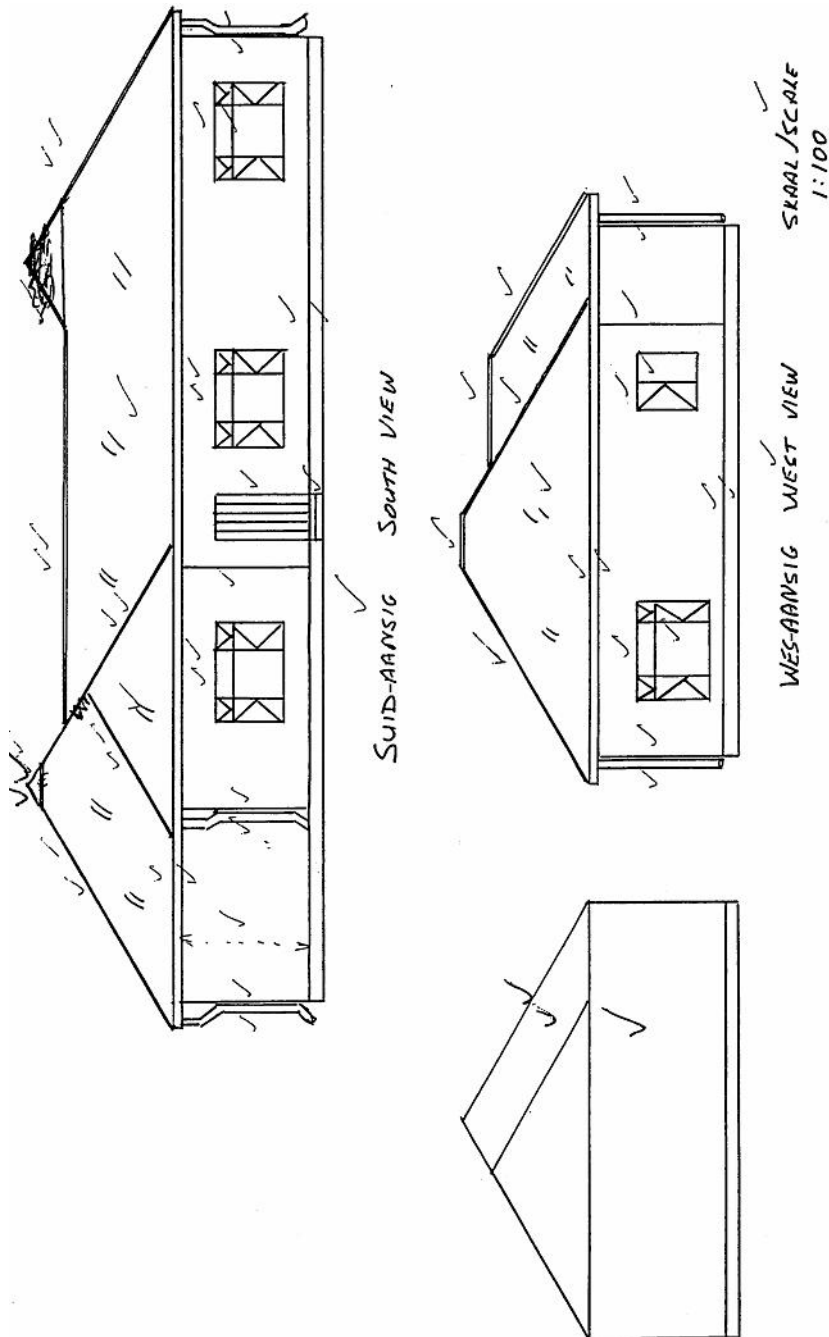


GAUTENG DEPARTMENT OF EDUCATION /
GAUTENGSE DEPARTEMENT VAN ONDERWYS
SENIOR CERTIFICATE EXAMINATION /
SENIORSERTIFIKAAT-EKSAMEN

BUILDING CONSTRUCTION SG
BOUKONSTRUKSIE SG

Possible Answers / Moontlike Antwoorde
Feb / Mar / Maart 2006

QUESTION 1 / VRAAG 1



QUESTION 2 / VRAAG 2

A	B	C	D
			Substructure centre line / Onderbou-hartlyn
			2 x 17 000 = 34 000 mm
			2 x 11 000 = 22 000 mm
			= 56 000 mm
			Minus 4 x 330 = <u>1 320 mm</u>
			= 54 680 mm
			The centre line is / <i>Die hartlyn is 54,68 metre / meter</i>
			Height of the substructure is 450 mm
			<i>Hoogte van die onderbou is 450 mm</i>
			50 Bricks per square metre for a half-brick wall
			<i>50 Stene per vierkante meter vir 'n halfsteen-muur</i>
			There are 3 half-brick walls
			<i>Daar is 3 halfsteen-mure</i>
1/	54,68 <u>0,45</u> 24,606	24,606 m	
3/	24,606 <u>50</u> 1 230,3	3 690,0	3 691 bricks are required. <i>Daar is 3 691 stene nodig.</i>
			Superstructure centre line / Bobou-hartlyn
			2 x 17 000 = 34 000 mm
			2 x 11 000 = 22 000 mm
			= 56 000 mm
			Minus 4 x 220 = 880 mm
			= 55 120 mm
			The centre line is / <i>Die hartlyn is 55,12 metre / meter</i>
			Height of the superstructure is 2 900 mm
			<i>Hoogte van die bobou is 2 900 mm</i>
			50 Bricks per square metre for a half-brick wall
			<i>50 Stene per vierkante meter vir 'n halfsteen-muur</i>
			There are 2 half-brick walls
			<i>Daar is 2 halfsteen-mure</i>
1/	55,12 <u>2,9</u> 159,85	159,85	
2/	159,85 <u>50</u> 7 992,5	15 985	15 985 bricks are required. <i>Daar is 15 985 stene nodig.</i>

