

education

Department: Education REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

FEBRUARY/MARCH 2009

MEMORANDUM

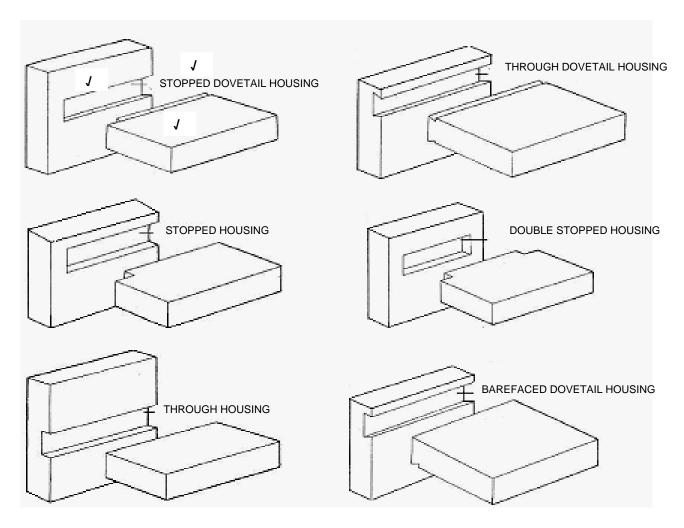
This memorandum consists of 19 pages.

QUESTION 1: CONSTRUCTION PROCESSES

1.1		ed wire/Galvanised steel band must be built into the brickwork before eaches wall plate level.	(1)
1.2	1.2.1	Galvanised wire/Galvanised steel band must be built into the brickwork at least 600 mm below wall plate level for a lightweight roof. J	(1)
	1.2.2	Galvanised wire/Galvanised steel band must be built into the brickwork at least 300 mm below wall plate level for a heavyweight roof. \emph{J}	(1)
1.3	Roofing s Self cuttir Hook bold	ng bolthead screw with bonded washer	(1)
1.4	The top a	that are correctly placed will remain vertically in place. J and bottom of the rafters will be straight. J spacing will be constant at any point. J ons subjected to pressure will not bend. J	(4)
1.5	1.5.1	Purlin is 76 mm x 50 mm J	(1)
	1.5.2	Battens is 38 mm x 38 mm √	(1)
1.6	Hard hat Gloves & Safety bo Harness Safety go [ANY TH	pots /	(3)
1.7	Bricklaye Plasterer Tiler Carpente Joiner Electricia Plumber Cabinet r	y er J n	
		UR OR OTHER ACCEPTABLE ANSWER]	(4)

1.8	Air pollut Noise po	ion ✓ - Because of blasting a lot of dust is sent into the air and carried away by the wind. ✓ - During blasting loud noise is created and can have a negative impact on neighboring communities and	
	Health ris	animals. ✓	
	[ANY TV	VO OR OTHER ACCEPTABLE ANSWER]	(4)
1.9	1.9.1	It is a temporary structure used to support workmen, tools, and material as the building advances in height.	(2)
	1.9.2	Base plate / Planks or other support inserted underneath the uprights of the scaffolds.	(1)
	1.9.3	Remove the base plate and insert castors/wheels. \emph{J}	(1)
	1.9.4	Independent/Putlog scaffold. Dependent scaffold.	(2)

1.10



ONE mark for the Identification and TWO marks for the sketch [ANY ONE OF THE ABOVE SIX OPTIONS]

