basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

# NATIONAL SENIOR CERTIFICATE

## GRADE 12

## CIVIL TECHNOLOGY

## FEBRUARY/MARCH 2013

## MEMORANDUM

**MARKS: 200**

**This memorandum consists of 11 pages.**

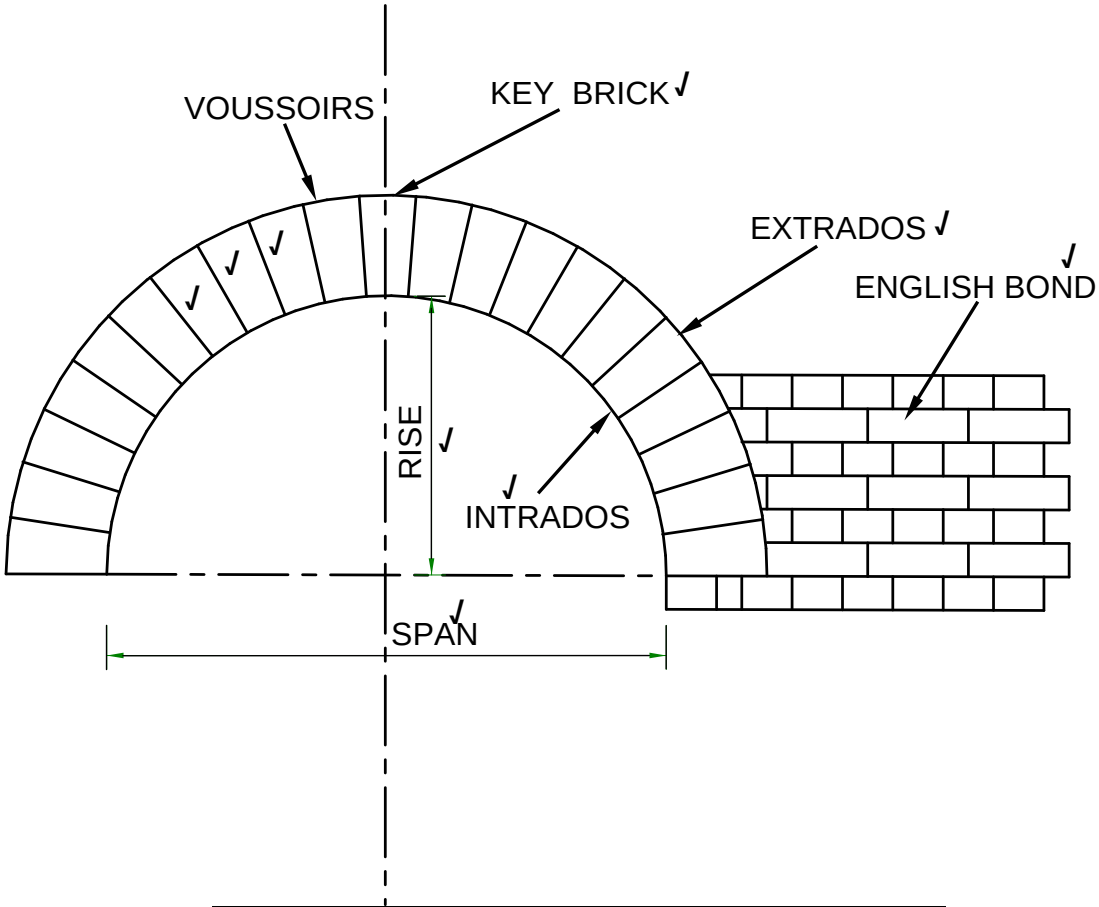
**QUESTION 1: LO 3 AS 1,2,4,5,7,10**

1.1

| | COLUMN A | COLUMN B | |
|---|---|---|---|
| 1.1.1 | Mass concrete | E ✓ | Casted without reinforcement |
| 1.1.2 | Safety officer | C ✓ | Ensures that the employer follows safety regulation |
| 1.1.3 | OHSA | B ✓ | Occupational health and safety act |
| 1.1.4 | Strut | G ✓ | Used for roof construction to brace the truss |
| 1.1.5 | Skirting | F ✓ | A moulding that is found where the wall meets the floor. |

(5)

