

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

**POSSIBLE ANSWERS FOR / BUILDING CONSTRUCTION SG
MOONTLIKE ANTWOORDE VIR : BOUKONSTRUKSIE SG**

QUESTION / VRAAG 1

1.1

- 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.
- It must be of a material that can be easily bent to any required shape.
Dit moet van 'n materiaal wees wat in die nodige vorm gebuig 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.
Die oppervlak van die bewapening moet in staat wees om 'n verband met die beton te verseker sodat die ontwerp- trekspanning verkry kan word.
- Availability at a reasonable cost on the market which must be acceptable to the overall design concept.
Dit moet vrylik in die handel beskikbaar wees teen billike pryse en moet aanpasbaar by die ontwerp wees.
- A similar coefficient of thermal expansion is required to prevent unwanted stresses being developed within the member due to the temperature changes
Dit moet 'n gelyksoortige warmte-uiteensettingskoeffisiënt hê om te verhoed dat onnodige spanning deur temperatuurverandering veroorsaak word.

5x2=(10)

1.2

- All staircases, pathways, gangways, basements and any other places where insufficient lighting may occur, should be properly illuminated.
Alle trappe, gange, loopplanke, kelders en ander plekke waar gevaar weens swak lig bestaan, moet toereikend verlig wees.
- All openings in floors, hatchways and stairways, or any other opening through which people could fall, must be adequately safeguarded.
Alle openinge in vloere, luikgange en trappe of enige ander opening waardeur iemand kan val, moet toereikend beveilig word.

- Dangerous areas, where material and debris can fall onto workers, must be adequately fenced off and catch platforms or nets must be provided.

Gevaargebiede waar materiaal en rommel op werkers kan val, moet van toereikende vangplatvorms of nette voorsien word.

- Staircases, pathways and gangways should be free of material, rubble or any other obstacles.
Alle trappe, loopgange en loopplanke moet vry van materiaal, rommel of ander hindernisse wees.
- Hoisting of materials must only be done by means of a hoist or shute.
Slegs hysmasjiene en/of glybane moet gebruik word om materiaal op te hys.

5x2=(10)

1.3

- Water test / *Water-toets*
- Air-pressure test / *Lugdruktoets*

(2)

1.4

- ALL work on the sewerage system complies with the regulations.
Dat alle rioleringswerk aan die regulasies voldoen.
- Cleaning eyes should be installed at each branching off.
Steekoë moet by elke vertakking aangebring word.
- A ventilation pipe must be installed at the highest or furthest point of the system.
'n Ontlugpyp moet op die hoogste of verste punt geïnstalleer word.
- Drains must have the correct gradient.
Die riool moet die regte val hê.
- Must be laid straight from one point to the other.
Moet van punt tot punt reguit gelê wees.
- Stench traps must be installed where waste water enters the drain.
Stankafsluiters moet geïnstalleer word waar vuilwater die riool binnegaan.
- The whole system must be water- and air-tight.
Die hele stelsel moet water- en lugdig wees.
- All drainpipes must be put on a solid concrete base, to prevent the pipes from sagging or breaking.
Alle rioolpype moet op 'n soliede basis gelê word om te verhoed dat die pype breek of sak.
- The system must be of such a nature that all sewerage will flow away easily.
Dit moet onmoontlik wees vir rioolvuil om op enige plek in die stelsel te bly sit.

- Rather avoid laying drainpipes underneath a building.
Where this is not possible, drainpipes must be placed in concrete.
- *Vermyn waar moontlik, alle rioolpype onder geboue. Indien onvermydelik, moet die rioolpype in beton geplaas word.*

Or any other if correct:
Of enige ander as korrek: 5x2=(10)

1.5

- A solar collector must face north, at an angle of 35° to the horizontal. A minimum deviation of 15° and a maximum of 5° is permissible, i.e. the angle must not be less than 20° or more than 40°.
Die sonkollektor moet reg noord wys vanuit 'n hoek van 35° tot die horisontaal. 'n Afwyking van 15° minimum en 5° maksimum is toelaatbaar, d.w.s. die hoek moet nie kleiner as 20° en groter as 40° wees nie.
- Install a solar collector and an electric storage cylinder which have been approved by the SABS.
- *Gebruik 'n sonkollektor en 'n opgaarsilinder wat deur die SABS goedgekeur is.*
- Insulate the primary circulation pipes in order to minimise loss of heat.
- *Isoleer die primêre sirkulasiepype om hitteverlies te voorkom.*
- Shadows and shade over the sun collector must be avoided, as this could seriously affect the performance of the system.
- *Maak seker dat die sonkollektor onder geen omstandighede in die skaduwee is nie, aangesien dit die werking kan belemmer.*
- The primary circulation pipes must be as short as practicable without badly decreasing the pressure head.
- *Die primêre sirkulasiepype moet so kort as prakties moontlik wees, sonder om die druk in die stelsel te veel te verminder.*
- Cold water must be supplied to the system through a pressure – reducing valve.
- *Kouewater moet deur 'n drukverminderingsklep na die sisteem vervoer word.*
- The glass panel of the solar collector must be checked regularly for the accumulation of dirt.
- *Glaspaneel van die sonkollektor moet nie vuil wees nie.*

Any Five / Enige Vyf (5)

1.6

- It must be completely impervious to damp.
- *Dit moet volkome vogwerend wees.*
- It must be strong and durable.
- *Dit moet sterk en duursaam wees.*
- Must be comparatively thin sheets.
- *Moet redelik dun wees.*

- Must be strong and flexible.
- *Moet sterk en buigbaar wees.*

Any / Enige (3)

1.7	Facts / Feite	=	17
	Correctness / Korrektheid	=	3
	Total / Totaal	=	20

- 1.7 The septic tank is designed so that **sewerage and water flow into the first compartment where all solids sink to the bottom to be attacked by bacteria.** During this process **a gas develops and rises to the top** taking any solid parts with it and **forms a layer of foam.** Thus the breeding of bacteria and their power to attack are increased. To ensure **breeding growth** the **foam layer must not be disturbed.** Some of the rising solid parts **flow to the next compartment** where the process is repeated. From the last compartment the contents, which should at this stage be in **liquid form, flow into a French drain** and seep into the ground.

*Die septiese tenk word so ontwerp dat **rioolvuil en water in die tenk ingelaat word** waar die **soliede stof afsak na onder en bakterieë** wat in die vloeistof teenwoordig is **die soliede stof aanval.** Gedurende hierdie proses **ontwikkel 'n gas wat na die oppervlak styg** en sodoende klein deeltjies soliede stof saamneem en 'n **skuimlaag vorm.** Sodoende word 'n **broeiplek vir bakterieë vergroot en hulle aanvalskrag vergroot.** Om groei omstandighede te verseker **moet die skuimlaag nie versteur word nie.** Van die soliede deeltjies wat opstyg **vloei oor na die volgende kompartement waar die proses herhaal word.** Vanaf die laaste kompartement vloei die inhoud, wat teen hierdie tyd al 'n **algehele vloeistof is, na die stapelriool** waar dit in die grond gedreineer word.*

(10)
[60]

QUESTION / VRAAG 2

2.1	2.1.1	Cold-water supply	:2	<i>Kouewatertoevoer</i>
	2.1.2	Pressure-reducing valve	:2	<i>Drukverminderingsklep</i>
	2.1.3	Full-way valve	:2	<i>Volgangklep</i>
	2.1.4	Electric hot-water cylinder	:2	<i>Elektriese warmwateropgaarsilinder</i>
	2.1.5	Full-way valve	:2	<i>Volgangklep</i>
	2.1.6	Storage cylinder	:2	<i>Opgaarsilinder</i>
	2.1.7	Primary flow	:2	<i>Primêre vloei</i>
	2.1.8	Primary return	:2	<i>Primêre terugvloei</i>
	2.1.9	Sun collector	:2	<i>Sonkollektor</i>
	2.1.10	Drainage valve	:2	<i>Dreineringsklep</i>
	2.1.11	North	:2	<i>Noord</i>
	2.1.12	Relief valve	:2	<i>Ontlasklep</i>
	2.1.13	Hot-water draw-off points	:2	<i>Warmwater aftappunte</i>
	2.1.14	Arrows for direction of flow	:2	<i>Pylpunte vir vloei</i>
	2.1.15	Pipes in position	:2	<i>Pype in posisie</i>