(3) **[30]**

QUESTION 2: ADVANCED CONSTRUCTION PROCESS

2.1	2.1.1	A gusset plate is used to connect the different members of a steel structure together. \emph{I}	(1)
	2.1.2	Welding Bolts and nuts Rivets [ANY TWO OF THE ABOVE OPTIONS]	(2)
2.2	2.2.1	Pile foundations are concrete columns with a pre determined strength that are sunk into the ground. $\ensuremath{\emph{I}}$	(1)
	2.2.2	Pile foundations are used when the ground is of such a nature	
		that it will sink, when the load of the building is imposed on it (unsuitable soil conditions).	(2)
2.3	2.3.1	The materials are highly cost effective. Excellent structural integrity. Large reduction in in-situ concrete volumes. Minimal formwork required. Good sound and temperature insulation. Not much skilled labour required. Simple and time saving erection required. [ANY FOUR OF THE ABOVE ALTERNATIVES]	(4)
	2.3.2	Pre-stressed ribs Concrete blocks Welded mesh In-situ concrete with strength of 25 MPa [ANY THREE OF THE ABOVE ALTERNATIVES]	(3)
2.4		 A Steel/metal stud or vertical member of the frame √ B Rhino firestop cladding √/cladding C Steel/metal track or horizontal member of the frame √ 	(3)
2.5	TrTrDiWFoA	aning is carried out where: here is uneven loading on the foundation Interest in the subsoil has an unequal bearing capacity Interest in the subsoil has an unequal bearing capacity Interest in the subsoil settlement act on the soil interest in the subsoil settlement act on the soil interest in the subsoil interes	(2)

2.6 Minimum Reinforcing concrete bar cover Helical binder

Mark allocation:

Spacing & Correct number of bars – 2 marks Drawing – 1 mark Helical binder – 1 mark Minimum concrete cover – 1 mark Labels – 3 marks

(8)

2.7 ANSWER SHEET 2.7

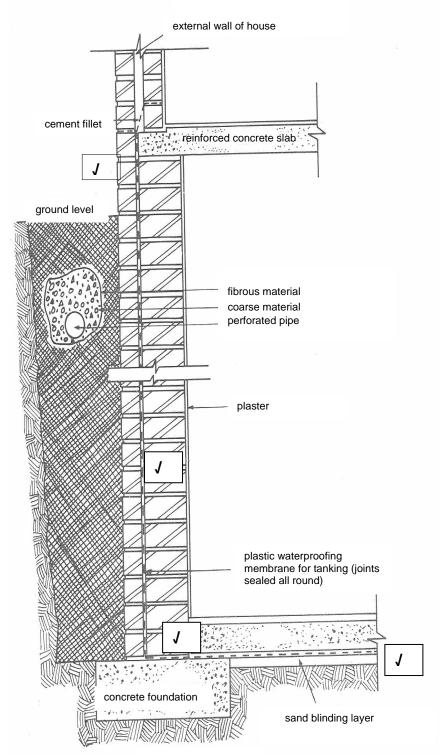
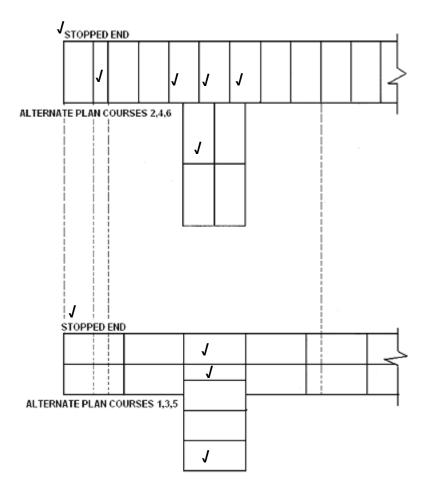


FIGURE 2.7

(4)

- ONE mark for horizontal DPC at floor level.
- ONE mark for vertical DPC within the wall.
- ONE mark for the DPC turning from vertical to horizontal just above the foundation, under the basin floor.
- ONE mark for the horizontal DPC under the basin floor.

2.8



ONE BRICK THICK "T" JUNCTION IN ENGLISH BOND

(10) **[40]**

QUESTION 3: CIVIL SERVICES

3.1 3.1.1 A Waste water pipe (inlet) \(\begin{align*} \infty \ext{ water pipe (inlet) } \extstyle \extstyle \ext{...} \extstyle \text{...} \extstyle \extstyle \ext{...} \extstyle \extstyle \ext{...} \extstyle \extstyle \ext{...} \extstyle \ext{...} \ext{.