1.2




| Criteria | Marks | Learner's mark |
|---|---|---|
| Voussoirs | 3 | |
| Key voussoir (brick) | 1 | |
| Rise | 1 | |
| Span | 1 | |
| Intrados | 1 | |
| Extrados | 1 | |
| English bond | 1 | |
| **Total** | **9** | |

1.3 1.3.1 A. Roof truss / Full truss ✓

1.3.2 B. Ridge ✓

1.3.3 C. Wall ✓

1.3.4 D. Hip rafter ✓

1.3.5 E. Common rafter or Half truss ✓

1.3.6 F. Jack Rafter ✓

1.3.7 G. North symbol ✓ (7)

1.3.8 760 mm (any approved spacing according to manufacturer's specifications) ✓ (1)

1.3.9 Hipped roof ✓ (1)

1.3.10 Barge board is used to protect/conceal the ends of batten/purlins and roof underlay at the gable end or verge of the roof ✓
Fascia board is a dressing used to conceal/protect the end of rafters. ✓
Used for attaching gutter brackets
(Any TWO or any other acceptable answers) (2)

1.4 To spread the load of the roof evenly onto the load bearing walls. ✓✓
To provide a level surface for the roof trusses to rest on.
Roof trusses can be nailed onto the wall plate.
(Any TWO or any other acceptable answers) (2)

1.5 Weakens the mixture ✓
Cause excessive bleeding ✓
Cracking can occur when concrete dries
Segregation of aggregates occurs
(Any TWO or any other acceptable answers) (2)

1.6 Triangles (1)
**[30]**

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

2.1 2.1.1 A. Bolt / Threaded rod ✓
B. Shutter board ✓
C. Yoke ✓
D. Concrete / Column ✓
E. Stirrups / Binders✓
F. Clamp / Cleat ✓
G. Wedges ✓
H. Main bars✓ (8)

2.1.2 Plywood/shutter board/toungue and groove planks ✓ (1)

2.1.3 Minimum concrete cover (1)

2.1.4 Hold main bars together (1)

2.2 2.2.1 A - Simple supported beam ✓
B - Cantilever concrete beam ✓ (2)

2.2.2 A – support of floors ✓
B - Used for balconies ✓ (2)

2.3 2.3.1 ✓ ✓
1,872 – 1,376 = 0,496 m OR 1,376 – 1,872 = -0,496 m (2)

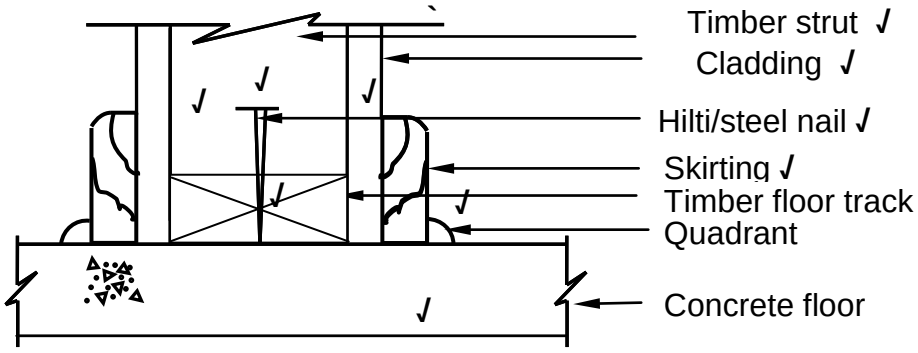
2.3.2 ✓ ✓
1,872 – 1,621 = 0,251 m OR 1,621 – 1,872 = -0,251 m (2)

2.3.3 Intermediate sight ✓ (1)

2.3.4 Fall ✓ (1)

2.4 The dumpy level can be used to measure vertical distance ✓
Vertical angles ✓
Horizontal distance (Any TWO or any other acceptable answers) (2)

2.5




| **Assessment criteria** | **Marks** |
|---|---|
| Concrete floor | 1 |
| Timber floor track | 1 |
| Hilti / Steel nail | 1 |
| Timber strut | 1 |
| Cladding | 1 |
| Skirting | 1 |
| Quadrant | 1 |
| Labelling | 2 |
| **TOTAL** | **9** |

2.6 Tied with wire ✓
Spot welded/welded ✓ (2)

2.7 2.7.1 A Landing
B Rise
C Tread/Going (3)