			Beam filling centre line / Balkvulling-hartlyn
			2 x 17 000 = 34 000 mm
			2 x 11 000 = 22 000 mm
			= 56 000 mm
			Minus 4 x 110 = 440 mm
			= 55 560 mm
			The centre line is / Die hartlyn is 55,56 metre / meter
			Height of the beam filling is 225 mm
			Hoogte van die balkvulling is 225 mm
			50 Bricks per square metre for a half-brick wall
			50 Stene per vierkante meter vir 'n halfsteen-muur
			There is 1 half-brick wall
			Daar is 1 halfsteen-muur
1/	55,56 <u>0,225</u> 12,501	12,501 m	
1/	12,501 <u>50</u> 625,05	625,05	There are 625 bricks required. Daar is 625 stene nodig.
			Total for structure without deductions
			Totaal van struktuur sonder aftrekkings
			Sub structure / Onderbou 3 691
			Super structure / Bobou 15 985
			Beam filling / Balkvulling <u>625</u>
			20 301 Bricks / Stene
			Deductions / Aftrekkings
			Doors / Deure
			2 x 2 x 1
			50 Bricks per square metre for a half-brick wall
			50 Stene per vierkante meter vir 'n halfsteen-muur
			There are 2 half-brick walls
			Daar is 2 halfsteen-mure
2/	2 <u>1</u> 2	4 m	
2/	4 <u>50</u> 200	400	There are 400 bricks. Daar is 400 stene.

			Windows / Vensters
			WINDOW A / VENSTER A
			5 x 2 x 1.5
			50 Bricks per square metre for a half-brick wall
			<i>50 Stene per vierkante meter vir 'n halfsteen-muur</i>
			There are 2 half-brick walls
			<i>Daar is 2 halfsteen-mure</i>
5/	2 <u>1.5</u> 3	15 m	
2/	15 <u>50</u> 750	1 500	1 500 bricks are required <i>Daar is 1 500 stene</i>
			Total deductions / Totale aftrekkings
			Doors / Deure 400
			Windows / Vensters <u>1 500</u>
			1 900 Bricks / Stene
			Total bricks for the structure
			<i>Totale getal stene vir die struktuur</i>
			Structure / Struktuur 20 301
			Deductions / Aftrekkings <u>1 900</u>
			18 401
			Plus 6% Wastage / Vermorsing
			18 401
			<u>0.06 x</u>
			1 104,06
			1 104
			<u>18 401 +</u>
			19 505
			19 505 bricks will be required for the structure.
			<i>Daar sal 19 505 stene nodig wees vir die struktuur.</i>
			Foundation centre line / Fondasie-hartlyn A
			17 000 - 2/110 = 16 780
			7 000 - 2/110 = 6 780
			Floor thickness / Vloerdikte 75 mm
	16.78 6.78 <u>0.075</u> 8,533	8,533 m ³	

			Foundation centre line / Fondasie-hartlyn B
			5 000 - 2/110 = 4 780 4 000 - 2/110 = 3 780 Floor thickness / Vloerdikte 75 mm
	4.78 3.78 <u>0.075</u> 1,355	1,355	
			Total volume of concrete Totale volume beton
	8,553 <u>1,355</u> 9,888	9,888	9,888 cubic metres of concrete will be required. Daar sal 9,888 kubieke meter beton nodig wees.

QUESTION 3 / VRAAG 3

3.1

- It must be of a material that can be easily bent to any required shape.
Dit moet van 'n materiaal wees wat maklik in die vereistevorm gebuig kan word.
- It must be capable of achieving this tensile strength without undue strain.
Dit moet in staat wees om die trekspanning te weerstaan sonder enige noemenswaardige vervorming.
- 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.
Die oppervlak van die bewapening moet in staat wees om 'n verband met die beton te verseker sodat die ontwerp-trekspanning verkry kan word.
- A similar coefficient of thermal expansion is required to prevent unwanted stress being developed within the member due to temperature changes.
Dit moet 'n soortgelyke warmte-uitsettingskoeffisiënt hê om te verhoed dat onnodige spanning deur temperatuurverandering veroorsaak word.
- Availability at a reasonable cost which must be acceptable to the overall design and concept.
Dit moet vryelik, en teen billike pryse, in die handel beskikbaar wees en aanpasbaar wees by die bewapeningsontwerp en-konsep.