B Cover/lid 1

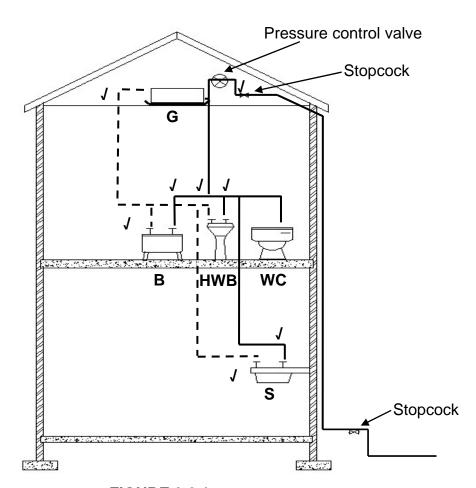
C Drain pipe (outlet) J

D Galvanised sieve J (4)

3.1.2 The sieve must be regularly removed and cleared of vegetable and greasy materials, and returned to it's place.

(2)

3.2 3.2.1



(8)

Cold-water inlet \(\textsup \)
Cold-water taps \(\square \textsup \)
Hot-water outlet \(\square \)
Hot-water taps \(\square \square \)

FIGURE 3.2.1

3.2.2 To shut down the water supply to the building when maintenance needs to be done. (2)

3.3	3.3.1	Nuclear power is used to generate steam which will drive turbines that generate electricity. [ANY OTHER ACCEPTABLE ANSWER]	(1)
	3.3.2	Yes √	(1)
3.4		√ used to drive turbines that generate electricity. HER ACCEPTABLE ANSWER]	(2)
3.5	3.5.1	Where municipal water borne sewage disposal system is non-existent. \emph{J} Where it is not possible to install a septic tank. \emph{J}	(2)
	3.5.2	The local municipality or other service provider must be informed to empty the tank. J A vehicle with a tank and a motorised vacuum system is dispatched to the house. J The hose is connected to the draw off valve, and the content in the conservancy tank is vacuum pumped into the tank of the vehicle. J The waste is then transported to the nearest reticulation plant of the municipality, where it may be recycled. J	(4)
3.6	Animals of Humans of Washing Building la	s from industry further upstream. \(\int \) entering the river. \(\int \) dumping waste into the river. \(\int \) clothes in the river. \(\int \) atrines too close to the bank of the river. UR OF THE ABOVE ALTERNATIVES]	(4) [30]

(2)

(2)

QUESTION 4: MATERIALS

4.1 4.1.1 G J (1)

4.1.2 E J (1)

4.1.3 B J (1)

 $4.1.4 \qquad A \qquad J \tag{1}$

4.1.5 C J (1)

4.1.6 H **J** (1)

4.2 Water must be present in the mix for the chemical reaction called hydration that causes the concrete to harden to take place. ✓

[ANY OTHER ACCEPTABLE ANSWER]

4.3 4.3.1 It is the removal of air voids, in freshly placed concrete to ensure that it reaches its maximum strength. ✓ (3)

4.3.2 Hand compaction

Compaction by vibration

Vibrating table

[ANY TWO OF THE ABOVE ALTERNATIVES] (2)

4.4 The bars can rust. $\sqrt{}$

The bars will not bond properly with the concrete. $\mbox{\it J}$ Heat from fires can cause the bars to lose its tensile strength and distort.

[ANY ONE OF THE ABOVE ALTERNATIVES]

4.5 Use either method A below, or method B on ANSWER SHEET 4.5

4.5.1 **Method A**

Area of the door $-1 \text{ m x 2 m} = 2 \text{ m}^2 \text{ J}$ Area of the window $-2 \text{ m x 1,5 m} = 3 \text{ m}^2 \text{ J}$ Total $=5 \text{ m}^2 \text{ J}$ (3)

4.5.2 Total area $\sqrt{\frac{1}{3}} \sqrt{\frac{1}{3}} \sqrt{\frac{1}{3}} \sqrt{\frac{10 \text{ m} \times 3 \text{ m} = 30 \text{ m}^2}{30 \text{ m}^2 - 5 \text{ m}^2 \sqrt{\frac{1}{3}}}}$ (6)