30

2.2.1	Frame stile	:2	<i>Kosynstyl</i>
2.2.2	Door-frame stile	:2	<i>Deurraamstyl</i>
2.2.3	Solid panel	:2	<i>Soliede paneel</i>
2.2.4	Labels and dimensions	:2	<i>Afmetings en byskrifte</i>
2.2.5	Correctness	:2	<i>Korrektheid</i>

10

2.3.1.1	Frame stiles 115 x 75 mm	:6	<i>Kosynstyle 115 x 75 mm</i>
2.3.1.2	Door stiles 115 x 45 mm	:6	<i>Deurstyle 115 x 45 mm</i>
2.3.1.3	Raised and fielded panel 22 thick	:4	<i>Verhewe kussing paneel 22 dik</i>
2.3.1.4	Hatching for section	:2	<i>Arsering vir snit</i>
2.3.1.5	Scale 1:5	:2	<i>Skaal 1:5</i>

20

QUESTION / VRAAG 3**SHUTTERING FOR STAIRCASE / TRAPBEKISTING**

3.1	Wall 220 mm	:2	<i>Muur 220 mm</i>
3.2	Landing 900 x 100 mm	:4	<i>Bordes 900 x 100 mm</i>
3.3	Rise 150 mm	:4	<i>Styging 150 mm</i>
3.4	Tread 280 mm	:4	<i>Aantree 280 mm</i>
3.5	Bearer 150 x 76 mm	:4	<i>Draer 150 x 76 mm</i>
3.6	Bearer beam 150 mm x 76 mm	:4	<i>Drabalk 150 mm x 76 mm</i>
3.7	Joists 76 mm x 50 mm	:4	<i>Balke 76 mm x 50 mm</i>
3.8	Uprights 114 x 76 mm	:4	<i>Regopstutte 114 x 76 mm</i>
3.9	Struts 114 x 76 mm	:4	<i>Skuinstutte 114 x 76 mm</i>
3.10	Wedges	:2	<i>Wie</i>
3.11	Fish plate	:2	<i>Spalkplaat</i>
3.12	Sole plate 228 x 76 mm	:3	<i>Voetplaat 228 x 76 mm</i>
3.13	Soffit boards 100 x 22 mm	:3	<i>Soffietplanke 100 x 22 mm</i>
3.14	Main bars	:6	<i>Hoofstawe</i>
3.15	Distribution bars	:6	<i>Verspreidingsstawe</i>
3.16	Labels and dimensions	:2	<i>Byskrifte en afmetings</i>
3.17	Scale	:2	<i>Skaal</i>
[60]			

Sheet / Vel 1

QUESTION / VRAAG 5.1

EXAMINATION NUMBER:

EKSAMENNOMMER:

ANSWER SHEET / ANTWOORDBLAD SG 702-2/2(2)

			SUBSTRUCTURE / ONDERBOU
			Centre line for substructure / <i>Hartlyn van onderbou</i>
			$2 \times 7\,000 = 14\,000$ $2 \times 6\,000 = 12\,000$ Subtotal / <i>Subtotaal</i> = <u>26 000</u> Minus / <i>Minus</i> $4 \times 220 = - 880$ Total / <i>Totaal</i> = <u>25 120</u>
1/	<u>25,12</u> <u>0,45</u>	<u>11,304</u>	Centre line of substructure is 25,12 m long. / <i>Hartlyn van onderbou is 25,12 m lank.</i> Area if substructure is 450 mm high = <i>Oppervlakte as onderbou 450 mm hoog is</i> = <u>11,304 m²</u>
2/	<u>11,304</u> 50	<u>1130,4</u>	Number of bricks for substructure if there are 50 bricks per square meter for a half-brick wall; / <i>Hoeveelheid stene vir onderbou as daar 50 stene per vierkante meter vir 'n halfsteenmuur is;</i> = <u>1130,4</u>

			SUPERSTRUCTURE / BOBOU
			Centre line for superstructure / <i>Hartlyn van bobou</i>
			$2 \times 7\,000 = 14\,000$ $2 \times 6\,000 = 12\,000$ Subtotal / <i>Subtotaal</i> = <u>26 000</u> Minus / <i>Minus</i> $4 \times 220 = - 880$ = <u>25 120</u>
1/	<u>25,12</u> <u>2,7</u>	<u>67,824</u>	Centre line of superstructure is 25,12 m long. <i>Hartlyn van bobou is 25,12 m lank.</i> Area if superstructure is 2700 mm high <i>Oppervlakte as bobou 2700 mm hoog is</i> = <u>67,824</u>
2/	<u>67,824</u> 50	<u>6782,4</u>	Number of bricks for superstructure if there are 50 bricks per square meter for a half-brick wall; <i>Hoeveelheid stene vir bobou as daar 50 stene per vierkante meter vir 'n halfsteenmuur is;</i> = <u>6782,4</u>

Sheet / Vel 1

			DEDUCTIONS / AFTREKKINGS OPENINGS / OPENINGE
<u>3/</u>	2,5 1,5	<u>11,25</u>	Window A / Venster A 2 500 mm x 1 500 mm
<u>2/</u>	0,9 1,5	<u>2,7</u>	Window B / Venster B 900 mm x 1 500 mm
<u>1/</u>	2 1	<u>2</u>	Door opening / Deuropening 2 000 x 1 000 mm
			Total area of openings Totale oppervlakte van openinge
			Window A / Venster A = <u>11,25</u> Window B / Venster B = <u>2,7</u> Doors / Deure = <u>2,0</u> Total / Totaal = <u>15,95 m²</u>
<u>2/</u>	<u>15,95</u> 50	<u>15,95</u>	Total number of bricks to fall away at openings = Totale hoeveelheid stene wat wegval by openinge = <u>1 595</u>
			TOTAL NUMBER OF BRICKS FOR THE BUILDING TOTALE HOEEVEELHEID STENE VIR DIE GEBOU
			Substructure / Onderbou = <u>1130,4</u> Superstructure / Bobou = <u>6782,4</u> Subtotal / Subtotaal = <u>7912,8</u> Minus openings / Minus openinge = <u>- 1595</u> Total / Totaal = <u>6317,8</u>
			Total number of bricks plus 5% for wastage = Totale hoeveelheid stene plus 5% vir vermorsing = <u>6634</u>

Bereken P / Calculate PNeem momente om Q / *Take moments about Q*

$$P \times 11 = (10 \text{ kN} \times 0 \text{ m}) + (9 \text{ kN} \times 7,5 \text{ m}) + (5 \text{ kN} \times 11 \text{ m})$$

$$= 0 + 67,5 + 55 \text{ kN.m}$$

$$P = \frac{122,5}{11}$$

$$P = 11,14 \text{ kN}$$

Bereken Q / Calculate QNeem momente om P / *Take moments about P*

$$Q \times 11 = (5 \text{ kN} \times 0 \text{ m}) + (9 \text{ kN} \times 3,5 \text{ m}) + (10 \text{ kN} \times 11 \text{ m})$$

$$= 0 + 31,5 + 110 \text{ kN.m}$$

$$Q = \frac{141,5}{11}$$

$$Q = 12,86 \text{ kN}$$

Toets / Test

Kragte op = kragte af

Forces up = forces down

$$P + Q = 5 + 9 + 10 \text{ kN}$$

$$11,14 + 12,86 \text{ kN} = 24 \text{ kN}$$

$$24 \text{ kN} = 24 \text{ kN}$$

Buigmomente / Bending moments

$$\text{Bm.A} = (P \times 0)$$

$$= 0 \text{ kN.m}$$

$$\text{Bm.B} = (11,14 \text{ kN} \times 2 \text{ m}) - (5 \text{ kN} \times 2 \text{ m})$$