(10)

TWO POINTS EACH / TWEE PUNTE ELK

3.2

- The area must be fenced
Die gebied moet omhein wees.
- The area must be kept clean
Die gebied moet skoon wees.
- The building area must be lit up at night.
Die bougebied moet snags verlig wees.
- Walkways must be erected under cranes and building work in sideways.
Loopgange moet aangebring word onder hyskrane en bouwerk op sypaadjies.
- A hard hat and protective clothing must be worn.
'n Hardehoed en beskermklere moet gedra word.
- Sufficient and unambiguous notices must be put up on the building site.
Voltoende en duidelike kennisgewings moet op die perseel aangebring word.
- No unskilled labourers or other persons are allowed on the site.
Ongemagtigde persone en onopgeleide werkers mag nie die perseel betree nie.
- Where dangerous excavations are in progress, such areas must be effectively enclosed.
Waar gevaarlike uitgrawings op die terrein plaasvind, moet dit omhein wees.
- Scaffolding in use must stand firm and be kept clean
Stelers wat gebruik word, moet stewig staan en skoon gehou word.
- Material, which is not immediately used, must be neatly stored.
Materiaal wat nie dadelik gebruik word nie, moet netjies gebêre word.
- Movement of vehicles on the site must be minimized.
Voertuie wat op die terrein beweeg, moet tot 'n minimum beperk word.

Any TEN / Two marks each / *Enige TIEN / Twee punte elk*

(20)

3.3

- There must be no change of direction under the building.
Die riool mag nie van rigting verander onder die gebou nie.
- There must be no connections underneath the building.
Geen aansluitings mag onder die gebou gemaak word nie.
- An access opening should be installed on both sides: where the sewer enters the building and at the exit.
Toegangsopeninge moet aan beide kante, waar die riool onder die gebou in- en uitgaan, aangebring word.

- It is preferable to use heavy cast-iron pipes for the sewer line.
Daar moet verkieslik swaar gietysterpype vir die rioollyn gebruik word.
- The sewer should be laid at least 50 mm clear of any foundations.
Die riool moet minstens 50 mm vry (weg) van enige fondasies wees.

Any VYF/ one mark each / *Enige FIVE / Een punt elk*

3.4

Bidet	2	<i>Bidet</i>
Water closet	2	<i>Spoelkloset</i>
Grease trap	2	<i>Vetvanger</i>
Mild steel pipe	2	<i>Weekstaal-pyp</i>
French drain	2	<i>Stapelriool</i>

Marks as shown *Punte soos aangedui*

3.5

- Situation of the stand
Ligging van die erf
- Slope of the stand
Helling van die erf
- Are municipal services available?
Is daar munisipale dienste beskikbaar?
- Air pollution in the area
Lugbesoedeling in die omgewing
- View
Uitsig
- Main roads and access roads
Hoofpaaie en toegangswêë
- Noise
Geraas

Any VYF/ One mark each / *Enige FIVE / Een punt elk*

3.6

3.6.1	Brown	-	<i>Bruin</i>
3.6.2	green	-	<i>Groen</i>
3.6.3	Red	-	<i>Rooi</i>
3.6.4.	Blue	-	<i>Blou</i>
3.6.5	Orange	-	<i>Oranje</i>

ONE MARKEACH

EEN PUNT ELK

(5)

CALCULATE LR/ *BEREKEN LR*

TAKE MOMENTS ABOUT RR / *NEEM MOMENTE OM RR* ü

$$L.O.M = R.O.M \ddot{u}$$

$$LR \times 10 = (6 \times 2) + (12 \times 6) + (4 \times 9) \ddot{u}$$

$$10 LR = 12 + 72 + 36 \ddot{u}$$

$$10 LR = 120$$

$$LR = \frac{120}{10 \text{ m}}$$

$$LR = 12 \text{ kN} \ddot{u} \ddot{u} \quad (6)$$

CALCULATE RR/ *BEREKEN RR*

TAKE MOMENTS ABOUT LR / *NEEM MOMENTE OM LR* ü

$$L.O.M = R.O.M \ddot{u}$$

$$P^{RR} \times 10 = (4 \times 1) + (12 \times 4) + (6 \times 8) \ddot{u}$$

$$10 L^{RR} = 4 + 48 + 48 \ddot{u}$$

$$10 L^{RR} = 100$$

$$L^{RR} = \frac{100}{10 \text{ m}}$$

$$L^{RR} = 10 \text{ kN} \ddot{u} \ddot{u} \quad (6)$$

TEST / *TOETS*

$$OPWAARTSE KRAGTE = AFWAARTSE KRAGTE \ddot{u}$$

$$12 \text{ kN} + 10 \text{ kN} = 4 \text{ kN} + 12 \text{ kN} + 6 \text{ kN} \ddot{u}$$