4.5.3 Number of bricks = Area x No. of bricks /
$$m^2$$
 J
= 25 m^2 x 100 bricks / m^2 J
= 2 500 bricks J (3)

4.5.4 1 000 bricks cost R1 200,00 1 200 1 000 = 1,2 √ 1 brick cost R1,20 x 2 500 bricks √ 2 500 bricks will cost R3 000,00 √

Or

 $\frac{2 \, 500 \, \text{bricks}}{1 \, 000 \, \text{bricks}} = 2,5$

 $2.5 \times R1\ 200 = R\ 3\ 000.00$

Or

One brick cost = $\frac{R1\ 200,00}{1\ 000}$ = R1,20 \checkmark

2 500 bricks cost = R1,20 x 2 500 $\sqrt{ }$ = R3 000,00 $\sqrt{ }$

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(3)

ANSWER SHEET 4.5

Α	В	С	D
			4.5.1
1 /	2		Area of the door:
1 /			
	1	2 m²	= 2 m² √
			Area of the window:
1/	2		
	1.5	3 m²	= 3 m² J
			Total area of the openings:
			Door = 2 m ²
			Window = 3 m ²
			Total = 5 m ² √
			4.5.2
			Total area of brickwork:
1 /	10 √		
	3 √	30 m² √	$= 30 \text{ m}^2 - 5 \text{ m}^2$ J
			= 25 m ² \(\sqrt{J} \)
			4.5.3
			No. of bricks required:
1 /	25 m²		Number of bricks = Area X No. of bricks / m ² J
	<u>100</u> √	2 500	= 2 500 bricks √
			4.5.4
			Price of bricks
			One brick cost = R1 200,00
			$\frac{1000}{1000} = R1,20 \text{ J}$
			2 500 bricks cost = R1,20 x 2 500 ✓
			= R3 000,00 J

[30]

QUESTION 5: APPLIED MECHANICS

5.1 UDL is the load that is spread evenly over the whole or part of a beam. \checkmark (1)

THE METHODS BELOW OR ANY OTHER IS ALSO ACCEPTABLE

5.1.2 Moments around RL

RR x 8 = P x 4

$$48 \times 8 = 4P$$

 $384 = 4P$
 $384 = P$
 4
 $96 \text{ N} = P$

UDL over 8 m $\frac{96}{8}$ = 12 N/m \sqrt{J}

P is used as the UDL (Converted to point load as used in calculation.)

TWO marks given for the method of solving of the problem.

ONE mark for the answer

ONE mark for the unit

(4)

OR

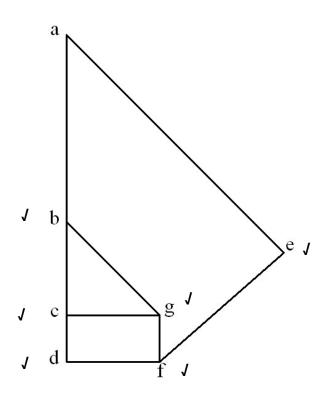
Over 8 m distance

UDL =
$$\frac{N}{Distance}$$
.
$$= \frac{96}{8}$$

$$= 12N/m \sqrt{J}$$

TWO marks given for the method of solving of the problem. JJ ONE mark for the answer ONE mark for the unit

5.2 5.2.1



FORCE DIAGRAM

SCALE 10 mm = 1 kN

(Not to scale) (6)

5.2.2

MEMBER	MAGNITUDE	NATURE
AE	12.8 kN √	Tie J
BG	5.6 kN √	Tie √
CG	3.9 kN √	Strut √
DF	3.9 kN √	Strut √
EF	7.2 kN J	Strut /
FG	2 kN 🗸	Tie J

A tolerance of 0,2 kN will be allowed to either side.

