basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2011

POSSIBLE ANSWERS

MARKS: 200

This memorandum consists of 18 pages.

Please turn over

QUESTION 1 LO 3 AS 1, 2, 4, 5, 7, 10

1.1 1.1.1 A – Ear muffs/ Ear protection/ Ear plugs ✓
B – Safety goggles/ Safety glasses/Eye protection/Safety
goggles ✓ (3)
C – Gloves ✓

1.1.2 A – When using equipment like a angle grinder that makes a lot of
noise. ✓
B – When grinding or cutting material. ✓
Chasing walls.
C – When working with material with sharp or rough edges/ when
chipping slag after welding C- when working with: concrete/ hot
material/ welding ✓ (3)

OR ANY OTHER ACCEPTABLE ANSWERS

1.2 • Apply continuous pressure to the wound with a handkerchief or cloth. ✓
• For a wound on a limb, lift one or both limbs higher than the body/
heart. ✓
• Apply a pressure bandage or use pressure point if bleeding continues.
• Keep body warm and treat for shock until help arrive. (2)

ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS

| COLUMN A	COLUMN B
1.3.1 Sustainability	K✓ Preserving material in its original state
1.3.2 Pre-cast concrete	I✓ Concrete cast elsewhere and placed in position.
1.3.3 Slump test	G✓ Used to determine the workability of fresh concrete.
1.3.4 PVC	F✓ Conduit pipes is an example of this material
1.3.5 Cube test	B✓ Used to determine the compressive (crushing) strength of concrete
1.3.6 In-situ concrete	L✓ Fresh concrete cast in place
1.3.7 Dumpy level	C✓ A precision measuring instrument used to measure height and distance
1.3.8 Telescopic staff	E✓ An accessory used with a dumpy level
1.3.9 Hydration	J✓ A chemical reaction between water and cement
1.3.10 Compaction	H✓ Removal of air bubbles from concrete

(10)

1.4
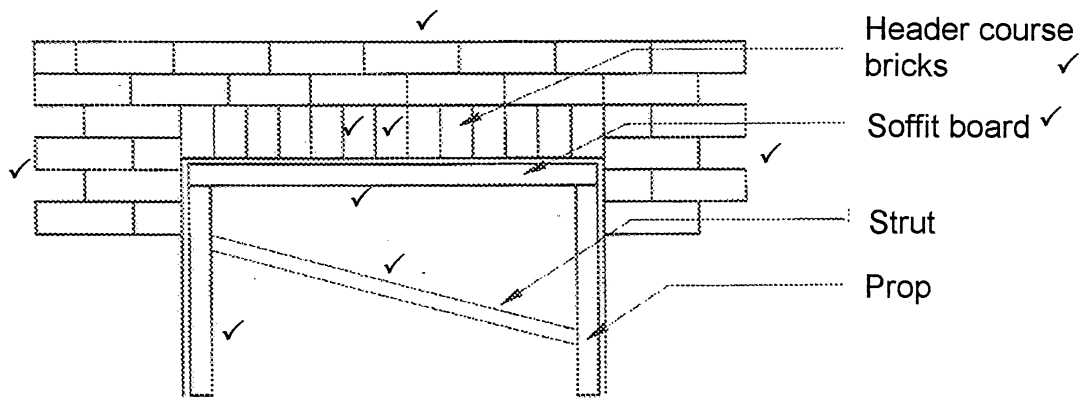
FIGURE 1.4

ASSESSMENT CRITERIA	MARK
Flat gauged arch brick header course	2
Two courses of brickwork above arch	1
Surrounding brickwork in stretcher bond	2
Soffit board	1
Props	1
Strut	1
Any two labels	2
TOTAL	**10**

(10)

1.5
- Bricks are pressed and formed to the required shape (is done by the brick manufacturer) ✓
- Bricks are sanded against a rough or fine toothed surface
- Bricks are cut into desired shape by means of a special saw
- Buy the brick   (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.6
- Longitudinal half lap/ longitudinal halving joint ✓   (1)
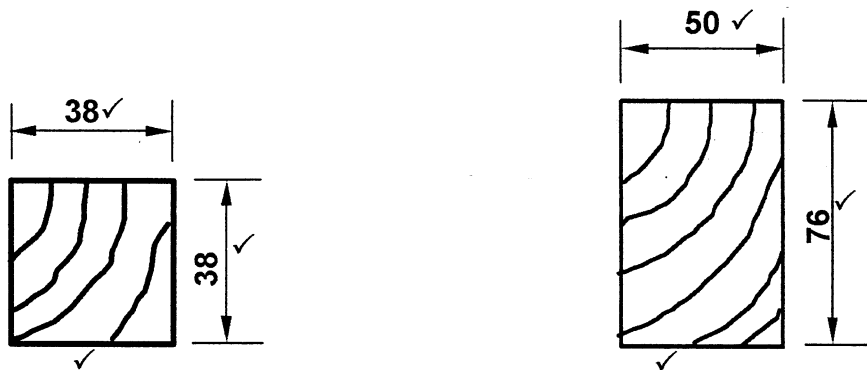
ANY OTHER ACCEPTABLE ANSWER   **[30]**