$$22 \text{ kN} = 22 \text{ kN} \quad (2)$$

BENDING MOMENTS / *BEREKEN BUIGMOMENTE (KRAG X AFSTAND)*

$$B.M.A = LR \times 0$$

$$= 12 \times 0 \ddot{u}$$

$$= 0 \text{ kNm} \ddot{u} \quad (2)$$

$$B.M.B = LR \times 1 \ddot{u}$$

$$= 12 \times 1$$

$$= 12 \text{ kNm} \ddot{u} \quad (2)$$

$$B.M.C = (LR \times 4) - (B \times 3)$$

$$= (12 \times 4) \ddot{u} - (4 \times 3) \ddot{u}$$

$$= 48 - 12$$

$$= 36 \text{ kN.m} \ddot{u} \quad (3)$$

$$\begin{aligned}
 \text{B.M.D} &= (\text{LR} \times 8) - (\text{C} \times 4) - (\text{B} \times 7) \\
 &= (12 \times 8) - (12 \times 4) \text{ ü} - (4 \times 7) \text{ ü} \\
 &= 96 - 48 - 28 \\
 &= 20 \text{ kN.m ü}
 \end{aligned}
 \tag{3}$$

$$\begin{aligned}
 \text{B.M.E} &= (\text{LR} \times 10) - (\text{D} \times 2) - (\text{C} \times 6) - (\text{B} \times 9) \\
 &= (12 \times 10) \text{ ü} - (6 \times 2) \text{ ü} - (12 \times 6) \text{ ü} - (4 \times 9) \text{ ü} \\
 &= 120 - 12 - 72 - 36 \text{ ü} \\
 &= 0 \text{ kN.m ü}
 \end{aligned}
 \tag{6}$$

SHEAR FORCES / *BEREKEN SKUIFKRAGTE*

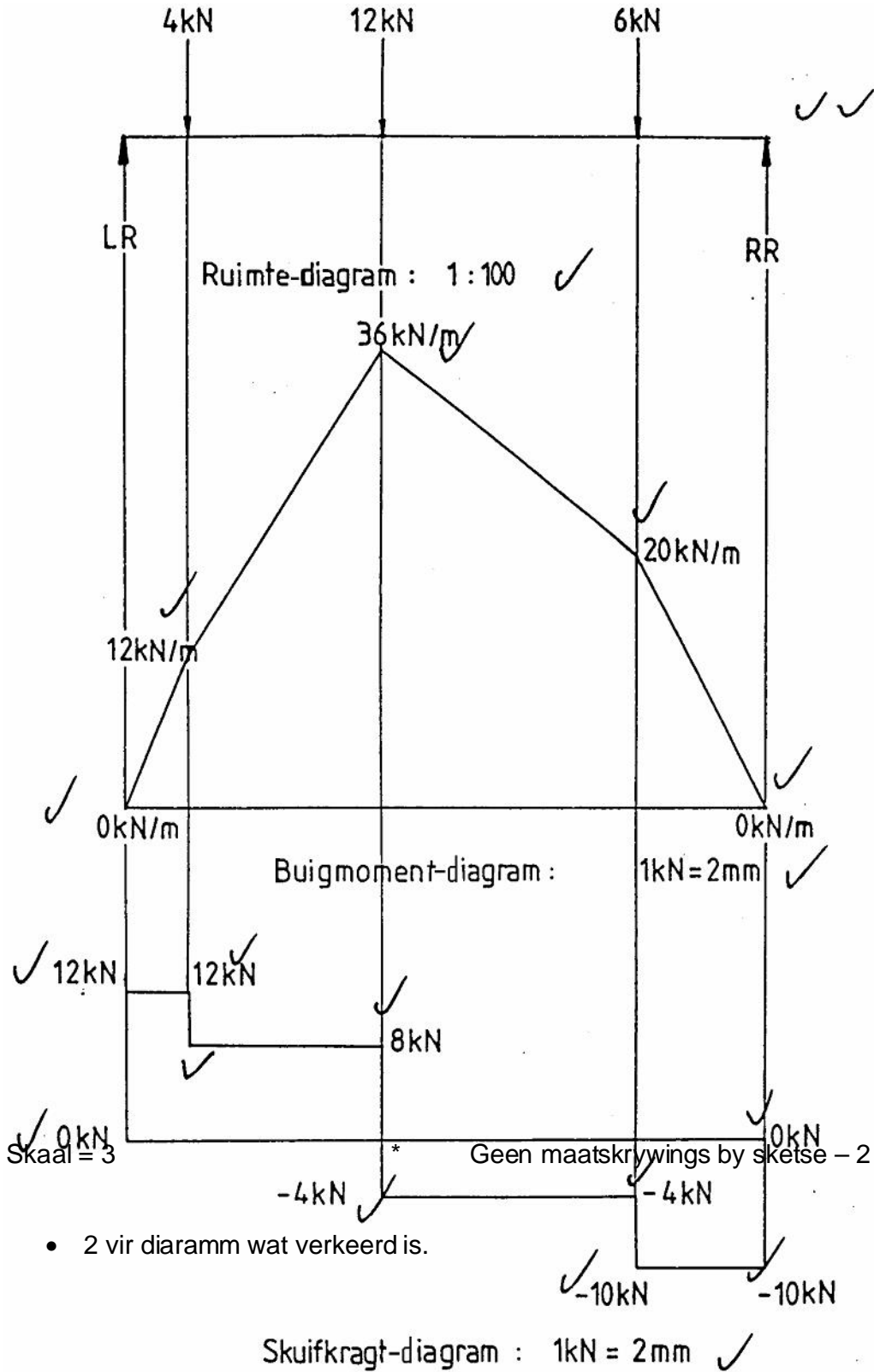
$$\begin{aligned}
 \text{SKA} &= \text{LR} \text{ ü} \\
 &= 12 \text{ kN ü}
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 \text{SKB} &= \text{LR} - \text{B} \\
 &= 12 - 4 \text{ ü} \\
 &= 8 \text{ kN ü}
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 \text{SKC} &= \text{LR} - \text{B} - \text{C} \\
 &= 12 - 4 - 12 \text{ ü} \\
 &= -4 \text{ kN ü}
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 \text{SKD} &= \text{LR} - \text{B} - \text{C} - \text{D} \\
 &= 12 - 4 - 12 - 6 \text{ ü} \\
 &= -10 \text{ kN ü}
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 \text{SKE} &= \text{RR} \text{ ü} \\
 &= 0 \text{ kN ü}
 \end{aligned}
 \tag{2}$$

