GAUTENG DEPARTMENT OF EDUCATION
GAUTENGSE DEPARTEMENT VAN ONDERWYS

SENIOR CERTIFICATE EXAMINATION
SENIORSERTIFIKAAT-EKSAMEN

TECHNIKA (CIVIL / *SIVIEL*) SG

POSSIBLE ANSWERS / MOONTLIKE ANTWOORDE SUPP 2007

VRAAG 1 / QUESTION 1

1.1

1.1.1 Dit moet vogwerend wees.
It must be impervious to moisture.
1.1.2 Dit moet sterk en duursaam wees.
It must be strong and durable.
1.1.3 Dit moet dun wees.
It must be thin.
1.1.4 Dit moet sterk en buigbaar wees.
It must be strong and flexible.
1.1.5 Dit moet saam met die gebou kan uitsit en inkrimp.
It must be able to expand and shrink with the building.

EEN PUNT ELK ***ONE MARK EACH*** (5)

1.2

1.2.1 Dit moet van 'n materiaal wees wat in die nodige vorm gebuig kan word.
It must be of a material that can be easily bent to any required shape.
1.2.2 Dit moet in staat wees om die trekspanning te weerstaan sonder enige noemenswaardige vervorming.
It must be capable of achieving this tensile strength without undue strain.
1.2.3 Die oppervlakte van die bewapening moet in staat wees om 'n verband met die beton te verseker sodat die ontwerp-trekspanning verkry kan word.
Its surface must be capable of developing an adequate bond between the concrete and the reinforcement to ensure that the required design tensile strength is obtained.
1.2.4 Dit moet 'n soortgelyke warmte-uitsettingskoëffisiënt hê om te verhoed dat onnodige spanning deur temperatuurverandering veroorsaak word.
A similar coefficient of thermal expansion is required to prevent unwanted stresses being developed within the member due to temperature changes.
1.2.5 Dit moet vryelik, en teen billike pryse, in die handel beskikbaar wees en aanpasbaar wees by die bewapeningsontwerp.
Availability at a reasonable cost which must be acceptable to the overall design and concept.

EEN PUNT ELK ***ONE MARK EACH*** (5)

1.3

1.3.1 Beton is geweldig sterk en kan onder samedrukking 'n baie hoë drukkrag weerstaan.
Concrete is very strong and can resist very high compressive stress.
1.3.2 Onder sametrekking breek dit egter maklik en moet met staal bewapen word om trekspanning te weerstaan.
Its tensile strength is rather poor and it will collapse easily and should be reinforced with steel to resist tensile stress.
1.3.3 Waterdigtheid
Watertightness
1.3.4 Duursaamheid
Durability
1.3.5 Nie-verwerend
Resistance to weathering
1.3.6 Skokbestand
Shock resistant
1.3.7 Stabiliteit
Stability

ENIGE VYF EEN PUNT ELK ***ANY FIVE ONE MARK EACH*** (5)

1.4

1.4.1 Alle rioleringswerk moet aan die regulasies voldoen.
All work on the system must comply with the regulations.
1.4.2 Steekoë moet by alle vertakkings aangebring word.
Rodding eyes should be installed at each branch off.
1.4.3 'n Ontlugpyp moet op die hoogste of verste punt geïnstalleer word.
A ventilation pipe must be installed at the highest or furthest point of the system.
1.4.4 Die riool moet die regte val hê.
The drainage system must have the correct gradient.
1.4.5 Dit moet van punt tot punt reguit gelê word.
Must be laid straight from one point to the other.
1.4.6 Stankafsluiters moet geïnstalleer wees waar vuilwater die riool binnegaan.
Stench traps must be installed where waste water enters the drain.
1.4.7 Waar vuilwater die stelsel binnegelaat word, moet dit geskied deur 'n rioolsperder.
Where waste water enters the system it must be over a grid in the gulley.
1.4.8 Alle rioolpype moet op 'n stewige betonfondament rus om te verhoed dat die pype sak en breek.
All drainpipes must be laid on a solid concrete base to prevent it from sagging or breakage.
1.4.9 Die hele stelsel moet water- en lugdig wees.
The complete system must be water and air tight.
1.4.10 Dit moet onmoontlik wees vir enige rioolvuil om op enige plek in die stelsel vas te steek.
The system must be of such a nature that no waste will get stuck.

