education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

EXEMPLAR 2008

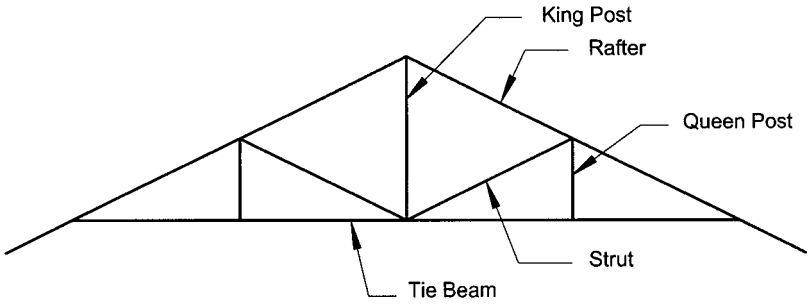
MEMORANDUM

This memorandum consists of 13 pages.

QUESTION ONE

1.1
- concrete footings (1)
- foundation walls (1)
- hardcore filling (1)
- Damp Proof Course (1)
- Concrete slab (1)

1.2 SA (Howe) roof truss (6)



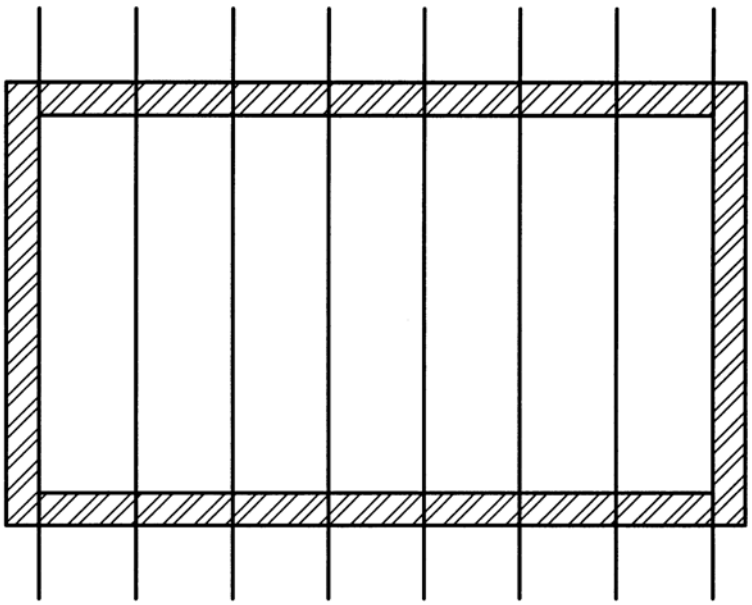
1.3
- Crane (4)
- Hoist
- Scaffolding
- Block and tackle (chain block)

1.4
- ensure that galvanized strap or wire is built five courses below the wall plate into the wall (1)
- ensure that these are spaced according to the specification (1)
- place the wall plate onto the wall (1)
- place the roof trusses onto the wall plate (1)
- nail the galvanized strap or wire on to the wall plate and around the roof truss (1)

1.5

1.5.1 (5)

Building plan - trusses



Not to scale

1.5.2.(a) $\frac{45600\text{mm}}{650\text{ mm}}$ (1)

= 7.015 (1)

The number of roof trusses = 7 + 1(truss against the wall) = 8

1.5.2.(b) 8 x 2 = 16 (3)

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√ √

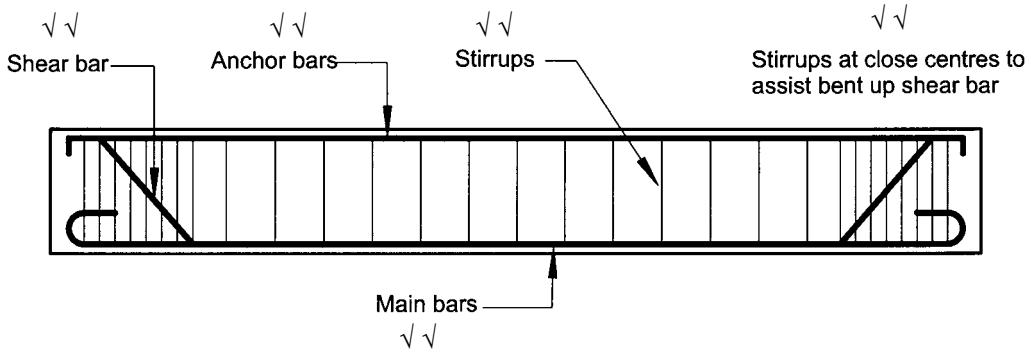
QUESTION TWO

2.1 Concrete is strong in compression and weaker in tensile, while metal is stronger in tensile and weaker in compression. The reinforcement bars will then increase the tensile strength of conrete (4)