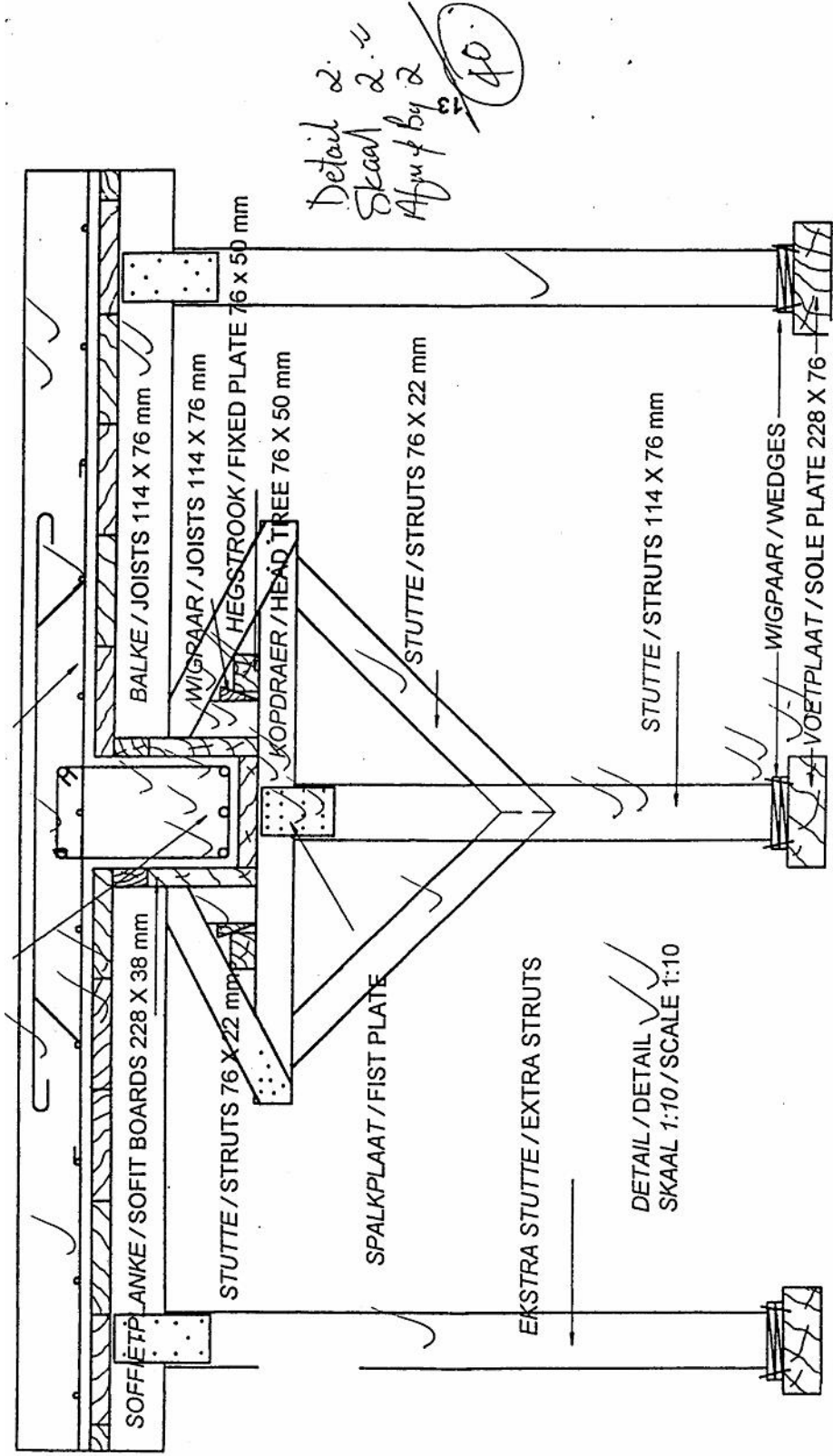


- 2 vir diaramm wat verkeerd is.