2.7.2 The height of three steps = 510 mm
$\frac{510}{3}$ ✓
= 170 mm ✓ (2)

2.7.3 Tiles
Carpets (Any ONE or any other acceptable answer) (1)
**[40]**

**QUESTION 3: LO 3 AS 5,8**

3.1 3.1.1 A ✓ (1)

3.1.2 A ✓ (1)

3.1.3 D ✓ (1)

3.1.4 A ✓ (1)

3.1.5 B ✓ (1)

3.2 Collect energy from the sun ✓
Free energy ✓
12 V appliances can be used directly
(Any TWO or any other acceptable answers) (2)

3.3 Pipes and gas bottles must be checked for leakages ✓
Gas leaks must be checked using soap and water, not open flames. ✓
Close the shut-off valve when the system is not in use. ✓
Do not allow open flames near gas bottles. ✓
Ensure that the pilot flame trigger is in good working order.
Refill gas bottles when empty, not when half full.
Check and clean chimneys regularly.
(Any FOUR or any other acceptable answers) (4)

✓
3.4 3.4.1 B - Correct because water and waste will join the main sewer pipe of a 45º angle causing no interuption in the flow of the sewage. ✓✓ (3)

✓
3.4.2 A - Incorrect because waste water will flow into a dead end, bringing the water to temporarily come to a complete halt causing blockages in the system. ✓✓ (3)

3.5 3.5.1 Protection / Prevent sagging✓ (1)

3.5.2 45°✓ (1)

3.5.3 B✓ (1)

3.5.4 C✓ (1)

3.5.5 uPVC✓ (1)

3.6

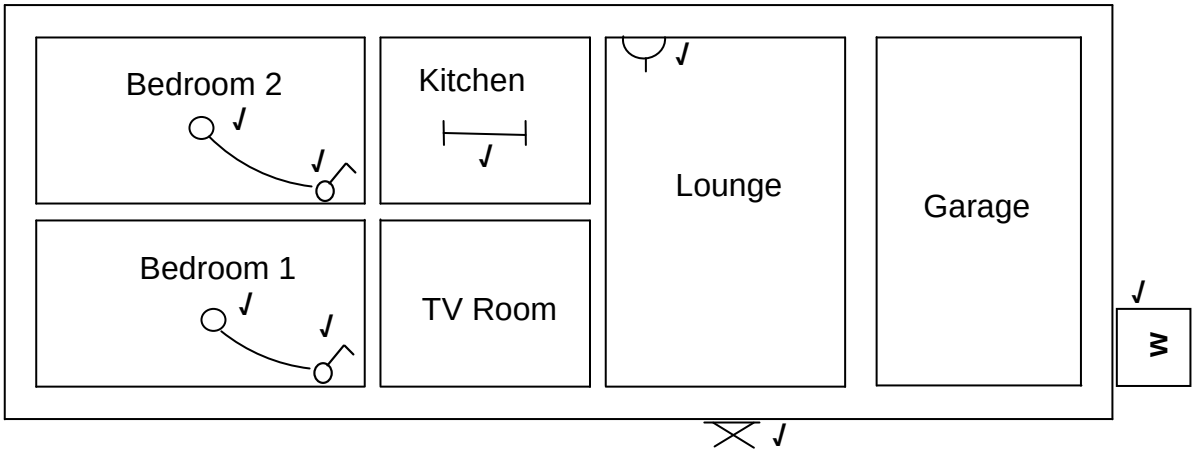



**FIGURE 3.6** (8)

**[30]**

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

4.1 4.1.1 TRUE ✓ (1)

4.1.2 FALSE ✓ (1)

4.1.3 TRUE ✓ (1)

4.1.4 FALSE ✓ (1)

4.1.5 TRUE ✓ (1)

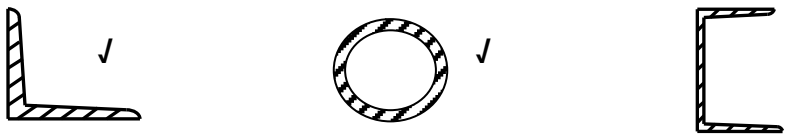
4.2 4.2.1 Not easily flammable ✓
Creosote does not change the shape and dimensions of wood. ✓
(Any TWO or any other acceptable answers) (2)

4.2.2 Wood treated with creosote cannot be painted with ordinary paint. ✓
Wood treated with creosote may stain paint or plaster. ✓
Its smell is absorbed by foodstuffs and other substances around it which makes it less suitable for use indoors
(Any TWO or any other acceptable answers) (2)