1.4.11 Vermy waar moontlik, alle rioolpype onderdeur geboue. Indien dit onvermydelik is moet die pype bekis word.
Avoid drainpipes to run under buildings. Where it is not possible the drain pipes must be boxed in concrete.

ENIGE TIEN EEN PUNT ELK ***ANY TEN ONE MARK EACH*** (10)

1.5

1.5.1 Die hele stelsel moet waterdig wees.
The complete system must be watertight.
1.5.2 Lug moet vrylik deur die stelsel kan vloei.
Air must be able to circulate through the system.
1.5.3 Elke deel van die stelsel moet vir skoonmaakdoeleindes bereik kan word.
Each part must be reachable for cleaning purposes.
1.5.4 Dit moet onmoontlik wees vir rioolvuil om op enige punt in die stelsel vas te steek.
It must be impossible for any sewerage to be trapped at any point in the system.
1.5.5 Alle pype moet op 'n soliede fondament rus.
All pipes must be on a firm foundation.
1.5.6 Rioolpype moet van punt tot punt in 'n reguit lyn gelê word.
Sewerage pipes must be in a straight line from one end to the other.
1.5.7 Die uitleg moet so prakties en eenvoudig moontlik wees.
The layout must be as practical and simple as possible.
1.5.8 Die minimum diameter van die pype moet 100 mm wees.
The minimum pipe diameter must be 100 mm.
1.5.9 Steekoë moet by elke vertakking aangebring wees.
Cleaning eyes should be installed at each branching off.
1.5.10 Die riool moet die regte gradiënt hê.
Drains must have the correct gradient.

ENIGE VYF EEN PUNT ELK ***ANY FIVE ONE MARK EACH***

1.6

1.6.1 Plaas twee penne (A en B) op 'n redelik gelyk terrein, ongeveer 100 meter uitmekaar.
Place two pegs (A and B) on a level area about 100 metres apart.
1.6.2 Stel die instrument op in 'n posisie, sodat dit ewe ver van A en B is.
Set up the instrument in a position, so that it is the same distance from A and B.

1.6.3 Stel die instrument waterpas en neem lesings op die stawwe wat by A en B gehou word. **(Gestel hierdie lesings is a en b.)**
Die verskil in die lesings (a - b) sal die ware hoogteverskil tussen A en B wees, al het die instrument 'n kollimasiefout.

Met die peilingsafstande ewe lank, sal die afwyking van die horisontale lyn aan weerskante ewe groot, en in dieselfde rigting wees.
Hierdeur word die fout dus uitgekanselleer.
Set the instrument level and take the readings on the rods held at A and B. ***(The readings are respectively a and b.)***