QUESTION 5 / VRAAG 5

Beam	4	<i>Balk</i>	
Floor	4	<i>Vloer</i>	
Soffit boards	2	<i>Soffietplanke</i>	
Joists 114 x 76 mm	2	<i>Balke 114 x 76 mm</i>	
Cleats 76 x 50 mm	2	<i>Klampe 76 x 50 mm</i>	
Head tree 76 x 50 mm	2	<i>Kopdraer 76 x 50 mm</i>	
Struts 114 x 76 mm	2	<i>Stut 114 x 76 mm</i>	
Struts 76 x 22 mm	4	<i>Stutte 76 x 22 mm</i>	
Fish plate	2	<i>Spalkplaat</i>	
Sole plate 228 x 76 mm	2	<i>Voetplaat 228 x 76 mm</i>	
Wedges	4	<i>Wigpaar</i>	
Fixing plate 76 x 50 mm	4	<i>Hegstuk 76 x 50 mm</i>	
Wedges	2	<i>Wigpaar</i>	
Extra struts	2	<i>Ekstra stutte</i>	
Beam reinforcement	3	<i>Balkbewapening</i>	
Slab reinforcement	3	<i>Bladbewapening</i>	
Detail	2	<i>Detail</i>	
Scale	2	<i>Skaal</i>	
Labels and measures	2	<i>Afmetings en byskrif</i>	
	40		
Correctness	27	<i>Korrektheid</i>	} VRAAG 6.2 SKUIFNA BL 13
Construction	3	<i>Uitleg</i>	
	30		

QUESTION 5 / VRAAG 5



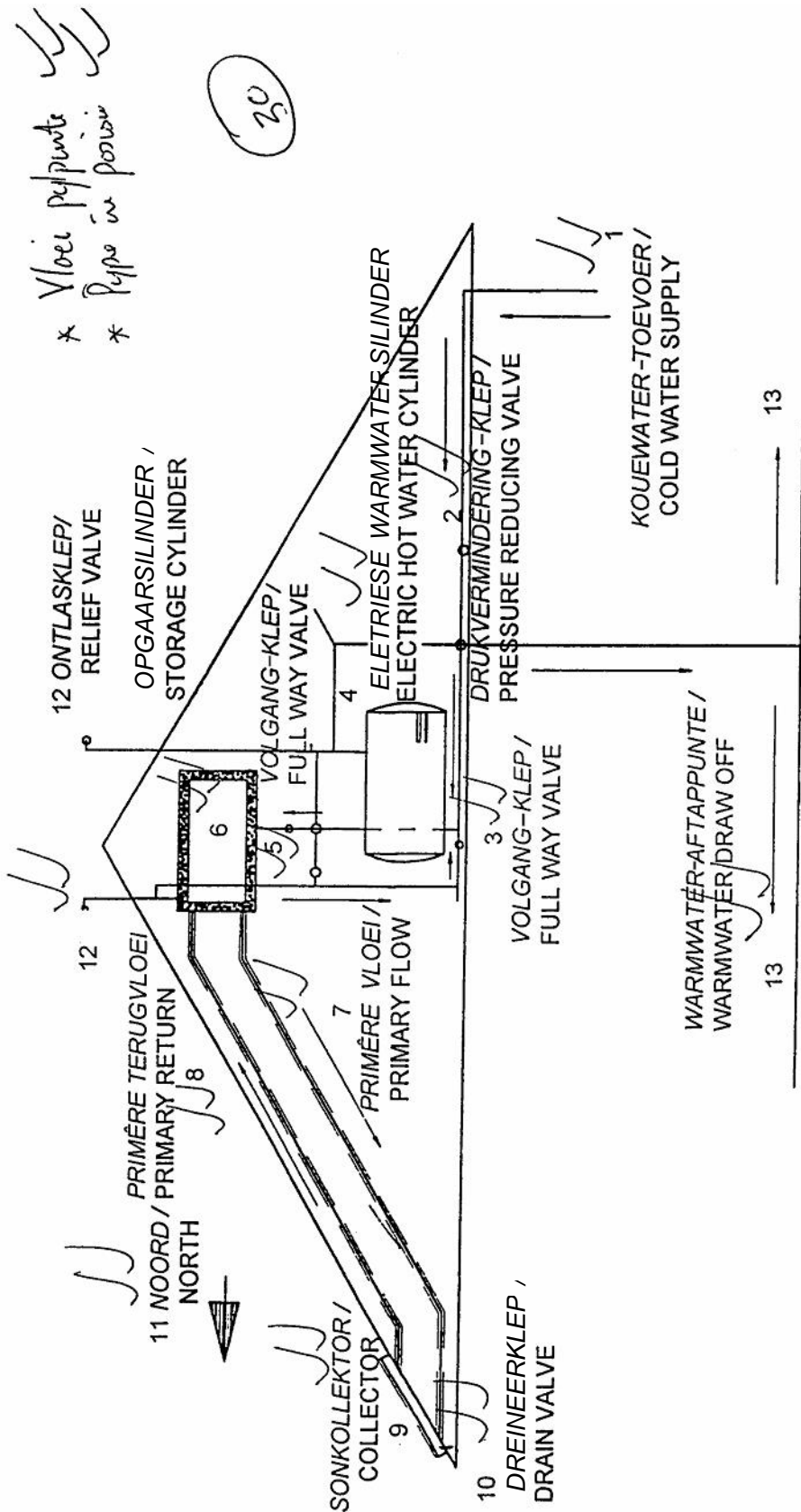
AFMETINGS EN BYSKRIFTE / LABLES AND MEASUREMENTS