$$= 22,28 - 10 \text{ kN.m}$$

$$= 12,28 \text{ kN.m}$$

$$\text{Bm.C} = (11,14 \text{ kN} \times 3,5 \text{ m}) - (5 \text{ kN} \times 3,5 \text{ m}) - (4,5 \text{ kN} \times 0,75 \text{ m})$$

$$= 38,99 - 17,5 - 3,375 \text{ kN.m}$$

$$= 18,115 \text{ kN.m}$$

$$\text{Bm.D} = (11,14 \text{ kN} \times 5 \text{ m}) - (5 \text{ kN} \times 5 \text{ m}) - (9 \text{ kN} \times 1,5 \text{ m})$$

$$= 55,7 - 25 - 13,5 \text{ kN.m}$$

$$= 17,2 \text{ kN.m}$$

$$\text{Bm.E} = (11,14 \text{ kN} \times 11 \text{ m}) - (5 \text{ kN} \times 11 \text{ m}) - (9 \text{ kN} \times 7,5 \text{ m}) - (10 \text{ kN} \times 0 \text{ m})$$

$$= 122,54 - 55 - 67,5 - 0 \text{ kN.m}$$

$$= 0,04 \text{ kN.m}$$

Skuifkragte / Shear forces

Sk / Sf A-	=	0 kN
Sk / Sf A	=	11,14 - 5 kN
	=	6,14 kN
Sk / Sf B-	=	11,14 - 5 kN
	=	6,14 kN
Sk / Sf B	=	11,14 - 5 kN
	=	6,14 kN
Sk / Sf C	=	11,14 - 5 - 4,5 kN
	=	1,64 kN
Sk / Sf D-	=	11,14 - 5 - 9 kN
	=	-2,86 kN
Sk / Sf D	=	11,14 - 5 - 9 kN
	=	-2,86 kN
Sk / Sf E-	=	11,14 - 5 - 9 kN
	=	-2,86 kN
Sk / Sf E	=	11,14 - 5 - 9 - 10 + 12,86 kN
	=	0 kN

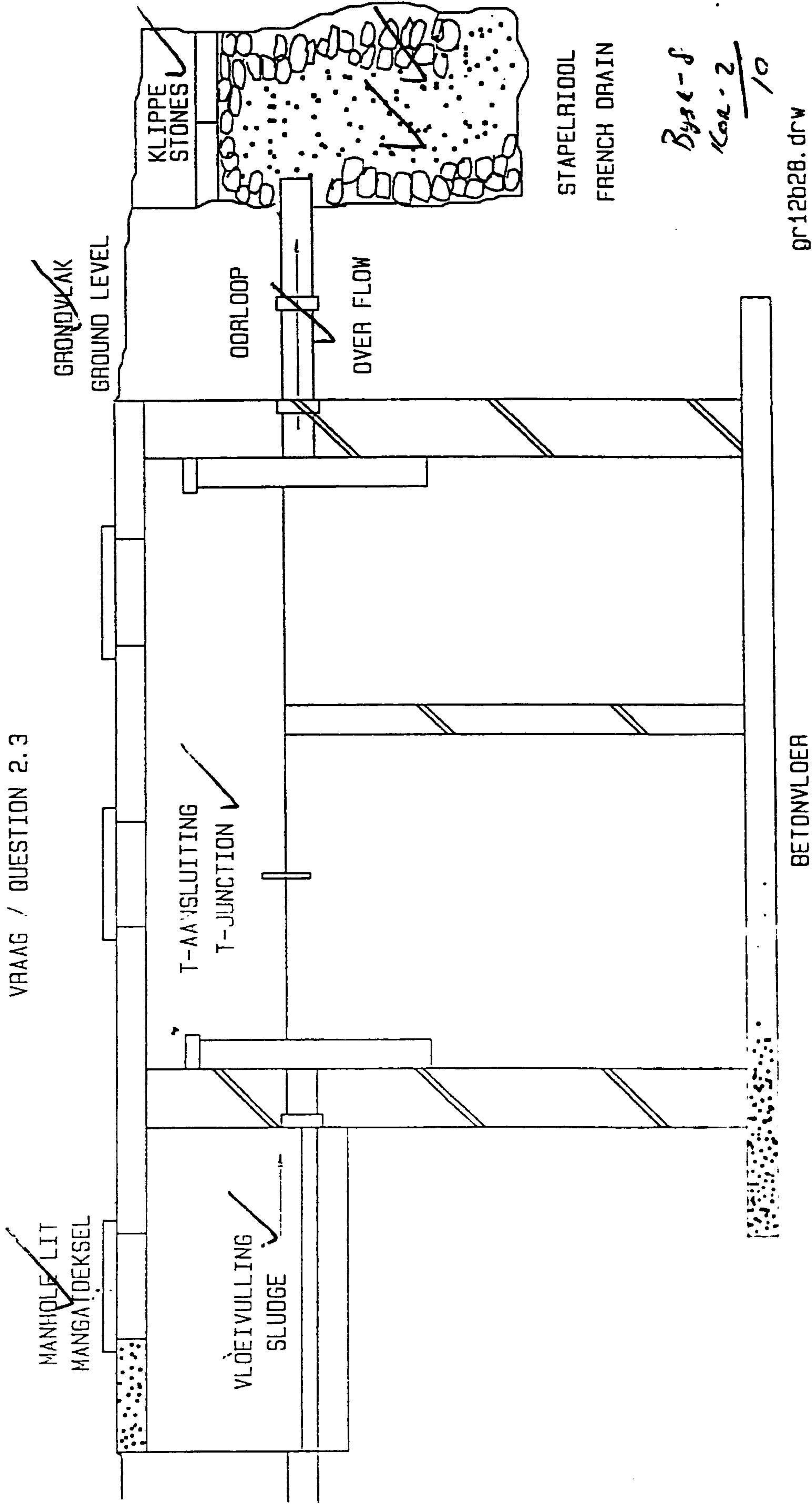
Punte toekenning / Mark allocation

Bereken P / Calculate P	=	5
Bereken Q / Calculate Q	=	5
Toets / Test	=	1
Buigmomente / Bending moments	=	17
Skuifkragte / Shear forces	=	24
Buigmomentdiagram / Bending moment diagram	=	4
Skuifkragediagram / Shear force diagram	=	4
<u>Totaal / Total</u>	=	60