2.2
8 – total number of bars (1)
R – mild steel round bar (1)
10 - diameter in mm (1)
01 - bar mark number (1)
200 – spacing centre to centre (1)

2.3

2.3.1 Draw longitudinal section through reinforced conc. Beam (10)



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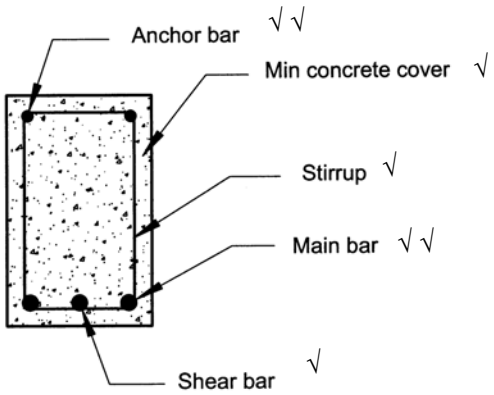
2.3.2 ross-section B-B (7)



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2.4

2.4.1 - it should be strong enough to support the load of wet concrete (3)
- it should not deflect under load which would include the loading of wet concrete, self weight and any superimposed load
- must be accurately set out
- must have grout tight joints
- material must be chosen so that it can be easily repaired
- the design of formwork should be in such a way that they can be easily assembled and dismantled without any members being trapped

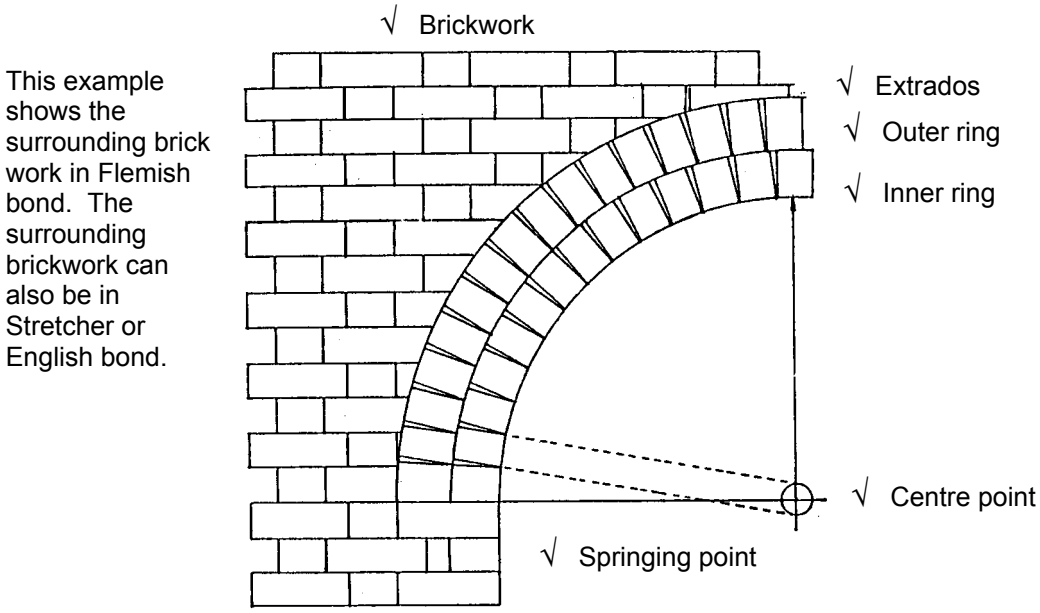
(Any three)

2.4.2 - timber (1)
- metal
- fibre glass
- hard plastic

(Any one)

2.5

2.5.1 Drawing of rough semi-circular arch (6)



2.5.2 A rough arch is constructed of ordinary uncut bricks with wedge joints while a gauged arch is constructed of bricks cut to the required wedge shape called voussoirs. A rough arch is drawn from the inside and a gauged arch is drawn from the outside. (4)