QUESTION 2   LO 3 AS 3, 4, 5, 7

2.1   REFER TO ANSWER SHEET 2.1.

2.2

Batten 38 mm x 38 mm/
50 mm x 38 mm tilting batten
For concrete roof tiles

Purlin 76 mm x 50 mm/
76 mm x 76 mm tilting purlin
for galvanised roof sheeting   (6)

If the candidate has drawn 2 sections through the roof showing a batten on one and a purlin on another. 1 mark for each sketch must be given. If he labels the drawing correctly with the size he gets 3 marks for each sketch.

2.3

DRYWALL CONSTRUCTION	BRICK WALL CONSTRUCTION
The erection of dry walls is a dry process ✓	Wet material such as mortar is to be used to join bricks ✓
The partitions are adaptable and can be fitted in awkward places ✓	It is time consuming to cut bricks to accommodate awkward angles in a wall ✓
Materials are portable/need less storage space than brickwork. ✓	Materials require a lot of storage space ✓
Partition stud/steel rail/standard partitions weigh less.	Material is heavy

ANY SIX OF THE ABOVE (THREE IN EACH COLUMN) OR ANY OTHER ACCEPTABLE ANSWER IF THE COMPARISON CORRELATES

(6)

2.4   2.4.1   • Precast concrete piling✓
                    • Continuous auger piling✓
                    • Driven in steel piling
                    • Auger drill piling
                    • Displacement piling
                    • Sleeved piling
                    • Percussion piling
                                ANY TWO OF THE ABOVE

2.4.2
- On unstable soil or ground ✓
- Where the soil is loose ✓
- Non-cohesive soil
- Where there is soil movement
- Constantly wet areas
  ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS (2)

2.5   ✓   ✓

1,941 – 1,782 = 0,159 m ✓ OR 159 mm

         OR

1,782 – 1,941 = -0,159 mm (3)

2.6   2.6.1   Back sight ✓ (1)

      2.6.2   Intermediate sight ✓ (1)

      2.6.3   Fore sight ✓ (1)

2.7
- The workmen to place the concrete must be ready ✓
- Ramps to take concrete to another level if necessary must be erected before the concrete arrives✓
- The formwork to cast the concrete must be ready ✓
- All tools and equipment to place the concrete must be clean and ready
- The rate of placing and compacting the concrete must be done in such a way so as not to waste time

(3)

ANY THREE OR ANY OTHER ACCEPTABLE ANSWERS

2.8
- Pipe scaffolds✓ – builder/carpenter/glazier✓
- Putlog scaffolds✓ – high-rise buildings ✓
- Movable/mobile platforms – electrician/painter/repairing of ceiling boards
- Independent scaffolds – bricklaying/building gable ends
- Trestles – building walls of low height/installing gutters/painting
- Dependent scaffold – depends on building for support/allow for more working space on scaffold
- Truss-out scaffold – depends on building for support/allow for more working space on scaffold

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (4)

[40]

QUESTION 3   LO 3 AS 5, 8

3.1   3.1.1   A – Sink ✓
                B – Gulley ✓
                C – P-trap ✓ or Gully trap
                D – Inspection eye (IE) ✓   (4)

         3.1.2   110 mm ✓   (1)

         3.1.3   40 mm/50 mm ✓   (1)

         3.1.4   To prevent foul gasses and smells from entering a building ✓   (1)
                Forms a water seal
                ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

         3.1.5   Waste-water pipe ✓   (1)

         3.1.6   Main sewer pipe ✓   (1)

         3.1.7   Between 1 : 40 to 1 : 60 ✓   (1)

3.2
- Sewage from the house flows into the first chamber ✓
- Heavier sewage sinks to the bottom ✓
- Bacteria decompose the solid sewage into a liquid ✓
- The sludge remains at the bottom of the tank ✓
- The soluble sludge eventually flows into the second chamber ✓
- Only liquid flows from the outlet pipe of chamber two ✓
- This liquid flows into a French drain where it soaks into the ground ✓