DEURSNEE VAN SEPTIESE TENK

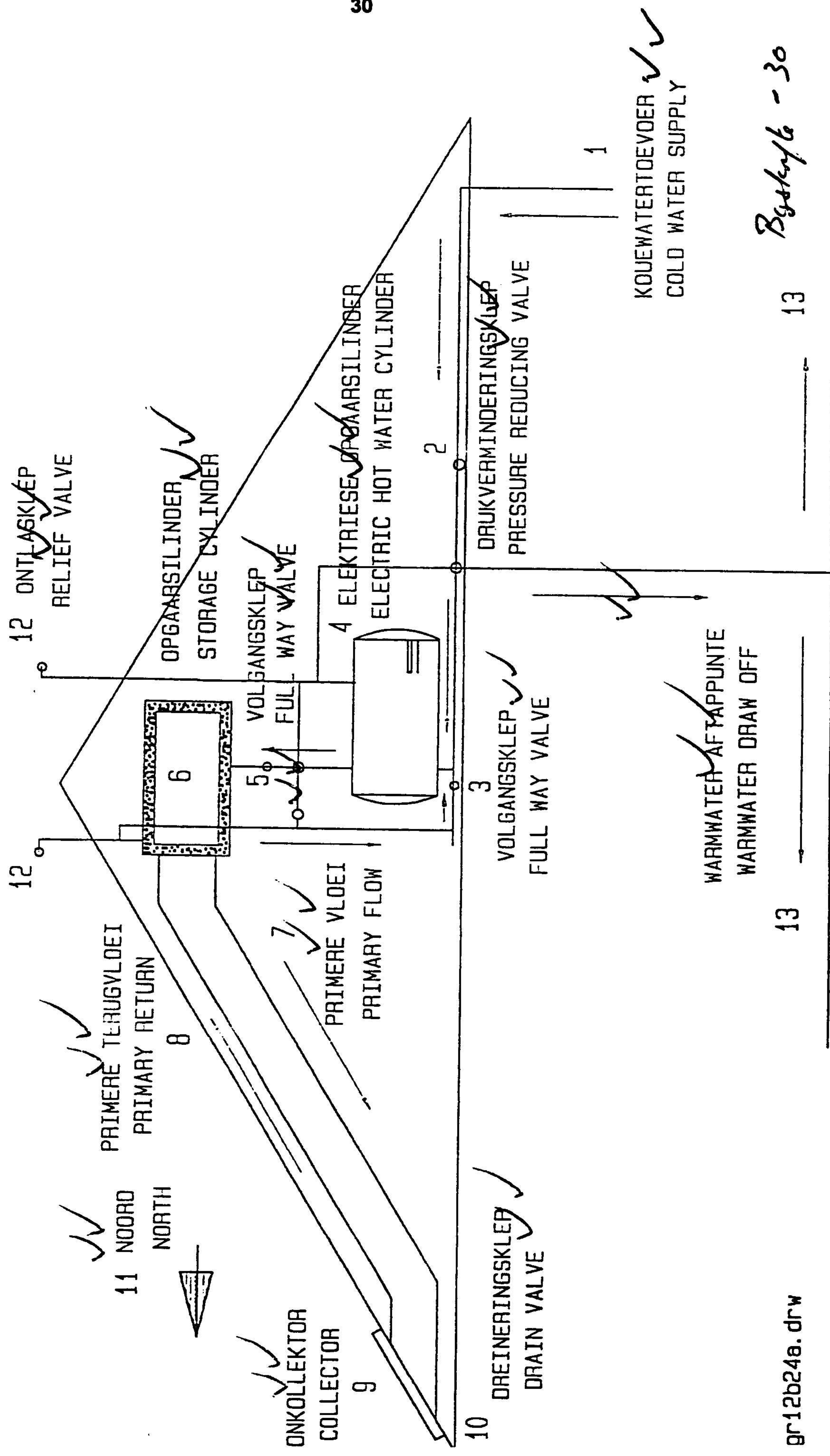
SECTION OF SEPTIC TANK

VRAAG / QUESTION 2.3



MEMORANDUM VIR VRAAG 2.1

MEMORANDUM FOR QUESTION 2.1



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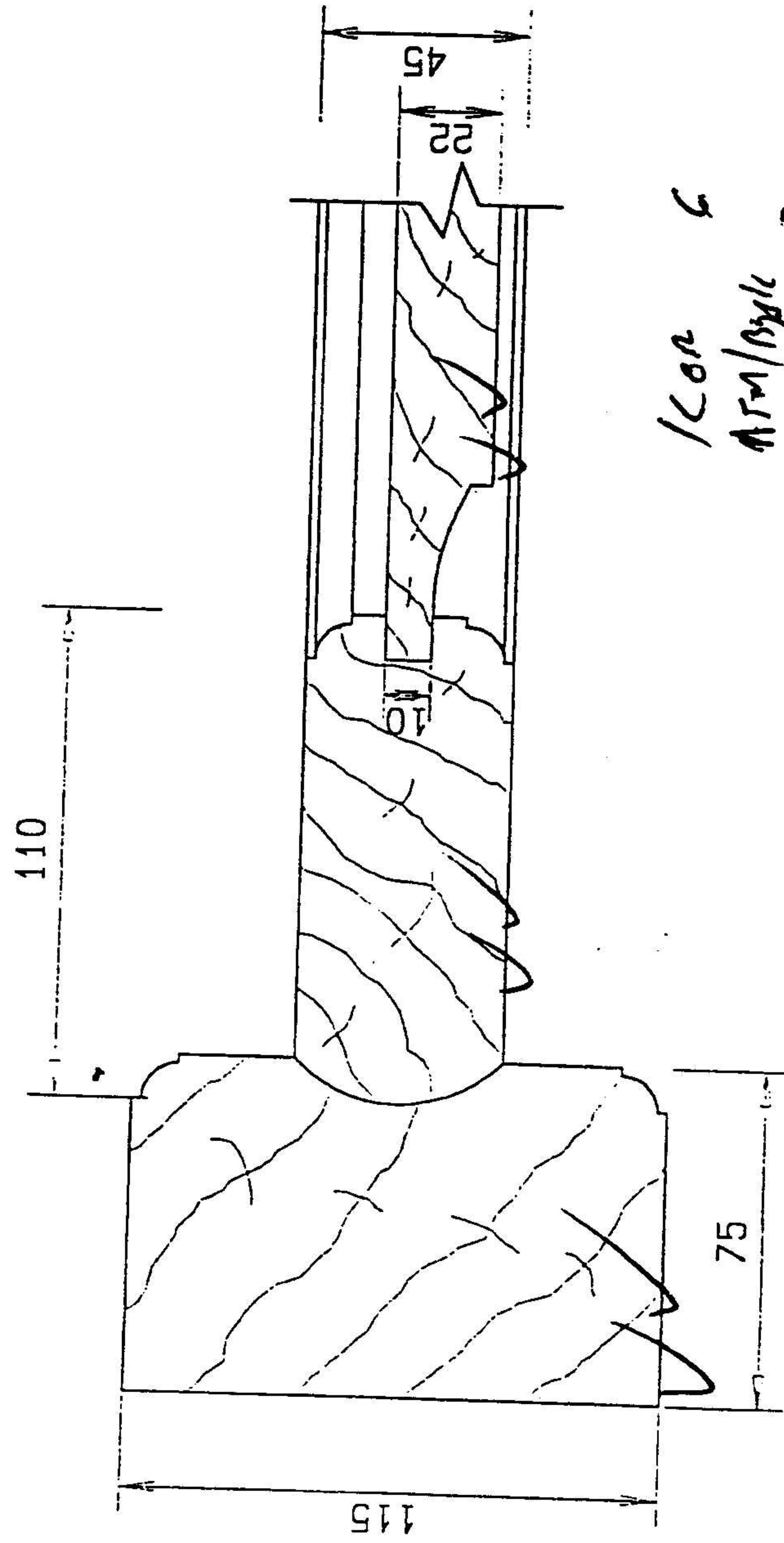
13

13

Bgskn/6-30

VRAAG / QUESTION 2.2

HORISONTALE SNIT DEUR DIE KOSYNSTYL, DEURRAAMSTYL EN SOLIEDE PANEEL
 HORIZONTAL SECTION THROUGH THE FRAME STILE, DOOR FRAME STILE AND SOLID PANEL
 SKAAL / SCALE 1:2