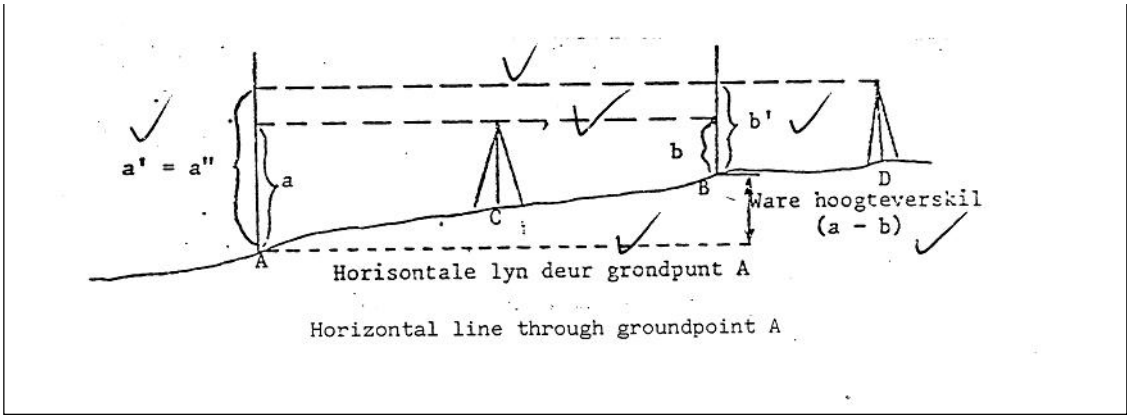
The difference in the readings (a – b) will be the real height difference between A and B, even if the instrument has a collimation fault.
With the distances equal, the deviation from the horizontal line on either side will be equal and in the same direction.
The miscalculation is thus corrected.

1.6.4 Verskuif nou die instrument en stel dit op in 'n posisie baie naby aan die een staf, en ver van die ander staf. (Staf B.)
Die kollimasiefout sal nou sy volle effek toon, aangesien die peilingsafstande nie ewe lank is nie, en dus nie die fout uitkanselleer nie.
Move the instrument and set it up close to one rod and far from the other. (Rod B)
The collimation fault will now show its full effect seeing that the marked distances are not equal in length, and the miscalculations are not corrected.

1.6.5 Nadat die instrument waterpas gestel is, word die lesings op die naby staf, staf "B", geneem. (Punt b!)
After the instrument has been set level, the readings close to rod "B" are taken. (Point b!)

1.6.6 Met behulp van hierdie lesing b! en die ware hoogteverskil (a – b), word die lesing wat op "A" gelees behoort te word, en geen fout teenwoordig is nie, soos volg bereken:
Ware lesing op staf A (a!) = b! + (a – b)
With the aid of this reading b! and the true height difference (a – b) and no miscalculation present, the reading at "A" is calculated as follows:
True reading on rod A (a!) = b! + (a – b)

1.6.7 Neem nou die werklike lesing (a!) op die staf by A, en vergelyk dit met die berekende of ware lesing.
Indien hierdie twee lesings, die ware en die werklike lesings, ooreenstem, is die instrument ingestel.
Take the real reading (a!) on the rod A and compare it to the true reading.
If both readings, the true and real readings, are the same then the instrument is set.



TWEE PUNTE VIR ELKE PUNT BESKRYF. SES PUNTE VIR DIE SKETS SOOS AANGEDUI.
TWO MARKS VIR EACH PIONT DISCUSSED. SIX MARKS FOR THE SKETCH AS SHOWN (20)

1.7

1.7.1 Stene of blokke moet in 'n stewige verband gebou word en met mortel vasgebou word.
Bricks or blocks must be built in a stout bond using dagha.

1.7.2 Die verskillende mure moet deur muurbinte verbind word.
The different walls must be joined with wall ties.

1.7.3 Die openinge mag nie minder as 50 mm en nie wyer as 75 mm wees nie.
The gap between the walls must not be smaller than 50 mm and not wider than 75 mm.

1.7.4 Die stene wat gebruik word, mag nie minder as 100 mm dik wees nie.
The bricks which are used may not be less than 100 mm thick.

1.7.5 Die binnemuurstene mag nie minder as 75 mm dik wees nie.
The inner wall bricks may not be less than 75 mm thick.

1.7.6 Gipsdagha met 'n mengverhouding van 1:2:9 moet gebruik word.
Plaster dagha with a mixing proportion of 1:2:9 must be used.

1.7.8 Die regte hoeveelheid muurbinte, soos deur regulasies bepaal, moet gebruik word.
The correct number of wall ties as stipulated by regulation must be used.