4.3 4.3.1 **Cube test**
Compressive ✓
Crushing strength of hardened concrete (1)

4.3.2 **Slump test**
Consistency ✓
Workability of fresh concrete (1)

4.4 4.4.1 Angle iron ✓
Round pipe ✓
Channelling (Any TWO or any other acceptable answer) (2)

4.4.2 


(Any two of the matching descriptions in QUESTION 4.4.1 or any other acceptable answer) (2)

4.5

| A | B | C | D | |
|---|---|---|---|---|
| 1/ ✓ | 8,0 m ✓ | | Area of wall | |
| | 2,7 m ✓ | 21,6 m² ✓ | 8 000 mm x 2 700 mm | (4) |
| | | | | |
| | | | | |
| 1/ ✓ | 1,8 m | | Area of window | |
| | 1,2 m ✓ | 2,16 m² ✓ | 1 800 mm x 1 200 mm | (3) |
| | | | | |
| 1/ ✓ | 2,0 m | | Area of door | |
| | 1,0 m ✓ | 2 m² ✓ | 2 000 mm x 1 000 mm | (3) |
| | | | | |
| | | | Total area of wall excluding window and door openings | |
| | | | | |
| | | | 21,6 m² - 2,16 m² - 2 m² | |
| | | | = 17,44 m² ✓ | (1) |
| | | | | |
| | | | Number of bricks required (Use 110 bricks for 1 m² of 220 thick wall) | |
| 1/ ✓ | 17,44 ✓ | | 17,44 m² x 110 bricks | |
| | 110 ✓ | 1 918,4 | = 1 918,4 bricks | |
| | | | = 1 919 bricks ✓ | (4) |
| | | | | **[30]** |

**QUESTION 5: LO 3 AS 5,6**

5.1 5.1.1 20 mm = 1 m **OR** 30 mm = 1 m **OR** 10 mm = 1 m ✓✓ (2)

5.1.2 60 N ✓ (1)

5.1.3 70 N ✓ (1)

5.1.4 60 N ✓ (1)

5.1.5 2 m ✓ (1)

5.1.6 Upward forces = downward forces
✓ ✓
92 N + 103 N = 25 N + 60 N + 70 N + 40 N
195 N = 195 N (2)

5.1.7 SFa = 92 N ✓ (1)

5.1.8 SFb = 92 N – 25 N = 67 N ✓✓ (2)

5.1.9 SFe = 92 N – 25 N – 60 N – 70 N – 40 N = -103 N

**OR**

67 N – 60 – 70 - 40 = -103 N ✓✓ (2)

5.1.10 SFf = 92 N – 25 N – 60 N – 70 N – 40 N + 103 N ✓ = 0 N ✓

**OR**

- 103 N + 103 N = 0 N (2)

5.1.11 Yes ✓ (1)

5.2 5.2.1 Area of triangle = ½ b x h
= ½ x 30 x 30
= 15 x 30
= 450 mm²

Area of square = s x s
= 30 x 30
= 900 mm²

Total Area = 450 mm² + 900 mm²
= 1 350 mm²

Position of centroid from A – A = $\frac{(A1 \times d) + (A2 \times d)}{\text{Total area}}$
✓✓ ✓✓ ✓✓ ✓✓
= $\frac{(450 \times 20) + (900 \times 45)\ mm^3}{1\ 350\ mm^2}$ ✓
= $\frac{9\ 000 + 40\ 500\ mm^3}{1\ 350\ mm^2}$ ✓
= $\frac{49\ 500\ mm^3}{1\ 350\ mm^2}$
= 36,67 ✓ mm ✓

**OR**

Take moments around A on Y - axis

✓✓ ✓✓ ✓✓ ✓✓

$1\ 350 \times X\ mm^2 = (450 \times 20) + (900 \times 45)\ mm^3$

$1\ 350\ X\ mm^2 = 9\ 000 + 40\ 500\ mm^3$

$X = \frac{49\ 500\ mm^3}{1\ 350\ mm^2}$ ✓ ✓ ✓

$= 36,67$ ✓ mm ✓

**OR**

| Part | AREA (A) | X | AREA OF X<br>Ax |
|---|---|---|---|
| Triangle A1 | 450 mm² ✓✓ | $\frac{h}{3} = \frac{30}{3} = 10 = 30 - 10 = 20$ ✓✓ | 9 000 mm³ |
| Square A2 | 900 mm² ✓✓ | $\frac{s}{2} = \frac{30}{2} = 15 + 30 = 45$ ✓✓ | 40 500 mm³ |
| Σ | 1 350 mm² ✓ | | 49 500 mm³ ✓ |