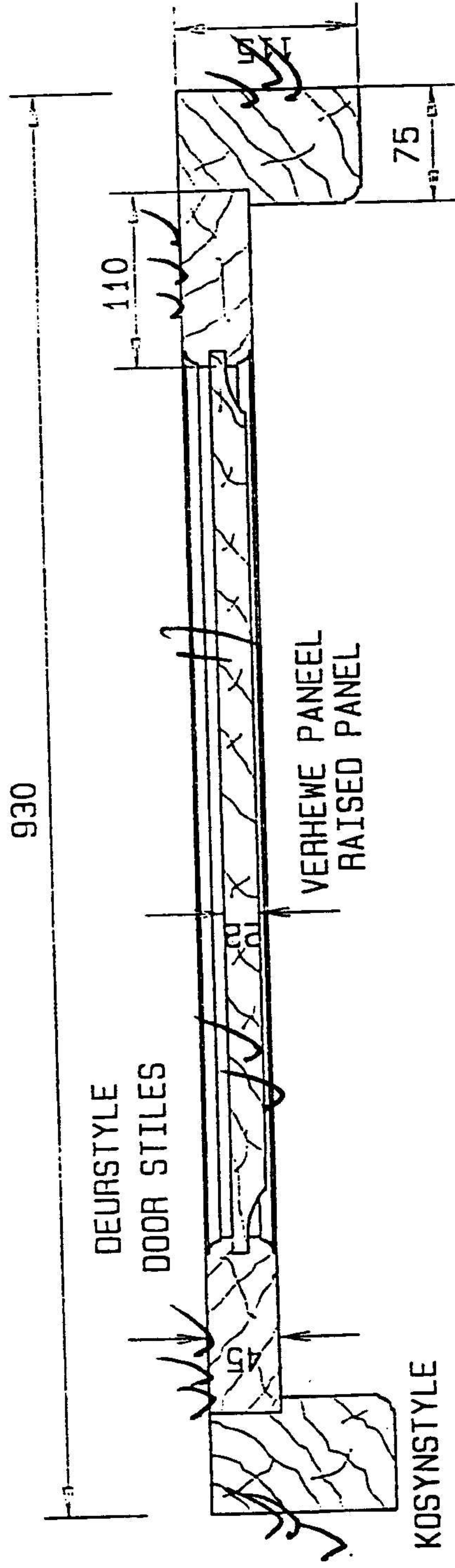


1600 6
 1500/1300 2
 1600 2
 10

01eind3.drw

VRAAG / QUESTION 2.3

SKAAL / SCALE 1:5



KOSYNSTYLE
FRAME STILES

- | | | | |
|---|----|----|---|
| 6 | 5 | 1. | KOSYNSTYLE / FRAME STILES 115 X 75 mm |
| 6 | 5 | 2. | DEURSTYLE / DOOR STILES 115 X 45 mm |
| 4 | 4 | 3. | VERHEWE KUSSING PANEEL / RAISED PANEL 22 mm |
| 2 | 2 | 4. | ARSERING / HATCHING |
| 2 | 2 | 5. | SKAAL / SCALE 1:5 |
| | 18 | | |

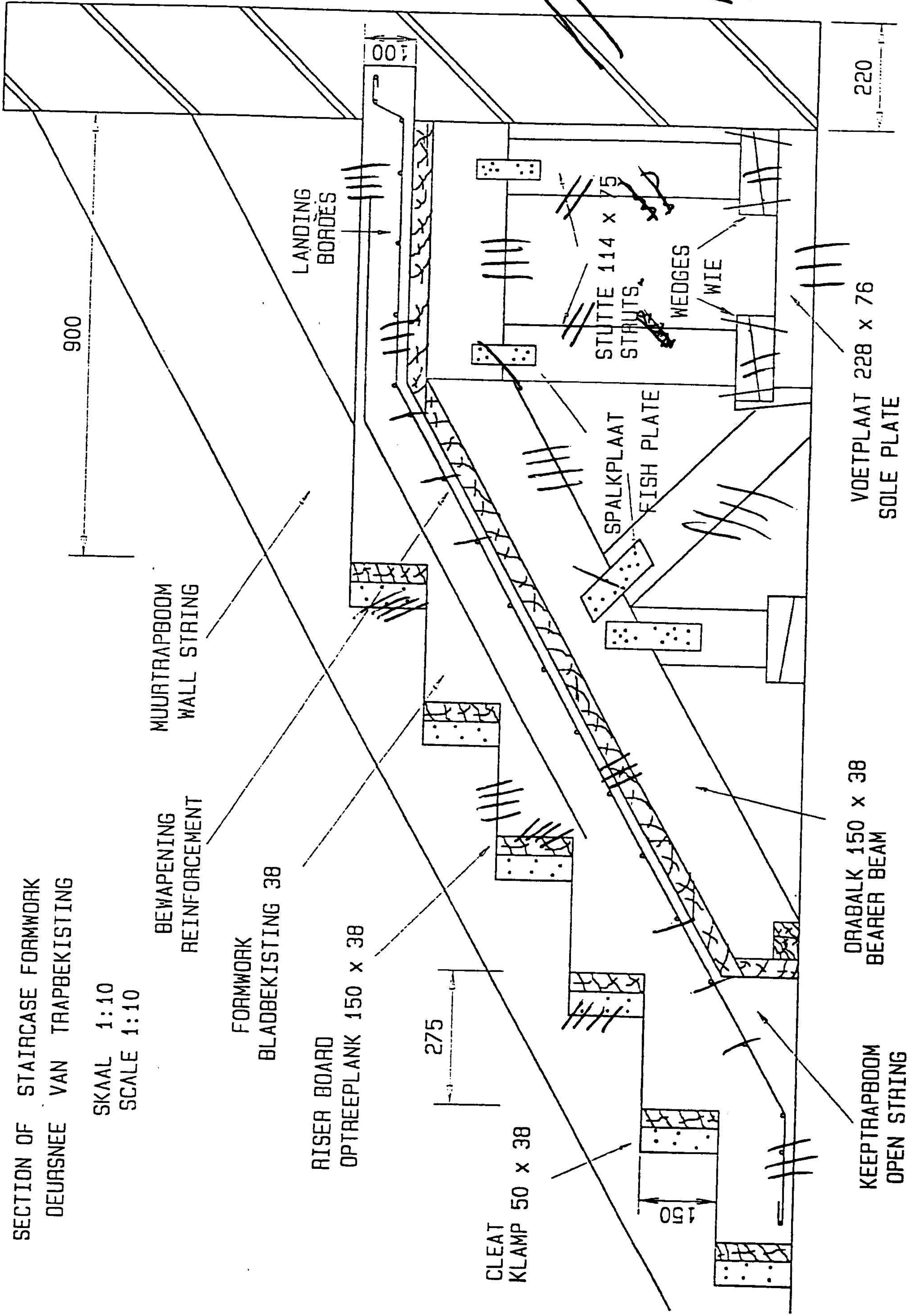
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1600 A 6
1700 B 2
1800 C 2
1900 D 10

1600 16
1700 2
1800 2
1900 20

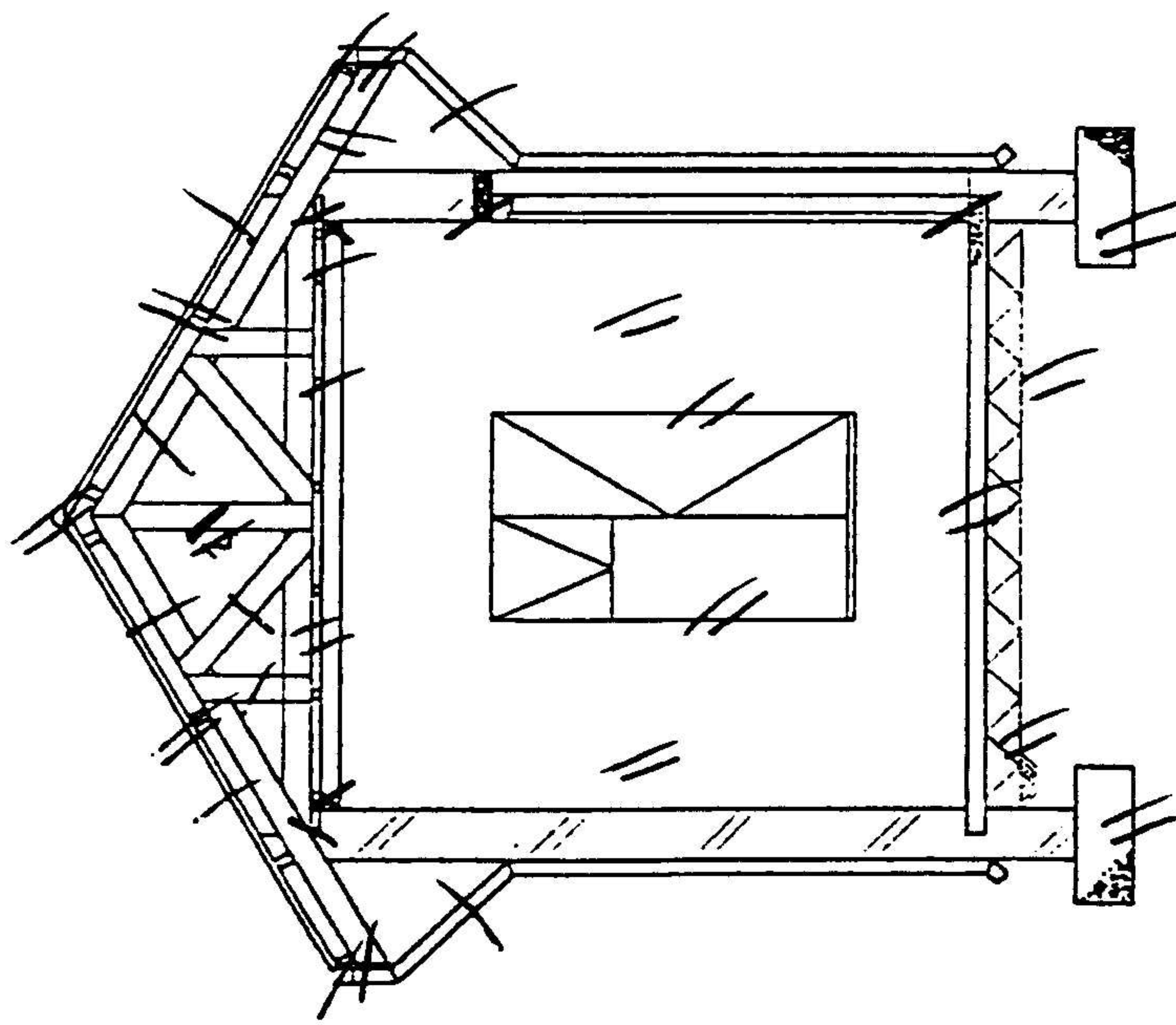
SECTION OF STAIRCASE FORMWORK
DEURSNEE VAN TRAPBEKISTING