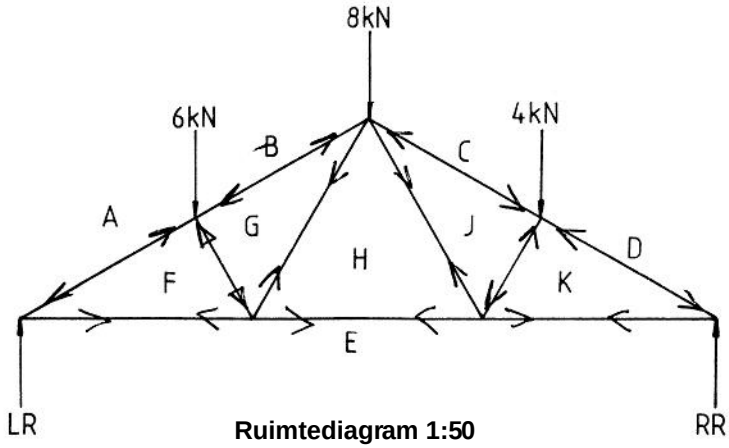
ENIGE VYF TWEE PUNT ELK ***ANY FIVE TWO MARKS EACH***

(10)

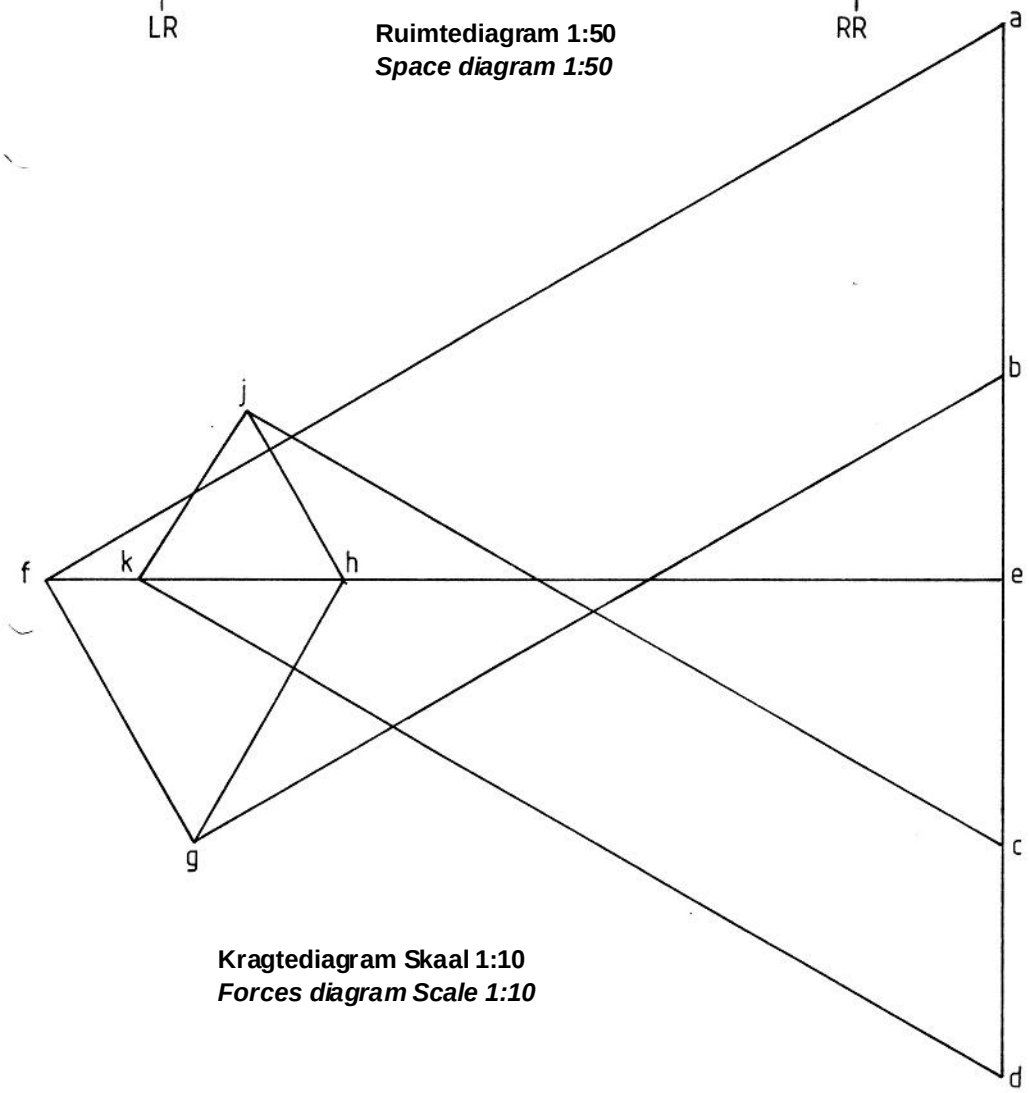
[60]

