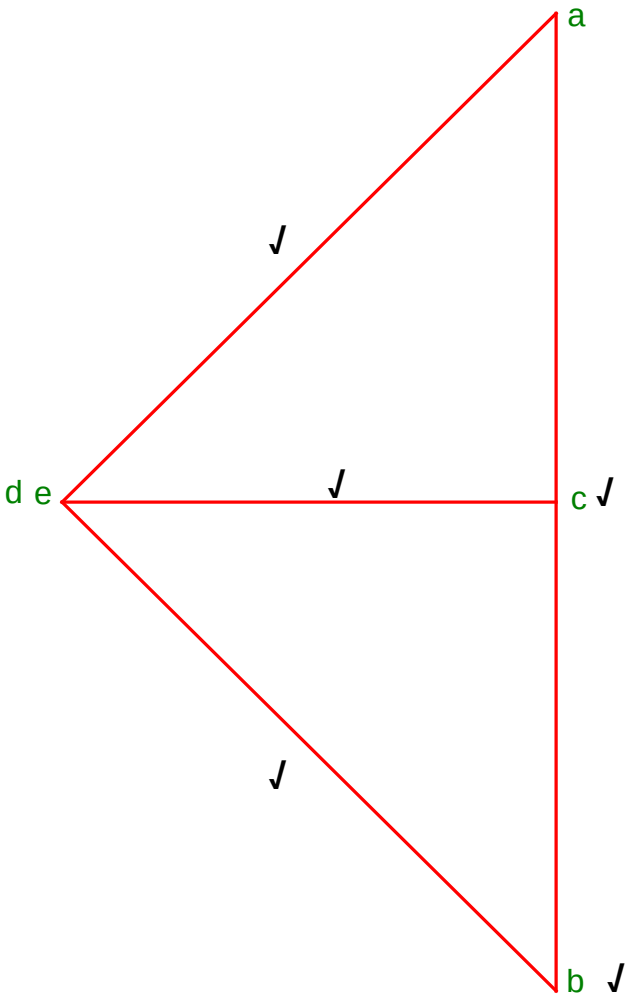


FIGURE 5.4



NOT TO SCALE
USE A MASK TO MARK THIS QUESTION (5)
Marks are allocated for plotting the points.

5.4.2

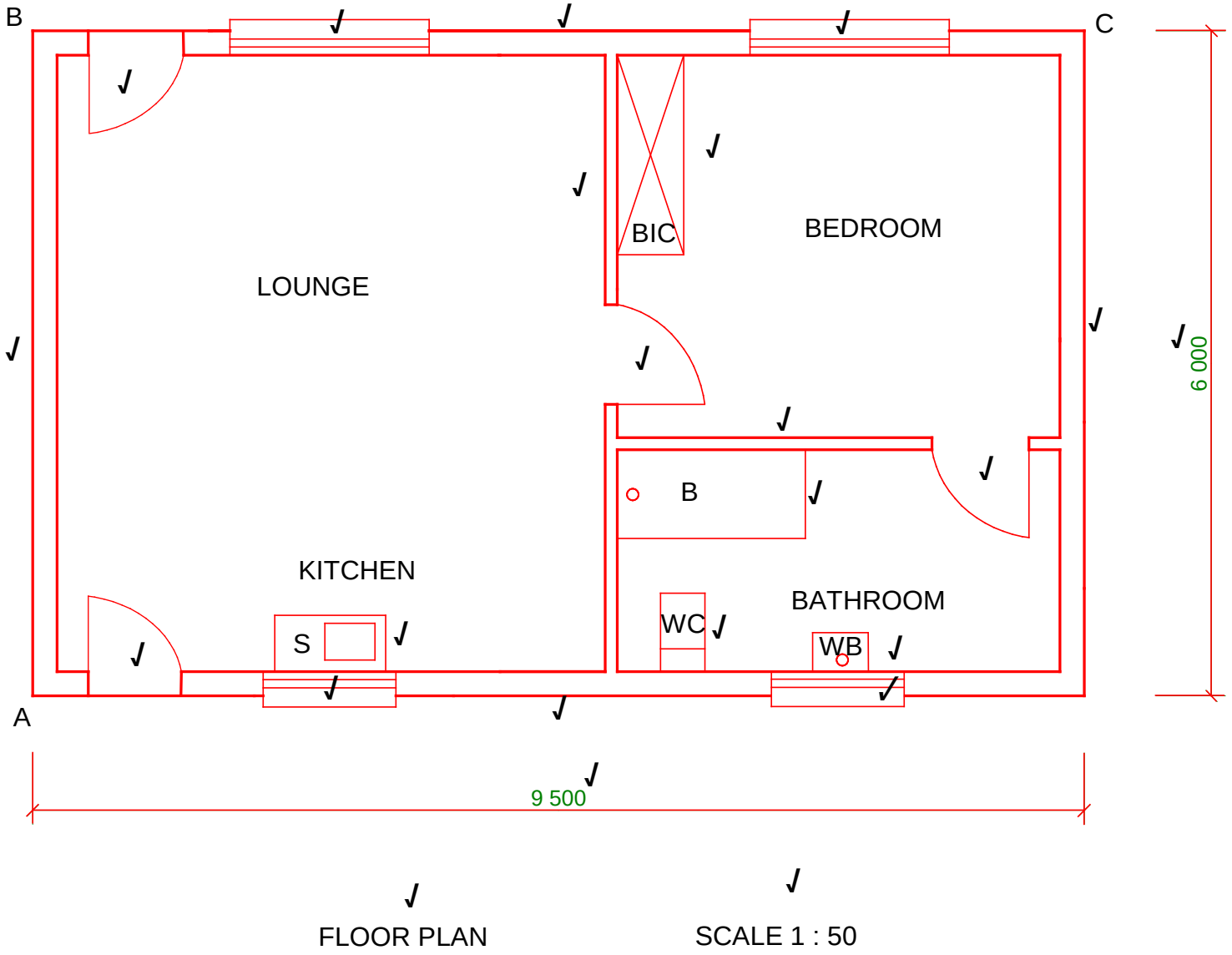
MEMBER	MAGNITUDE	NATURE
AD	106 N ✓	Strut ✓
BE	106 N	Strut ✓
CD	75 N ✓	Tie
DE	0 or ------	0/point load /------ ✓
EC	75 N	Tie ✓