LEARNERS SHOULD NOT BE PENALISED IF THEY PRESENT THE ANSWER IN ANY ORDER   (7)

3.3
- No pollution or noise ✓
- Electricity supply is continuous ✓
- The system is easy to regulate
- Water is not used up (renewable energy)
- Water still flows downstream as before
- Hydro-electric power stations have very low operating cost
- The lifespan of a hydro-electric power station is much longer than nuclear and coal plants
- Hydro-electric power is the most energy efficient way of generating electricity. It can convert 90% of the available energy into electricity

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER   (2)

3.4
- To water gardens and plants ✓
- Water can be provided in coastal areas with scarce water resources
- Salt water can be desalinated to be purer than normal fresh water
- Salt can be obtained in the process
- Unusable brackish water can also be desalinated
- Water becomes potable (drinkable)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.5	•	Saves electricity. It can be up to 30 percent cheaper than electrical alternatives ✓

- Gas gives instant heat ✓
- Gas geysers provide constant hot water supply ✓
- Not affected by power failures
- Always a supply of hot water on hand
- The fumes of burned out gas of the geyser such as the water vapour and carbon dioxide are the same elements that humans exhale, which makes gas healthier than electrical heaters that dry out the air

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS. (3)

3.6	3.6.1	Inspection eye ✓	(1)
	3.6.2	Rodding eye ✓	(1)
3.7	3.7.1	WC✓	(1)
	3.7.2	B ✓	(1)
	3.7.3	S✓	(1)
3.8	3.8.1	S-trap✓	(1)
	3.8.2	P-trap✓	(1)

[30]

QUESTION 4   LO 3 AS 2, 3, 7, 8

4.1   Refer to ANSWER SHEET 4.1 as the preferred method or alternatively use the method below.

    4.1.1   Inside measurement of garage   Length = 9 440 mm – 440 mm

$$= 9\ 000 \text{ mm} \checkmark$$

                         Width = 6 440 mm – 440 mm

$$= 6\ 000 \text{ mm} \checkmark \qquad (2)$$

    4.1.2   Total inside area of garage   = length x breadth

$$\checkmark \qquad \checkmark$$
$$= 9\ 000 \text{ mm} \times 6\ 000 \text{ mm} \qquad (3)$$
$$= 54 \text{ m}^2 \checkmark$$

    4.1.3   Area of one ceiling board = 3 000 mm x 1 200 mm $\checkmark$

$$= 3{,}6 \text{ m}^2 \checkmark \qquad (2)$$

    4.1.4   Number of ceiling boards = 54 m² ÷ 3,6 m² $\checkmark$

$$= 15 \text{ ceiling boards} \checkmark \qquad (2)$$

    4.1.5   Total length of cornice = 2 (9 000 mm) $\checkmark$ + 2 (6 000 mm) $\checkmark$

$$= 18\ 000 \text{ mm} + 12\ 000 \text{ mm}$$
$$= 30\ 000 \text{ mm } \textbf{OR } 30 \text{ m} \checkmark \qquad (3)$$

4.2

LEAD	MILD STEEL
Highly toxic $\checkmark$	Not toxic $\checkmark$
Blue grey metal $\checkmark$	Grey $\checkmark$
Heavy	Lighter
Rust free	Corrodes easily
Non-ferrous	ferrous
Conductor of electricity	Conductor of electricity

(4)

ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

4.3   4.3.1   1 200 mm $\checkmark$ (1)

      4.3.2   1 800 – (2 x 16 mm) = 1 768 mm $\checkmark$ (1)

      4.3.3   1 800 – (2 x 16 mm) = 1 768 mm $\checkmark$ (1)

      4.3.4   1 768 mm $\checkmark$ (1)

      4.3.5   1 200 mm $\checkmark$ (1)

      4.3.6   900 mm $\checkmark$ (1)

4.4
- Painting ✓
- Galvanising ✓
- Apply oil
- Powder coating

(2)

OR ANY OTHER ACCEPTABLE ANSWERS.

4.5   4.5.1
- Gypsum plaster ✓
- Clout nail/nail
- Silicone

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

(1)

4.5.2
- Steel nails ✓
- Silicone

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

(1)

4.5.3
- Panel pin ✓
- Silicone

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

(1)

4.5.4
- Clout nails ✓
- Dry-wall screws

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

(1)

4.6
- Prevents timber from deterioration ✓
- Enhances its appearance ✓
- Prevents attacks from insects
- Protects timber from the elements (weather)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER.