VRAAG 2 / QUESTION 2

ONDERDEEL *MEMBER*	AARD *NATURE*	GROOTTE *MAGNITUDE*
AF	STUT / *STRUT*	19 kN
BG	STUT / *STRUT*	16 kN
CJ	STUT / *STRUT*	15 kN
DK	STUT / *STRUT*	17 kN
KE	STANG / *TIE*	14,7 kN
HE	STANG / *TIE*	11,5 kN
EF	STANG / *TIE*	16,5 kN
GF	STUT / *STRUT*	5,5 kN
HG	STANG / *TIE*	5,2 kN
KJ	STUT / *STRUT*	3,5 kN



Ruimtediagram 1:50
Space diagram 1:50



Kragtediagram Skaal 1:10
Forces diagram Scale 1:10

PUNTE SOOS AANGEDUI ***MARKS AS SHOWN***

VRAAG 3 / QUESTION 3

3.1 **BEREKEN P** ***CALCULATE P***

Neem momente om Q *Take moments about Q*

LOM = ROM

(P x 12) = (R x 3,5) + (C x 5) + (B x 10)
12 P = (9 x 3,5) + (7 x 5) + (6 x 10)
12 P = 31,5 + 35 + 60
12 P = 126,5
P = $\frac{126,5}{12}$
P = 10,54 kN

BEREKEN Q ***CALCULATE Q***

Neem momente om P *Take moments about P*

(Q x 12) = (B x 2) + (C x 7) + (R x 8,5)
12 Q = (6 x 2) + (7 x 7) + (9 x 8,5)
12 Q = 12 + 49 + 76,5
12 Q = 137,5
Q = $\frac{137,5}{12}$
Q = 11,46 kN

TOETS / *TEST*

Opwaartse kragte = Afwaartse kragte
Upward forces = *Downward forces*

10,54 kN + 11,46 kN = 6 kN + 7 kN + 9 kN
22 kN = 22 kN

3.2 **BEREKEN BUIGMOMENTE** ***CALCULATE BENDING MOMENTS***

BMA = P x 0
= 10,54 x 0
= 0 kN/m

BMB = P x 2
= 10,54 x 2
= 21,08 kN/m

BMC = (P x 7) – (B x 5)
= (10,54 x 7) – (6 x 5)
= 73,78 – 30
= 43,78 kN/m

BMD = (P x 10) – (R x 1.5) – (C x 3) – (B x 8)
= (10,54 x 10) – (9 x 1.5) – (6 x 8)
= 105,4 – 13,5 – 48
= 43,9 kN/m

BME = (P x 12) – (R x 3.5) – (C x 5) – (B x 10)
= (10,54 x 12) – (9 x 3,5) – (7 x 5) – (6 x 10)
= 126,48 – 31,5 – 35 – 60
= - 0,02 kN /m