QUESTION 6.1 / VRAAG 6.1

6.1

6.1	Cold water supply	2	<i>Kouewater-toevoer</i>
	Pressure-reducing valve	2	<i>Drukvermindering-klep</i>
	Full-way valve	2	<i>Volgang-klep</i>
	Electric hotwater cylinder	2	<i>Elektriese warmwatersilinder</i>
	Full-way valve	2	<i>Volgang-klep</i>
	Storage cylinder	2	<i>Opgaarsilinder</i>
	Primary flow	2	<i>Primêre vloei</i>
	Primary return	2	<i>Primêre terugvloei</i>
	Collector	2	<i>Sonkollektor</i>
	Drain valve	2	<i>Dreineringsklep</i>
	North	2	<i>Noord</i>
	Relief valve	2	<i>Ontlasklep</i>
	Warm water draw off	2	<i>Warmwater-aftlappunte</i>
	Arrows for direction of flow	2	<i>Pylpunte vir vloei</i>
	Pipes in position	2	<i>Pype in posisie</i>
		30	

QUESTION 6 / VRAAG 6

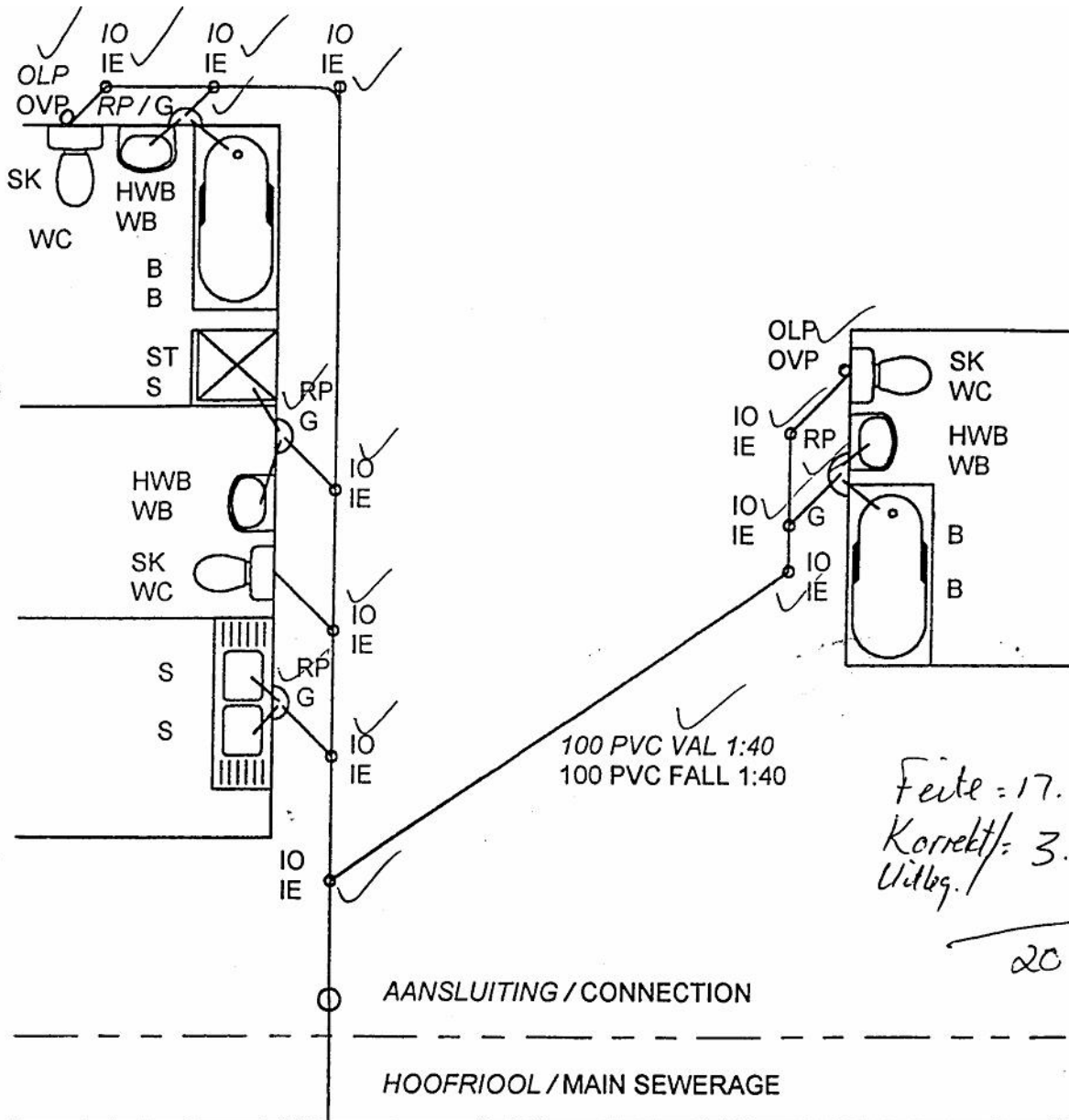


* Vloei pyp punte
 * Pyp in posisie

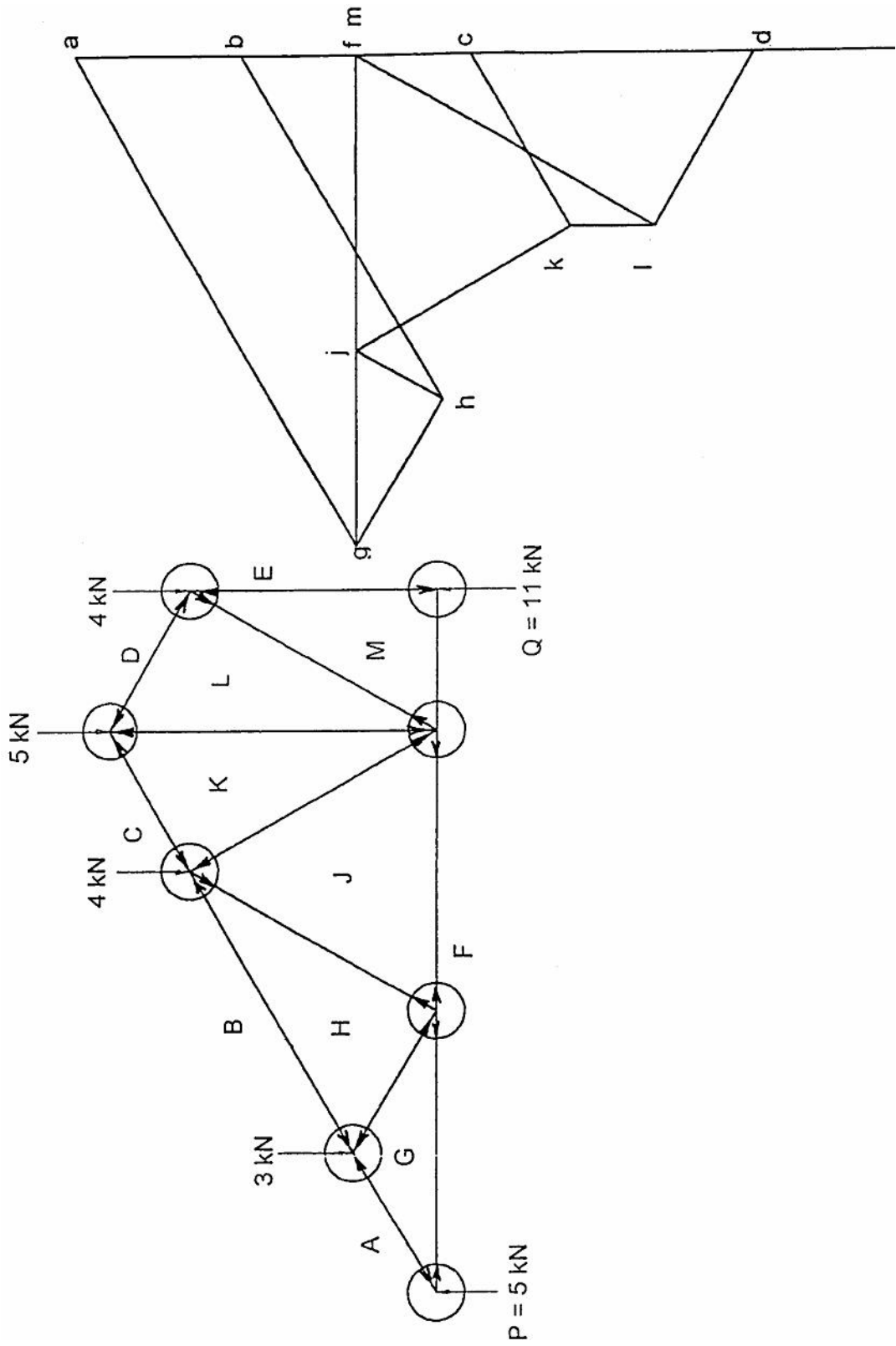