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

$$= \frac{49\ 500\ mm^3}{1\ 350\ mm^2}$$

= 36,67✓ mm ✓ (12)

5.2.2 Position of centroid from B – B

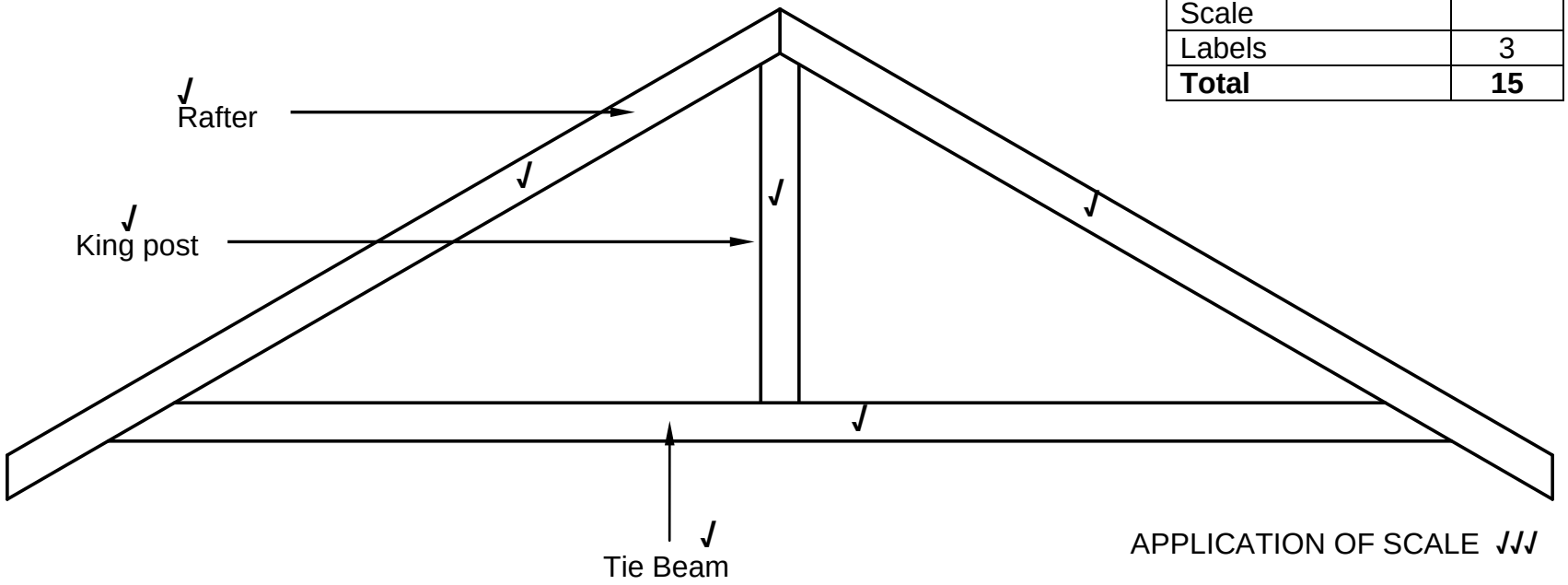
$$\frac{30}{2}$$

= 15 mm✓✓ (2)

**[30]**

**ANSWER SHEET 6.1**
**QUESTION 6.1**

| **Assessment Criteria** | **Marks** |
|---|---|
| Rafter | 2 |
| King post | 1 |
| Tie beam | 1 |
| Title | 1 |
| Scale in print | 1 |
| Neatness | 2 |
| Application of Scale | 4 |
| Labels | 3 |
| **Total** | **15** |