3.3 **BEREKEN SKUIFKRAGTE** ***CALCULATE SHEARFORCES***

SKA - / ***SFA -***	**=**	**0 kN**
SKA+ / ***SFA +***	=	P = **10,54 kN**
SKB - / ***SFB -***	**=**	P = **10,54 kN**
SKB + / ***SFB +***	=	P – B = 10,54 – 6 = **4,54 kN**
SKC - / ***SFC -***	**=**	P – B = 10,54 – 6 = **4,54 kN**
SKC + / ***SFC +***	=	P – B – C = 10,54 – 6 – 7 = **- 2,46 kN**
SKD - / ***SFD -***	=	P – B – C – R = 10,54 – 6 – 7 – 9 = **- 11,46 kN**
SKD + / ***SFD +***	=	P – B – C – R = 10,54 – 6 – 7 – 9 = **- 11.46 kN**
SKE - / ***SFE -***	=	P – B – C – R = 10,54 – 6 – 7 – 9 = **- 11,46 kN**
SKE + / ***SFE +***	**=**	P – B – C – R + Q 10,54 – 6 – 7 – 9 + 11,46 = **0 kN**

VRAAG 5 / QUESTION 5

BETONBALK EN -VLOER ***CONCRETE BEAM AND FLOOR***

BALK	6	*BEAM*
VLOER	6	*FLOOR*
SOFFIETPLANKE	4	*SOFFIT BOARDS*
BALKE 114 x 76 mm	4	*JOISTS 114 x 76 mm*
KLAMPE 76 x 50 mm	2	*CLEATS 76 x 50 mm*
KOPDRAER 76 x 50 mm	2	*HEAD TREE 76 x 50 mm*
STUT 114 x 76 mm	2	*STRUT 114 x 76 mm*
STUTTE 76 mm x 22 mm	2	*STRUTS 76 mm x 22 mm*
SPALKPLATE	2	*FISH PLATES*
VOETPLAAT	2	*SOLE PLATE*
WIGPAAR	2	*WEDGES*
HEGSTROKE	2	*FIXING PLATES*
EKSTRA STUTTE	2	*EXTRA STRUTS*
BALKWAPENING	6	*BEAM REINFORCING*
BLADWAPENING	6	*SLAB REINFORCING*
AFMETINGS	3	*DIMENSIONS*
BYSKRIFTE	3	*LABELS*
SKAAL	4	*SCALE*
	60	

VRAAG 6 / QUESTION 6

SNITAANSIG VAN HUISPLAN ***SECTIONAL VIEW OF DWELLING***

FONDASIES	2	*FOUNDATIONS*
ONDERBOU	2	*SUBSTRUCTURE*
BOBOU	2	*SUPERSTRUCTURE*
HARDEPUIN	2	*HARD CORE*
PUINVULLING	2	*CORE FILLING*
VLOER	2	*FLOOR*
VWL	2	*DPC*
VLOERLYS	2	*SKIRTING*
KWARTROND	2	*QUARTER ROUND*
VENSTERBANK	2	*WINDOW SILL*
LATEI	2	*LINTEL*
DEUR	2	*DOOR*
BUITEMURE	2	*OUTER WALLS*
BINNEMURE	2	*INNER WALLS*
PLAFON	2	*CEILING*
KROONLYS	2	*CORNICE*
PLAFONLATTE	2	*BRANDERING*
MUURPLAAT	2	*WALL-PLATE*
DAKKONSTRUKSIE	6	*ROOF CONSTRUCTION*
NOKPLAAT	2	*RIDGE CAP*
OORHANG	2	*OVERHANG*
DAKBEDEKKING	2	*ROOF COVERING*
GEUTE	2	*GUTTERS*
AFLEIPYPE	2	*DOWN PIPES*
LYNWERK	2	*LINEWORK*
NETHEID	2	*NEATNESS*
BYSKRIFTE	2	*LABELS*
SKAAL	2	*SCALE*
	60	