SKAAL 1:10
SCALE 1:10



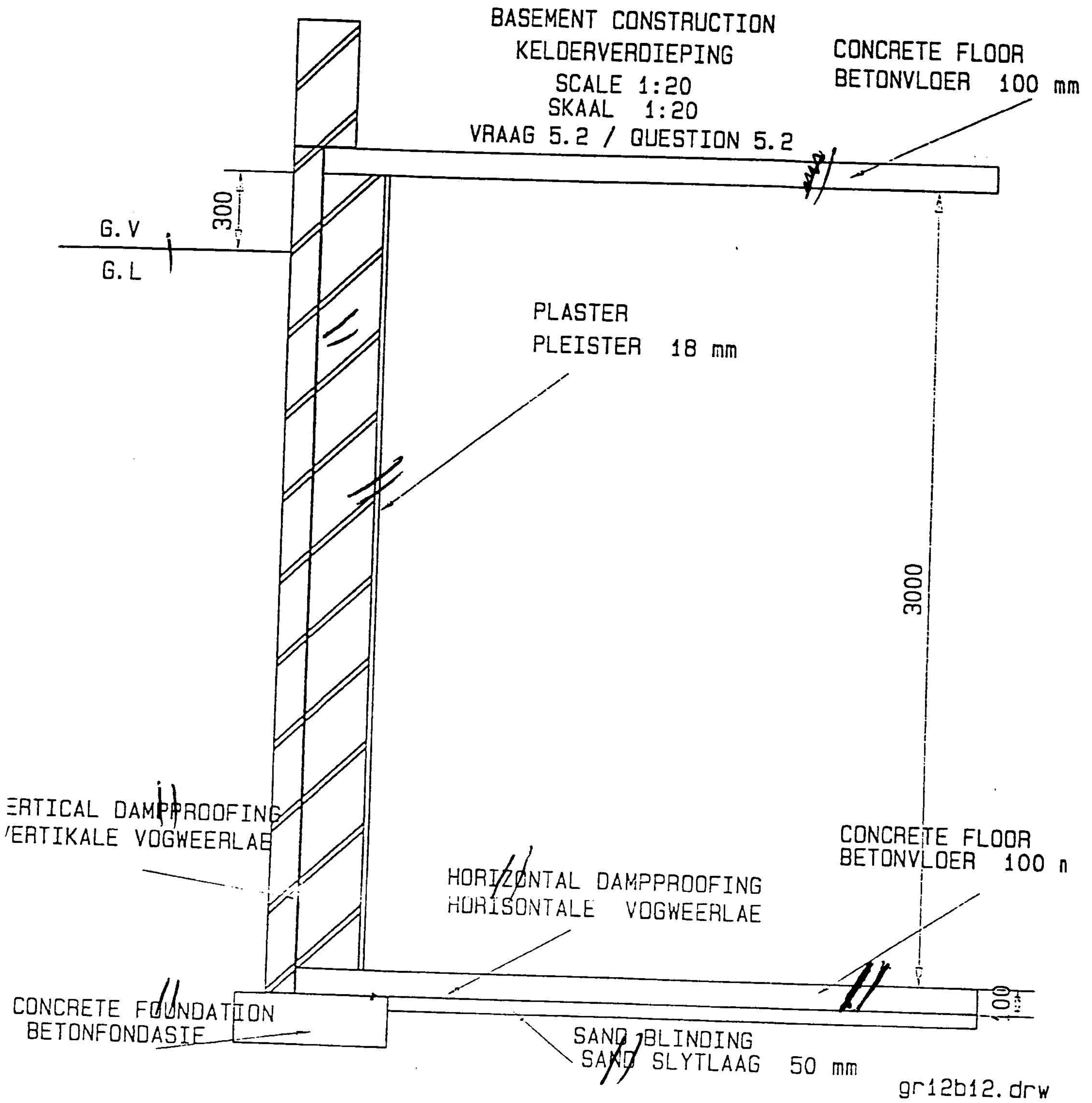
1/20/56
ARM/2/2
5/2 2
60

VRAAG 4 / QUESTION 4



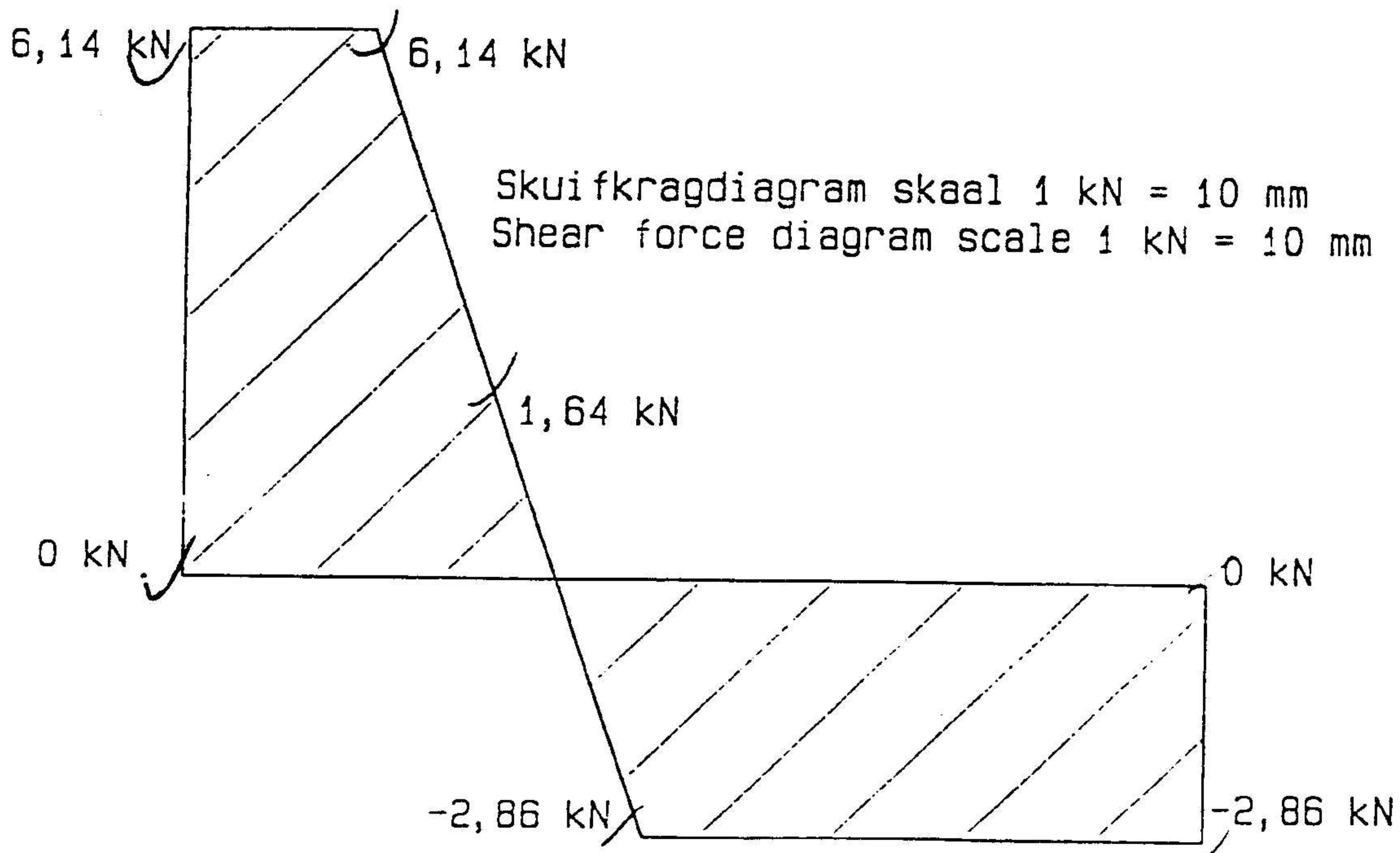
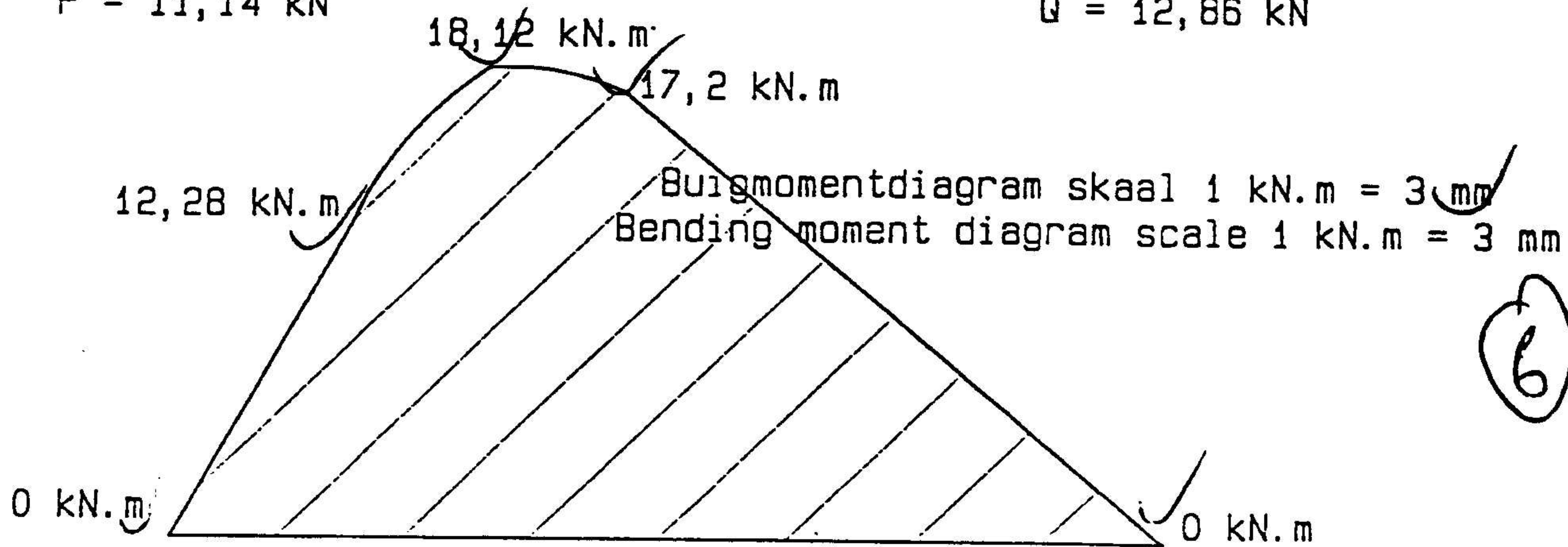
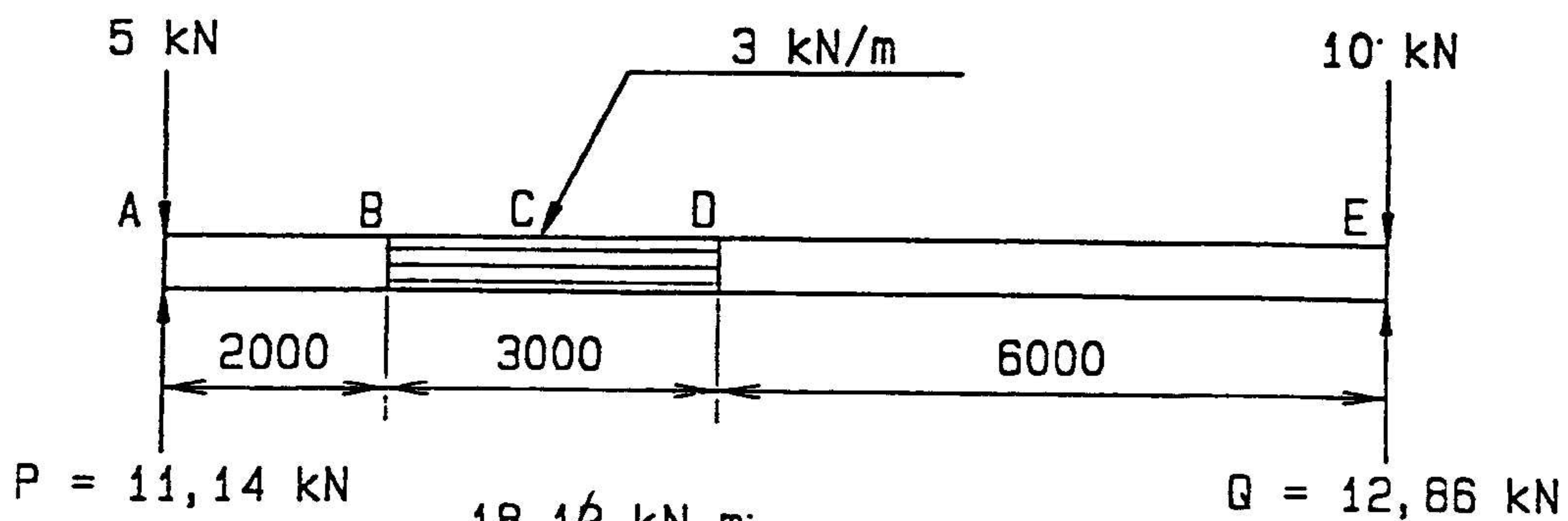
Konstruksie - 53
 Kon - 4
 Skaal - 3

Fondasie / Foundation 600 x 230	4
Onderbou / Substructure 450 mm	4
Betonvloer / Concrete floor 75 mm	2
Bobou / Superstructure 2700 mm	4
Venster / Window 2500 x 1500 mm	4
Snit van deur / Section of door	4
VWL / DPC	2
Dakkonstruksie / Roof construction	5
Muurplaat / Wall plate 114 x 38 mm	2
Daklatte / Purlins 75 x 50 mm	4
Dakbedekking / Roof covering	2
Fassieplank / Fascia board 230 x 20 mm	2
Geut / Gutter 75 x 75 mm	2
Afleipype / Down pipes 60 mm	2
Plafonlatte / Branderling 38 x 38 mm	2
Plafon / Ceiling 6 mm	2
Kroonlys / Cornice 75 mm	2
Nokplaat / Ridge plate	2
Oorhang / Overhang 450 mm	2
Korrektheid / Correctness	4
Skaal / Scale 1:50	3
	60