(6)

Tolerance: 1 N to either side

[30]

ANSWER SHEET 6.1
QUESTION 6.1



FLOOR PLAN SCALE 1 : 50

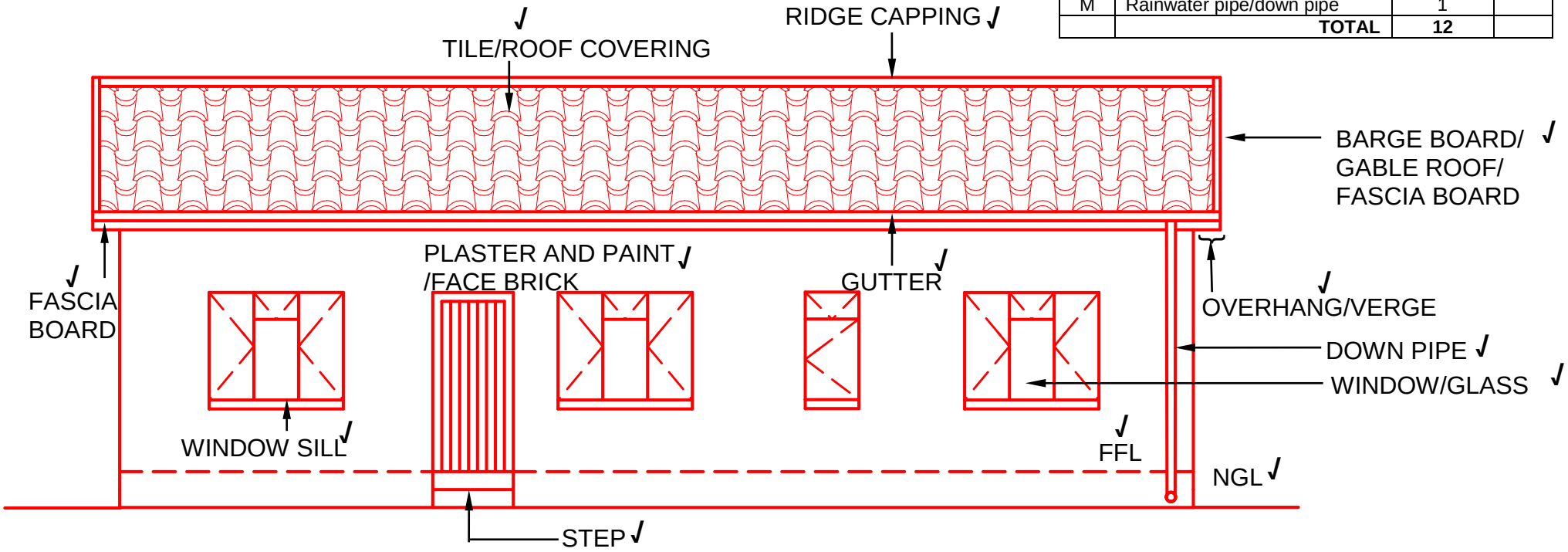
Aspect	Marks	LM
Windows	4	
Doors	4	
Drawing the Symbols	4	
External walls	4	
Internal walls	2	
Dimensions	2	
Title and scale	2	
Application of scale	2	
Neatness	1	
Total	**25**	

L M = Learner's mark

Application of scale ✓
Neatness ✓

	ANSWER	Marks	LM
6.2.2	150 mm/ two bricks high	1	
6.2.3	1 : 100	1	
6.2.4	Plaster and paint / Face brick wall	1	

	Aspect	Marks	LM
A	Tile/Roof covering	1	
B	Ridge capping/ridge	1	
C	Barge board/overhang/gable roof/fascia board	1	
D	Roof verge/fascia board/ overhang	1	
E	Gutter	1	
F	Fascia board	1	
G	Window sill	1	
H	Window/glass	1	
J	Natural ground level/NGL	1	
K	Finished floor level/FFL	1	
L	Doorstep/step	1	
M	Rainwater pipe/down pipe	1	
	TOTAL	**12**	



SCALE 1 : 100 ✓ SOUTH ELEVATION ✓

TOTAL: 200