(2)
[30]

QUESTION 5   LO 3 AS 5, 6

5.1   5.1.1   Area of rectangle   = 3 200 mm² ✓   (1)

      5.1.2   Area of triangle   = 1 350 mm² ✓   (1)

      5.1.3   Position of centroid $= \dfrac{(A1 \times d) + (A2 \times d)}{\text{Total Area}}$

$$\begin{array}{l} \checkmark \quad \checkmark \qquad \checkmark \quad \checkmark \\ = \dfrac{(3\,200 \times 40) + (1\,350 \times 20)}{4\,550 \ \checkmark} \\[2mm] = \dfrac{128\,000 + \ 27\,000}{4\,550} \\[2mm] = \dfrac{155\,000 \ \text{mm}^3 \quad \checkmark}{4\,550 \ \text{mm}^2} \\[2mm] = \ 34{,}07 \ \text{mm} \ \checkmark\checkmark \end{array}$$

OR

Take moments about B

$$\begin{array}{ll} \checkmark & \quad \checkmark \quad \checkmark \qquad \checkmark \quad \checkmark \\ 4\,550 \ \text{mm}^2 \times X & = (3\,200 \ \times 40\ ) \ + (1\,350 \ \times 20) \\ & = 128\,000 + 27\,000 \\ & = \dfrac{155\,000 \ \text{mm}^3 \checkmark}{4\,550 \ \text{mm}^2} \\ & = 34{,}07 \ \text{mm} \ \checkmark\checkmark \end{array}$$

OR

	AREA (A)	X	Area of X (Ax)
Rectangle	3 200 ✓	$\dfrac{L}{2} = \dfrac{80}{2} = 40$ ✓	128 000 mm³
Triangle	+ 1 350 ✓	$\dfrac{b}{3} = \dfrac{30}{3} = 10 + 10 = 20$✓	+ 27 000 mm³
Σ	4 550 mm² ✓		155 000 mm³

$$\begin{array}{l} \dfrac{\Sigma \, Ax}{\Sigma \, A} \\[2mm] = \ \dfrac{155\,000 \ \text{mm}^3 \quad \checkmark}{4\,550 \ \text{mm}^2} \\[2mm] = \ 34{,}07 \ \text{mm} \ \checkmark\checkmark \end{array}$$

(8)

5.2   5.2.1   REFER TO ANSWER SHEET 5.2   (9)

           5.2.2   REFER TO ANSWER SHEET 5.2   (1)

           5.2.3   REFER TO ANSWER SHEET 5.2   (4)

5.3   Take moments about RR
           ✓   ✓
           5 RL   = (6 kN x 1 m) + (4 kN x 2 m) + (4 kN x 3 m) + (2 kN x 5 m) ✓
                   = 6 kNm + 8 kNm + 12 kNm + 10 kNm
           5 RL   = 36 kNm or RL   or   = $\dfrac{36 \text{ kNm}}{5 \text{ m}}$ ✓

                   ✓✓
           RL   = 7,2 kN   (6)
                                                                                 [30]

QUESTION 6   LO 6   AS 4, 5, 7, 8
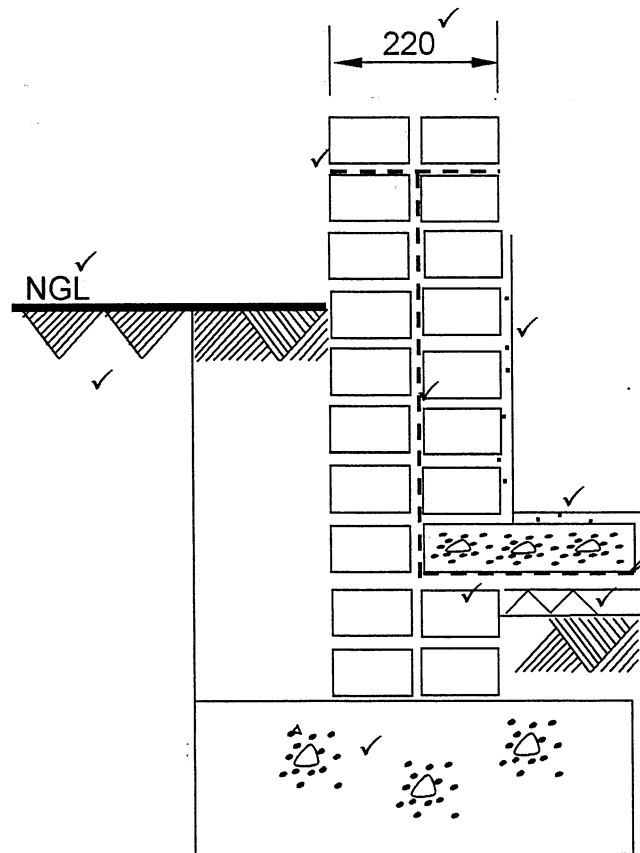
6.1   REFER TO ANSWER SHEET 6.1   · (15)