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CANDIDATE'S NUMBER / KANDIDAAT SE NOMMER

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QUESTION 7 / VRAAG 7
SCALE / SKAAL 1Kn = 10 mm



QUESTION 7 / VRAAG 7

Onderdeel	Aard	Grootte
AG	10 kN	STRUT / STUT
FG	8,66 kN	STANG / TIE
GH	3 kN	STRUT / STUT
BH	7 kN	STRUT / STUT
HJ	1,73 kN	STANG / TIE
FJ	5,17 kN	STANG / TIE
JK	4,33 kN	STRUT / STUT
CK	3,5 kN	STRUT / STUT
KL	1,5 kN	STRUT / STUT
DL DC	3,5kN 5 kN	STRUT / STUT
LM	6,06 kN	STRUT / STUT
ME	11,0 kN	STANG / TIE
FM	0 kN	

SPACE DIAGRAM / RUIIMTE-DIAGRAM (RD)	=	4	
FORCES / KRAGTE	=	26	13 Diagram & 13 Tabel
NATURE / AARD	=	26	13 Diagram & 13 Tabel
SCALE / SKAAL	=	4	Kragte-diagram
TOTAL / TOTAAL	=	60	

* Geen pypunte op RD nie
–geen punte in tabel nie!

TOTAL / TOTAAL: 300

END / EINDE