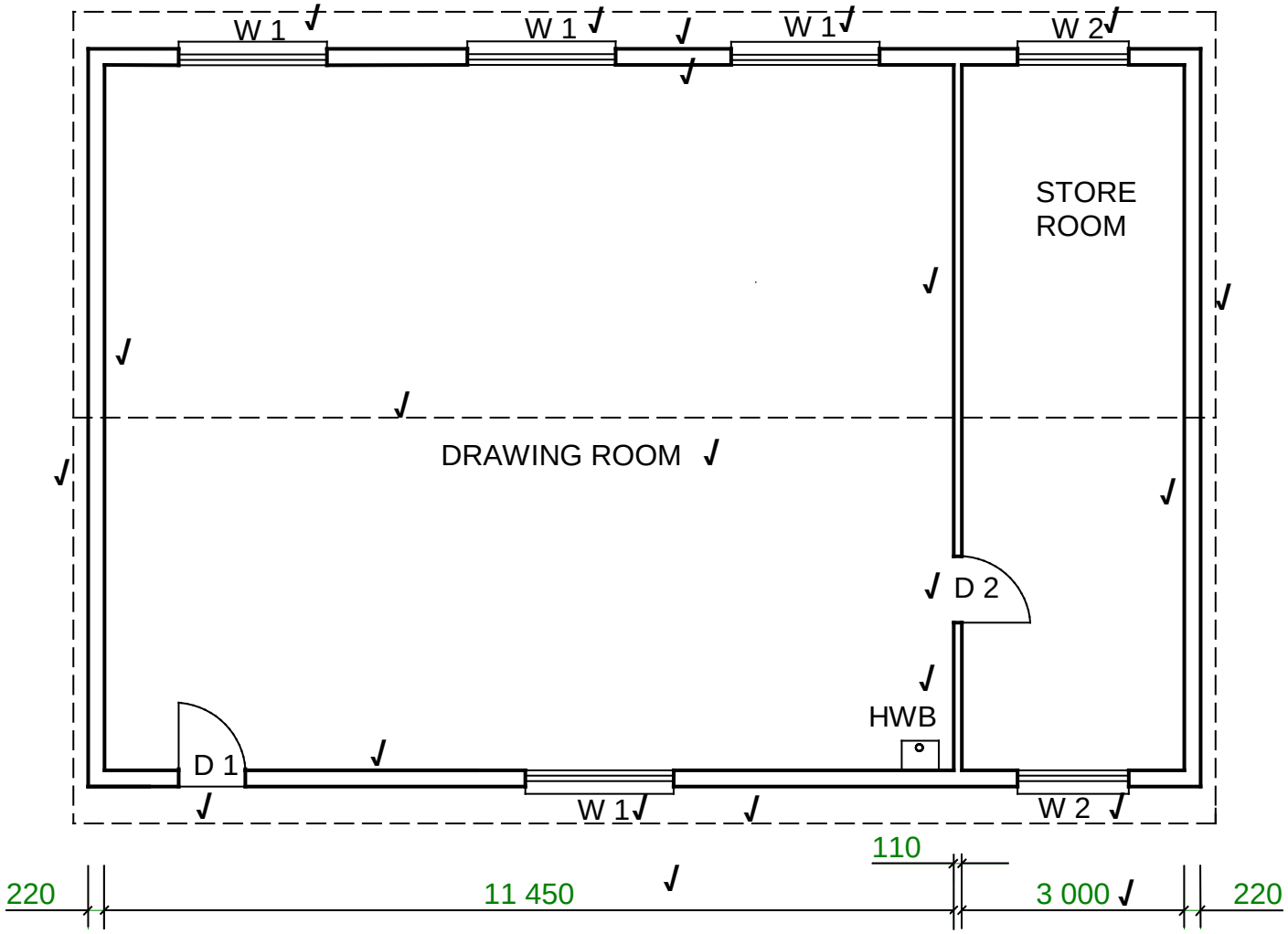

APPLICATION OF SCALE ✓✓✓

NEATNESS ✓✓

KING POST TRUSS ✓

SCALE : 1:20 ✓

**ANSWERSHEET 6.2**
**QUESTION 6.2**




FLOOR PLAN ✓
SCALE 1: 100 ✓

| Assessment Criteria | Marks |
|---|---|
| External walls | 4 |
| Internal wall | 1 |
| Windows | 6 |
| Doors | 2 |
| Roof line | 5 |
| WHB | 1 |
| Print title and scale | 2 |
| Dimensions | 2 |
| Application of scale | 1 |
| Neatness | 1 |
| **TOTAL** | **25** |

**NOT TO SCALE**

**[40]**

**TOTAL: 200**