6.2   REFER TO ANSWER SHEET 6.2   (25)
                                                                          [40]

                                                              TOTAL: 200

ANSWER SHEET 2.1

QUESTION 2.1

ASSESSMENT CRITERIA	MARK
Position of DPC	3
Drawing symbol for screed	1
Plaster	1
Drawing symbol for undisturbed earth under natural ground level	1
Abbreviation for natural ground level	1
Drawing symbol for concrete	2
Drawing symbol for hardcore filling	1
Wall thickness	1
TOTAL	**11**

(11)

ANSWER SHEET 4.1

QUESTION 4.1

A	B	C	D
			Inside length of garage
			= 9 440 – 2/220
			= 9 440 – 440
			= 9 000 mm ✓
			Inside width of garage
			= 6 440 – 2/220
			= 6 440 – 440
			= 6 000 mm ✓
			Inside area of garage
1/	9 ✓		
	6 ✓	54 m² ✓	
1/	3,0✓		Area of one ceiling board
	1,2	3,6 m² ✓	
			Total number of ceiling boards required
1/3,6	54	15	= 54 ✓
			3,6
			= 15 ceiling boards ✓
			Length of cornice required for the garage
2/	9	18 m ✓	Long sides
2/	6	12 m ✓	Short sides
		18 m	Total length required
		12 m	= 18 m + 12 m
		30 m	= 30 m ✓

(12)

ANSWER SHEET 5.2

QUESTION 5.2.1

Space Diagram

5.2.1
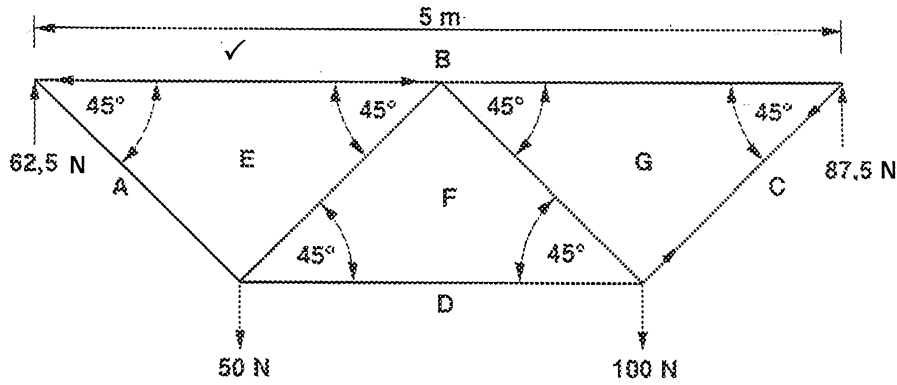
(1)
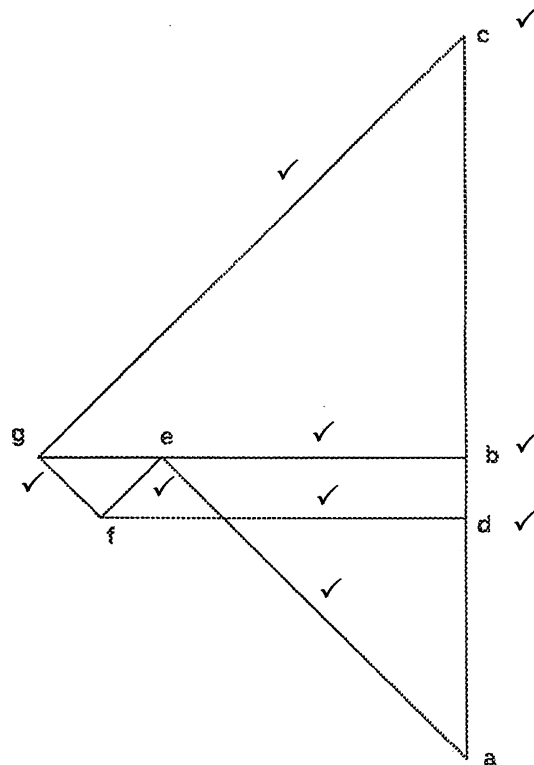
(9)