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QUESTION THREE

3.1

3.1.1 To trap grease and oil before it enters the sewer pipes (2)

3.1.2 On the outside of the building where waste water from the kitchen sink discharge into the sewer (1)

3.2

3.2.1 A tank that is built underground used to collect and store sewage material temporarily. This tank is used where there is no water borne sewage system and where it is not possible to install a septic tank. The waste from the houses is deposited into the tank through the interseptic trap. When the tank is about full, the waste is sucked out through the draw-off valve into a truck with a tank, thus emptying the tank. The municipality then disposes off the waste. (4)

3.2.2 The sewage is discharged into the first chamber of the septic tank. This is where the waste is broken down into sludge due to bacteria action. A grid between the two chambers prevent solid material to enter the second chamber where smaller particles are further broken down to a slurry from where it discharges into the French drain. (5)

3.3

3.3.1 In a special heating device, known as the solar collector that is installed on the roof, the sun's rays heat the water that is circulating through the arrangement of pipes between the collector and a storage tank. These solar collectors are specially designed to efficiently heat the water circulating through the pipes. In summer, the water can reach up to 66ºC. (4)

3.3.2 (6)
- The solar collector must face north, at an angle of 35º to the the horizontal.
- Solar collector installed must be SABS approved
- Insulate the circulation pipes in order to minimize loss of heat
- Shadows and shade over the collector should be avoided
- The primary circulation pipes must be as short as practicably possible
- The water may be supplied from either storage cylinder or storage tank

3.3.3 Gas refrigerators are ideal to use where the electricity is not freely available, and is very reliable as it contains no moving parts. (2)

3.4 - Can be led into a tank (1)
- Can be collected into the municipal storm water collection system (1)
- Can be led into the soakaway (1)
- Can be led from the downpipe straight onto the ground (1)

3.5 It will cause soil erosion (2)

[30]

QUESTION FOUR

4.1 - cement can become hard (1)
- it can become lumpy (1)
- it looses its strength (1)

4.2 Thermoplastics may be reshaped and remolded by heat and will harden on cooling, while thermosetting plastics cannot be softened by heat. (2)
Thermosetting plastics are more heat stable and more resistant to solvent action than thermoplastics. (2)

4.3 4.3.1 Expansion gap (1)
To allow for the expansion of different materials due to change in temperature (1)

4.3.2 - insulation / soft board (1)
- polystyrene (1)
- mastic sealant (1)
- silicon

(Any three)

4.4 - certain types can stain timber (1)
- corrosive to metals (1)
- can cause dermatitis (skin afflictions) (1)
- can cause drowsiness if used in confined areas and for long periods
- cause lung disease if fumes are inhaled

(Any three)

4.5 - Surfaces should be clean and dry (1)
- In some instances a special primer coat must be applied (1)

4.6 - thinners (1)
- turpentine (1)
- white spirit (1)
- water
- emulsion
- drying oil
- oil varnish

(Any three)

4.7

A	B	C	D
1/ √	3,76 √	√	CEILING BOARDS
	3,06 √	11,51	4200 - 2/220 = 3760 √√√
			3500 - 2/220 = 3060 √√√
			Therefore 11,51m² of ceiling boards are required
9/ √	4,20 √	37,80√	√
2/ √	3.50 √	7,00 √	√ √
		44,80√	Therefore 44,8metres of brandering is required for the ceiling

(20 / 2 =10)

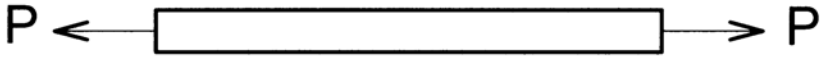
[30]

QUESTION FIVE

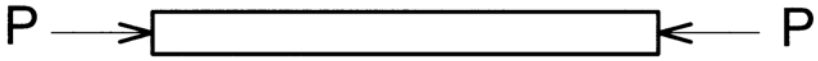
5.1

5.1.1 m (½)
5.1.2 J (½)
5.1.3 N (½)
5.1.4 N (½)

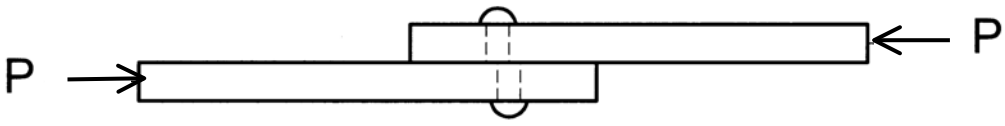
5.2.1 Draw tensile force (2)