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(12)

5.3 Area of rectangle =
$$I \times b$$

= 60 mm x 40 mm
= 2 400 mm² $\sqrt{ }$

Position of centroid of rectangle from A-B = 30 mm J

Area of square hole = side x side
= 10 mm x 10 mm
=
$$100 \text{ mm}^2 \text{ J}$$

Position of centroid of square from A-B = 15 mm J

Position of centroid =
$$\frac{\text{(A1 x d)} - \text{(A2 x d)}}{\text{Total area}}$$

= $\frac{\text{(2 400 x 30)} - \text{(100 x 15) mm}^2}{\text{2 300 mm}^2}$ J
= $\frac{72\ 000 - 1\ 500\ \text{mm}^2}{\text{2 300 mm}^2}$ J
= $\frac{70\ 500\ \text{mm}^2}{\text{2 300 mm}^2}$
= 30,65 mm

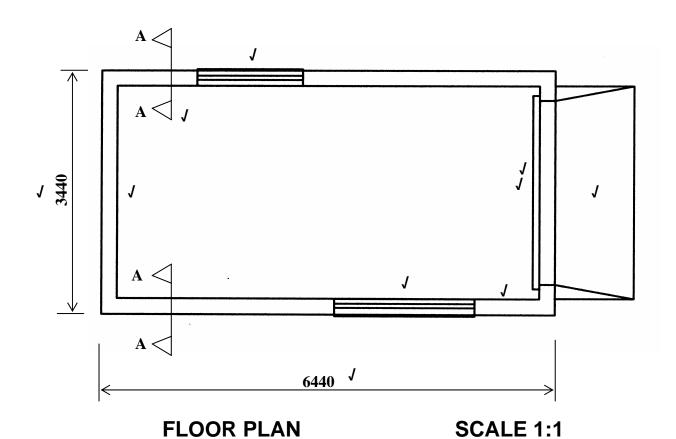
= 30,7 mm J from line A-B

[30]

QUESTION 6: GRAPHICS AND COMMUNICATION

ANSWER SHEET 6.1

QUESTION 6.1



1
1
2
2
1
1
2
10

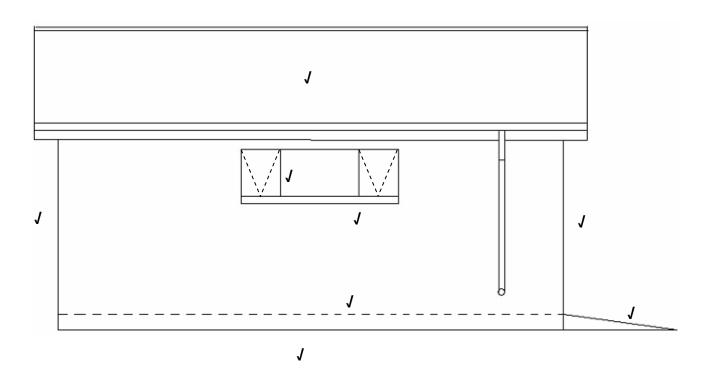


(NOT TO SCALE)

(10)

ANSWER SHEET 6.2

QUESTION 6.2

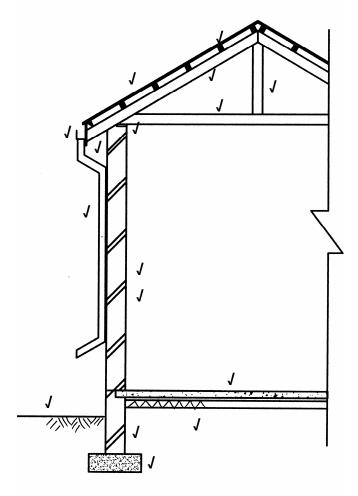


WEST ELEVATION SCALE 1:100

Length	1
Height	2
Window	1
Window sill	1
Floor line	1
Ramp	1
Roof	1
West elevation	1
Scale	1
Total	10

(NOT TO SCALE) (10)

ANSWER SHEET 6.3 QUESTION 6.3



SECTION A – A / SCALE 1:100 /

Accuracy	1
Correct scale	1
Corrugated iron sheeting	1
Purlins	1
Rafter, King Post, Tie Beam	3
Roof overhang	1
Gutter & Down-pipe	2
Wall plate	1
Walls	2
Concrete floor, Hardcore filling	2
Natural Ground Level (NGL)	1
Foundation Wall, Footing	2
Title & Scale	2
Total	20

(NOT TO SCALE) (20) **[40]**

. .

TOTAL: 200