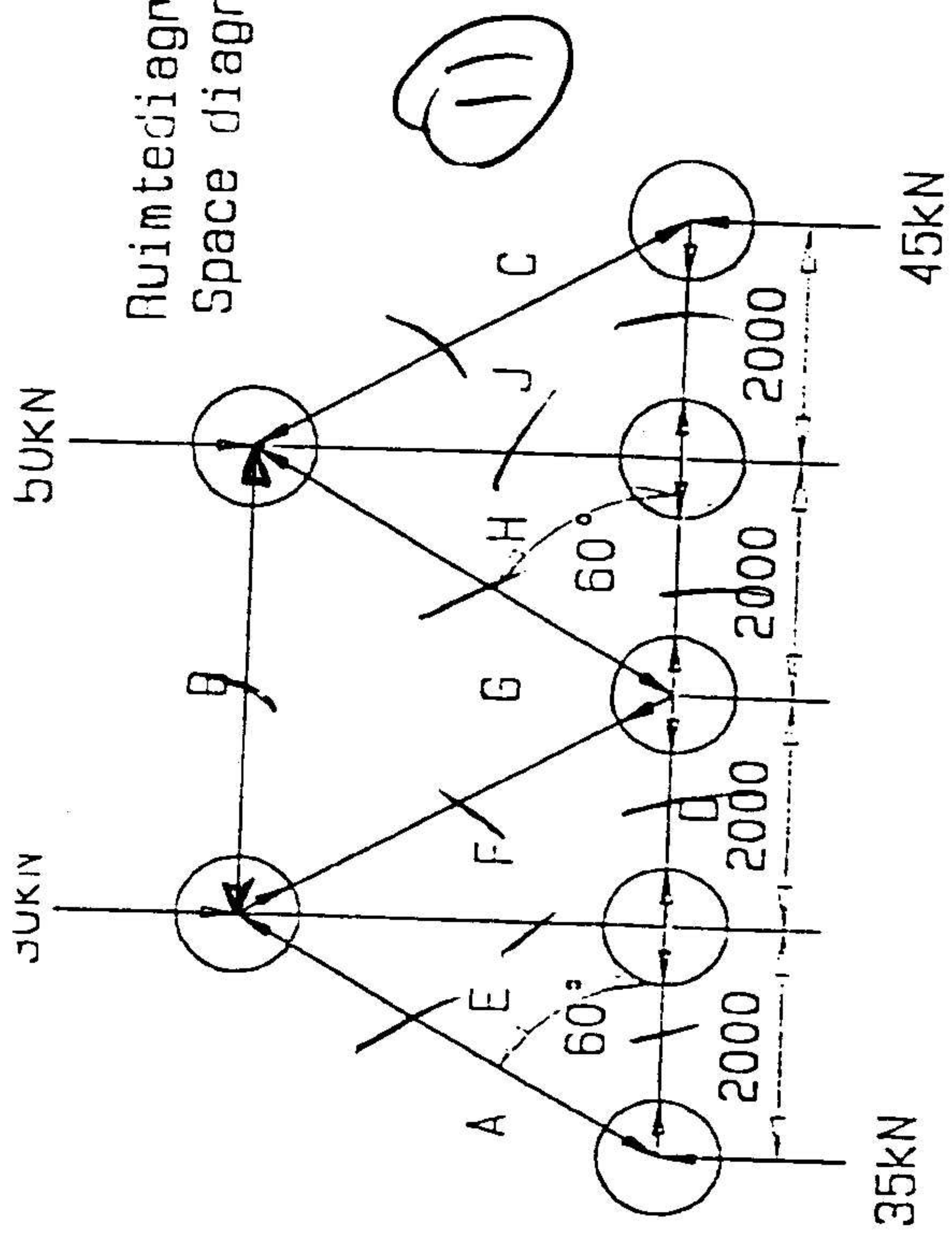


KOR - 1/2
 AFM 17
 Byst } 2
 S/L 2

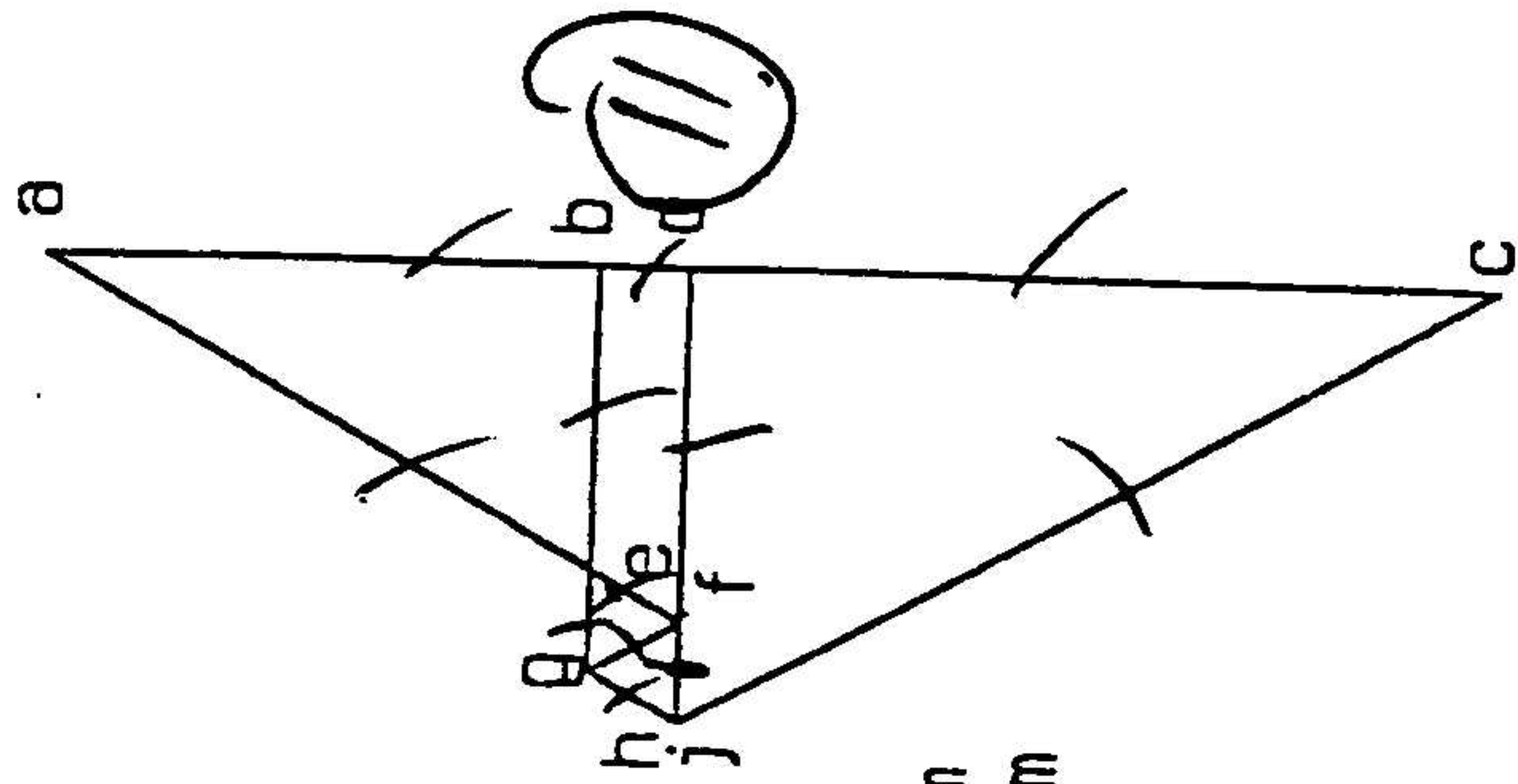
 20



14



Ruimtediagram skaal 1:100
Space diagram scale 1:100



Kragtediagram skaal 1kN = 1mm
Forces diagram scale 1kN = 1mm

Onderdeel	Krag in kN	Aard
Member	Force in kN	Nature
AE	✓ 40,41	Stut / strut
ED	✓ 20,21	Stang / Tie
EF	✓ -----	-----
FG	✓ 5,77	Stang / Tie
BG	✓ 23,09	Stut / Strut
GH	✓ 5,77	Stut / Strut
FD	✓ 20,21	Stang / Tie
HD	✓ 25,98	Stang / Tie
HJ	✓ -----	-----
JD	✓ 25,98	Stang / Tie
JC	✓ 51,96	Stut / Strut

22

Punte toekenning / Mark allocation	XXXX
Ruimtediagram / Space diagram	3
Kragtediagram / Forces diagram	11
Kragte / Forces	22
Aard / Nature	11
Pylpunte / Arrows	11
Skaal / Scale	2
Totaal / Total	60