5.2.2 Draw Compression force (2)



5.2.3 Draw shear force



(2)

5.3.1 Bending Moment Calculations

BM at A = 0

BM at B = (-20kN x 1.5m) + (-4kN/m x 1.5m x 0.75m) = -30kNm -4.5kNm
= -34.5kNm (1)

BM at C = (-20kN x 2.5m) + (-4kN/m x 2.5m x 1.25m) + (78.1kN x 1m)
= (-50kNm – 12.5kNm + 78.1kNm = 15.6kNm (1)

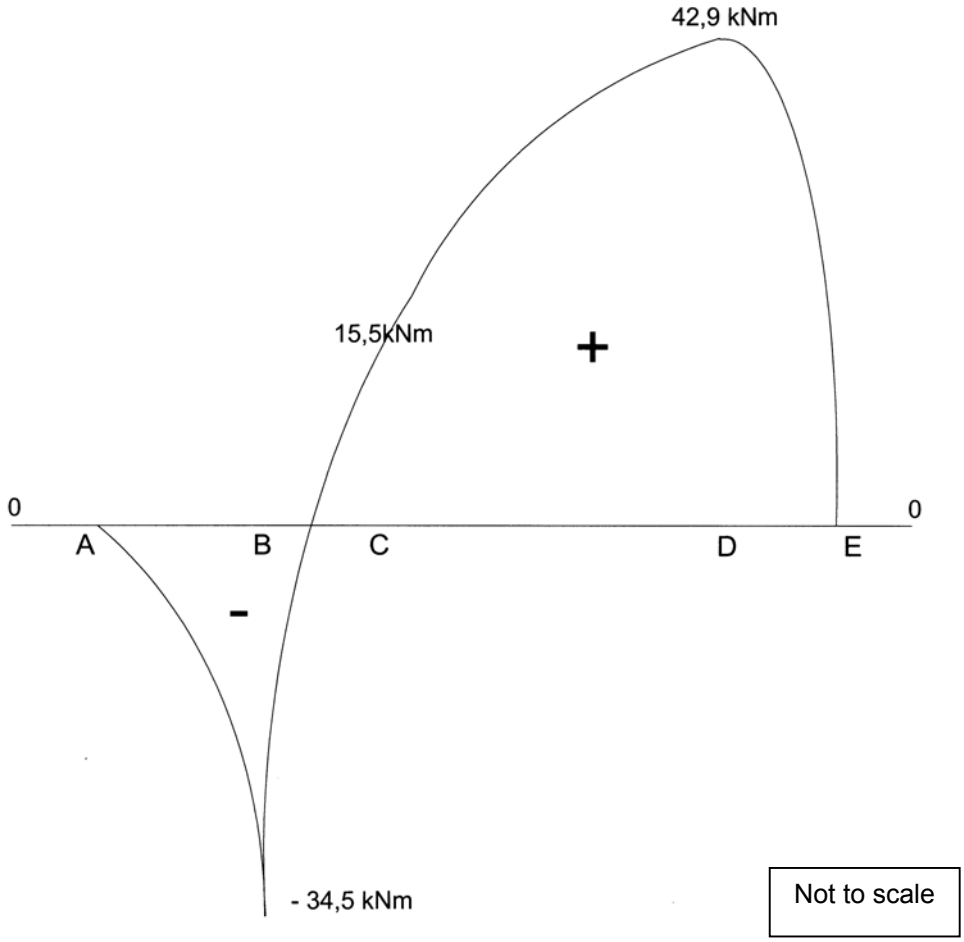
BM at D = (45.9kN x 1m) + (-6kN/m x 0.5m) = 42.9kNm **OR** (1)
(-20kM x 5.5m) + (-4kN/m x 2.5m x 4.25.) + (78.1kN x4m)
+ (-30kN x 3m) = 42.9kN

BM at E = 0

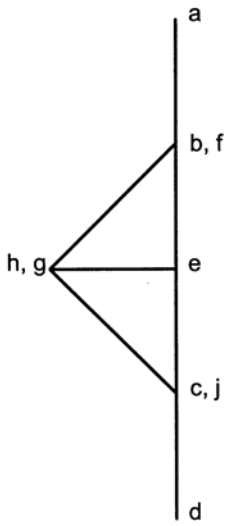
5.3.2

Bending Moment Diagram

(2)