QUESTION 5.2.2 AND QUESTION 5.2.3

MEMBER	NATURE	MAGNITUDE
AE	Tie	88 N ✓
BE	Strut ✓	62 N
BG	Strut	88 N ✓
CG	Tie✓	124 N

Allow a tolerance of 2 Newton on either side

QUESTION 6.1

ANSWER SHEET 6.1

No.	QUESTIONS	ANSWERS	MARKS
1	Identify the type of roof covering (labelled 1)	Roof tile, e.g. clay tile	1
2	What type of material is the roof covering made of?	Clay/concrete/slate/cement fibre	1
3	Identify number 2.	Rafter	1
4	Identify number 3.	Strut	1
5	Identify number 4.	Tie-beam	1
6	Identify number 5.	Beam filling	1
7	What is wrong with the heights of the window and door?	It is not level/not at the same height.	1
8	Identify number 6.	Ceiling board	1
9	Study the internal wall on the concrete slab and identify ONE error.	There is no foundation for this wall.	1
10	What is the width of the internal wall if it is a half brick wall?	110 mm	1
11	Name ONE material that can be used to make this component indicated by number 7.	PVC/alumimium/cement fibre/galvanised	1
12	Identify number 8.	Window sill (External)	1
13	Identify number 9.	Wash hand basin	1
14	Draw a freehand symbol for a bath.		2

(15)

ANSWER SHEET 6.2

QUESTION 6.2

Galvanised sheet

Pitch 30

Plaster and paint

√FFL

NGL
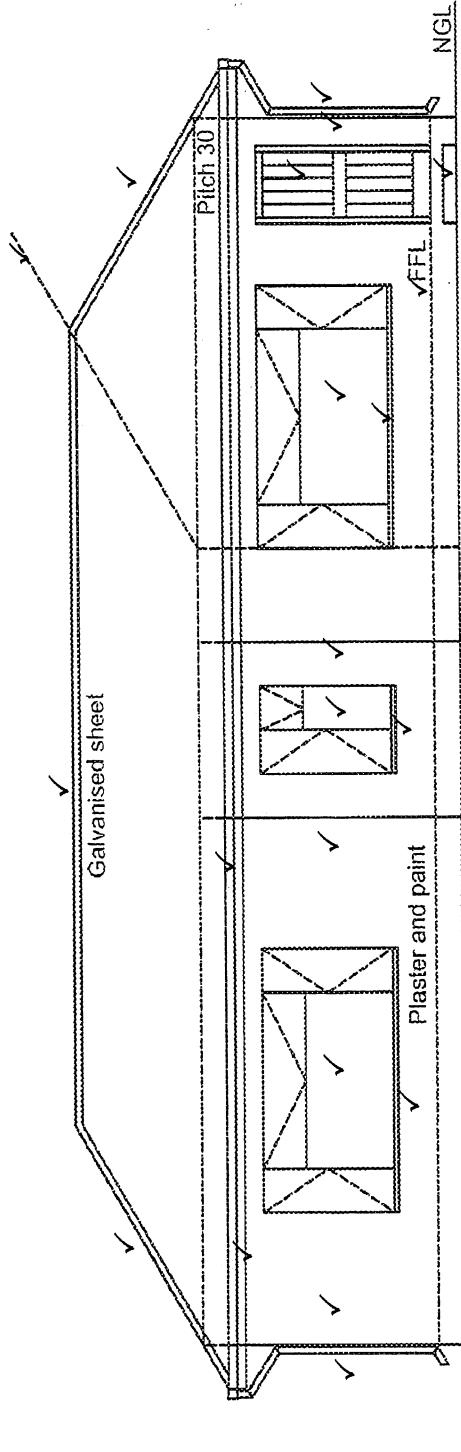
WEST ELEVATION ✓

SCALE 1 : 100 ✓

Accuracy / Neatness ✓✓

Roof construction	3
Fascia boards	1
Gutters	1
Down pipe	2
Windows	3
Door	1
Step	1
Walls – height and lengths	4
Window sills	3
Determining roof height	1
TOTAL	**20**
FFL (Finished floor level)	1
Scale (print)	1
West elevation (print)	1
TOTAL	**3**
Accuracy/neatness	2
TOTAL	**2**
GRAND TOTAL	**25**

-1 mark for wrong elevation

[40]