A	B	C	D
			9 Dakkappe moet vervaardig word ***9 Roof trusses must be made***
			Lengtes van tekening *Lengths from drawing*
			Hoofstyl / *Kingpost* 1 380 mm
			Kapbeen / *Rafter* 3 160 mm
			Bindbalk / *Tiebeam* 4 200 mm
			Skuinsstut / *Diagonal strut* 1 200 mm
			Stut / *Strut* 820 mm
			HOOFSTYL / *KINGPOST* (B)
9/	1,38 m	12,42 m	1 380 mm x 1 x 9
			KAPBEEN / *RAFTER* (A)
18/	3,16 m	62,28 m	3 160 mm x 2 x 9
			BINDBALK / *TIE BEAM* (C)
9/	4,2 m	37,8 m	4 200 mm x 1 x 9
			SKUINSSTUT/*DIAGONAL STRUT* D
9/	1,20 m	10,8 m	1 200 mm x 2 x 9
			STUT / *STRUT* (E)
9/	0,82 m	7,38 m	820 mm x 2 x 9
			TOTALE HOEVEELHEID HOUT ***TOTAL AMOUNT OF TIMBER***
		12,42 m	**HOOFSTYL / *KINGPOST***
		62,28 m	**KAPBEEN / *RAFTER***
		37,8 m	**BINDBALK / *TIE BEAM***
		10,8 m	**SKUINSSTUT / *DIAGONAL STRUT***
		7,38 m	**STUT / *STRUT***
		143,46 m	**TOTAAL / *TOTAL***

			5% VERMORSING / *WASTAGE*
		143,46 x 0,05 7,17 m	
		143,46 + 7,17 **150,63 m**	**TOTAAL / *TOTAL***
			Daar sal 150,63 lopende meter 114 x 38 mm timmerhout nodig wees om 9 dakkappe te vervaardig. ***There will be 150,63 running metre 114 x 38 mm timber needed to manufacture 9 roof trusses***

(30)

7.2

A	B	C	D
			Bobou-hartlyn / *Superstructure centre line*
			2 x 14 000 = 28 000 mm
			2 x 6 000 = 12 000 mm
			40 000 mm
			Minus 4 x 220 mm = 880 mm
			39 120 mm
			Die hartlyn is / *The centre line is 39,12 metre*
			Hoogte van bobou is 3 000 mm
			Height of superstructure is 3 000 mm
			50 Stene per vierkante meter vir 'n halfsteenmuur
			50 Bricks per square metre for a half-brick wall
			Daar is 2 halfsteenmure
			There are 2 half-brick walls
1/	39,12		
	3,0	117,36 m	
	117,36		
	117,36		
2/	50	11 736	Daar is 11 736 stene nodig.
	5 868		*There are 11 736 bricks needed.*
			Aftrekkings / *Deductions*
			Vensters / *Windows*
			3 x 2 000 x 1 500

			50 Stene per vierkante meter vir 'n halfsteenmuur
			50 Bricks per square metre for a half-brick wall
			Daar is 2 halfsteenmure
			There are 2 half-brick walls
3/	2,0 1,5 3,0 9,0	9,0 m	
2/	50 450	900	Daar is 900 stene *There are 900 bricks*
			Deure / *Doors*
			1x 2 000 x 2 000
			50 Stene per vierkante meter vir 'n halfsteenmuur
			50 Bricks per square metre for a half brick wall
			Daar is 2 halfsteenmure
			There are 2 half brick walls
1/	2,0 2,0 4,0	4,0 m	
2/	4,0 50 200	400	Daar is 400 stene *There are 400 bricks*
			Totale aftrekkings / *Total deductions*
			Vensters / *Windows* 900 Deure / *Doors* 400 1 300 Stene / *Bricks*

			Totale stene / *Total bricks*
			Struktuur / *Structure* 11 736 Aftrekkings / *Deductions* - 1 300 10 436
			Plus 5%-vermorsing / *Wastage*
			10 436 x 0,05 521,8 10 436 + 522 10 958
			Daar sal 10 958 stene nodig wees ***There will be 10 958 bricks needed***

(30)

300