5.4 Force Diagram
Scale 20mm = 1kN



(2)

Not to scale

MEMBER	MAGNITUDE	NATURE	
AF	1kN	Strut	(1)
FG	1.45kN	Strut	(1)
GE	1kN	Tie	(1)
JC	-------	-------	(1)
HJ	1.45kN	Strut	(1)

5.5

5.5.1 Modulus of Elasticity is defined as the stress value required to produce unit strain in a tensile specimen of a particular material and is given by the ratio of stress over strain. (2)

5.5.2 Stress is an internal force in a material resisting load (1)

5.6

5.6.1 Total Area = Area 1 + Area 2 + Area 3 + Area 4
= 2250 + (-706,86) + (-262.50) + 1925,00 (1)
= 3205,64 mm² (1)

5.6.2 Position of centroid from line AB = $\frac{\text{Total (Area x Distance)}}{\text{Total Area}}$ (5)

$= \frac{167422{,}25\ mm^3}{3205{,}64\ mm^2}$

$= \underline{52{,}227\ mm}$

[30]

ANSWER SHEET 6.1

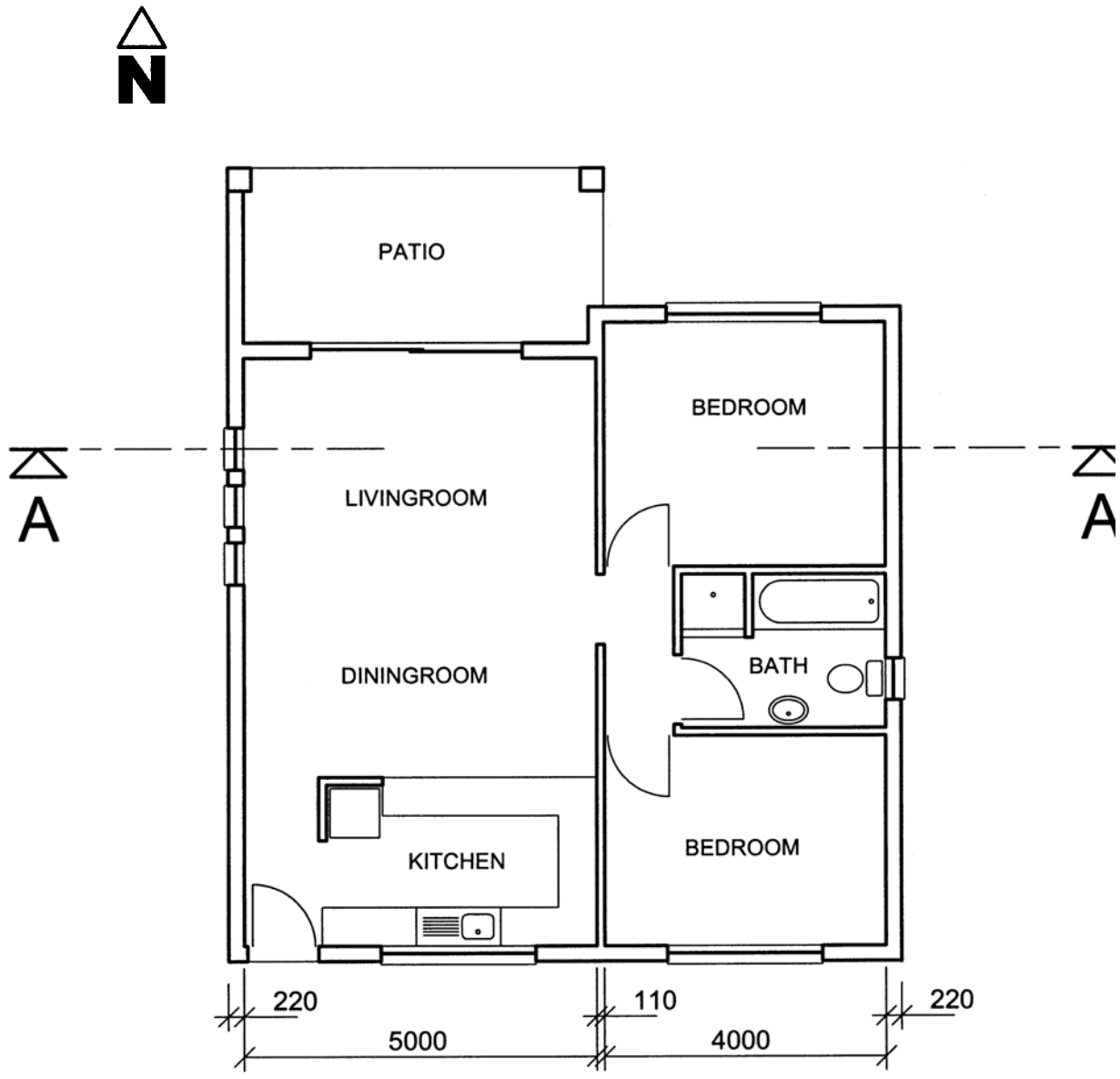


FIGURE 6.1 Not to scale

PLAN SCALE 1:100 Dimensioning (5)

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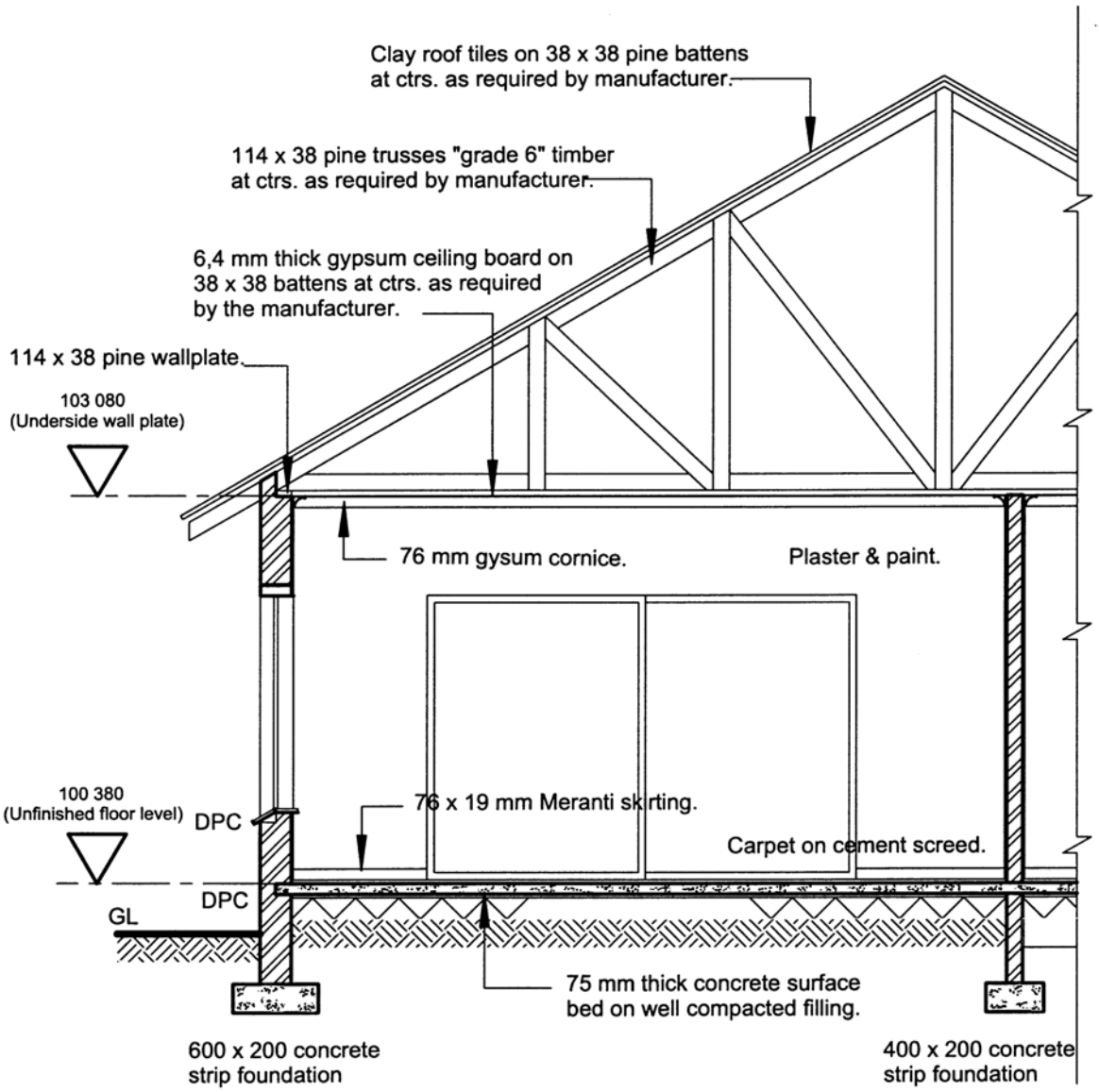
ANSWER SHEET 6.2



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SECTION A-A SCALE 1:50 (15)

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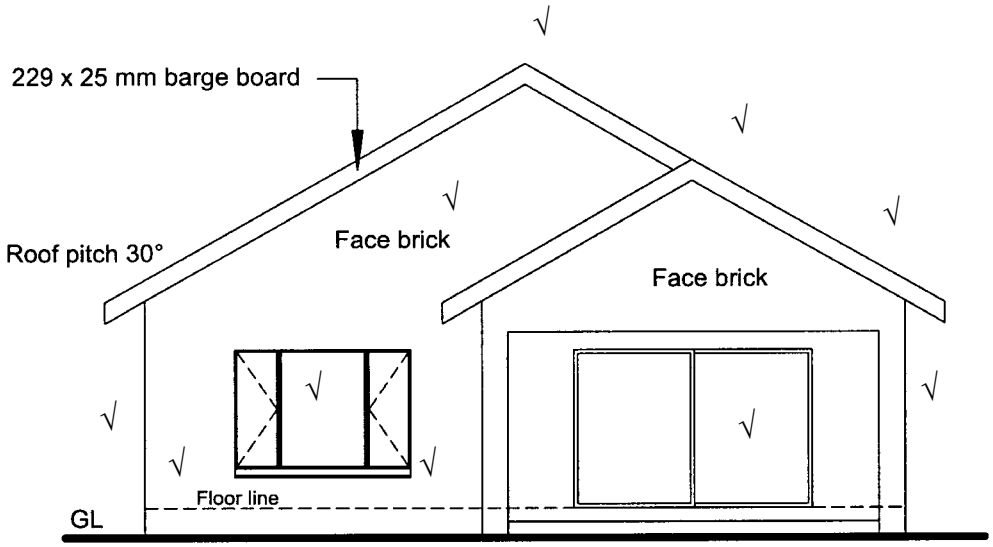
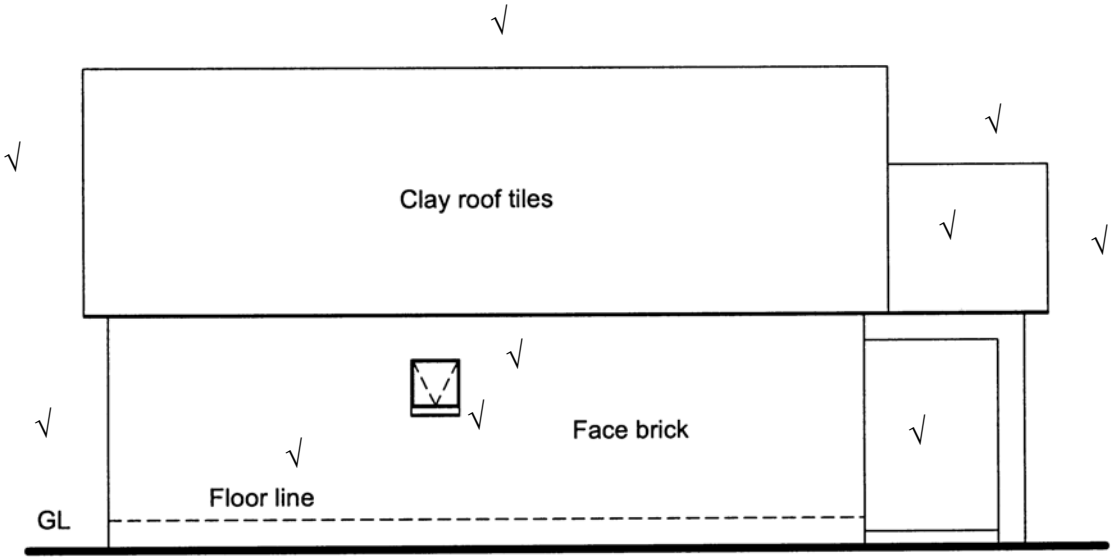
ANSWER SHEET 6.3



Not to scale

NORTH ELEVATION SCALE 1:100 (10)



Not to scale

EAST ELEVATION SCALE 1:100 (10)

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