higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

BOU- EN STRUKTUURKONSTRUKSIE N5

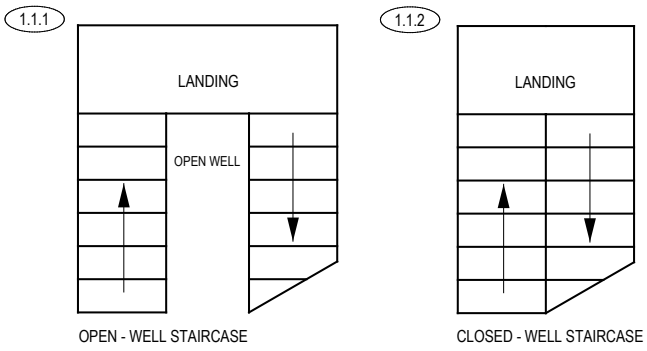
12 APRIL 2018

Hierdie nasienriglyn bestaan uit 13 bladsye.

Kopiereg voorbehou

VRAAG 1

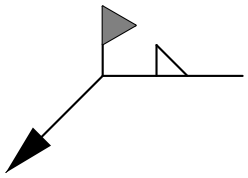
1.1



Correct view.	1
Arrow in place	1
Label	1
Total	3
Total 2 x 3 = 6	

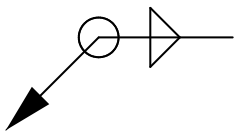
(2 × 3) (6)

1.2 1.2.1



Hoeksweislas
Gesweis aan die ander kant en op die terrein

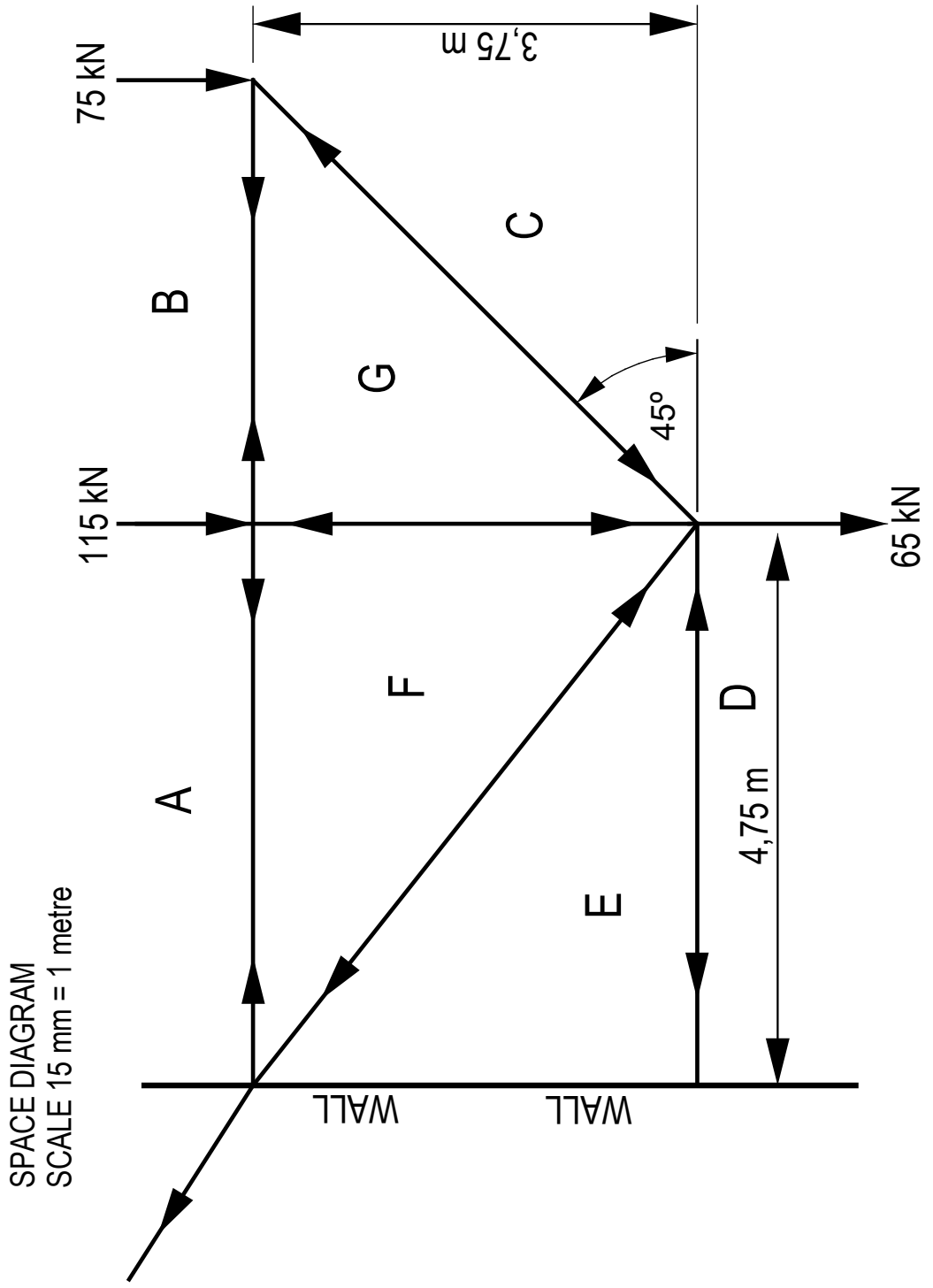
1.2.2



Hoeksweislas
Gesweis aan beide kante en rondom

(2 × 2) (4)
[10]

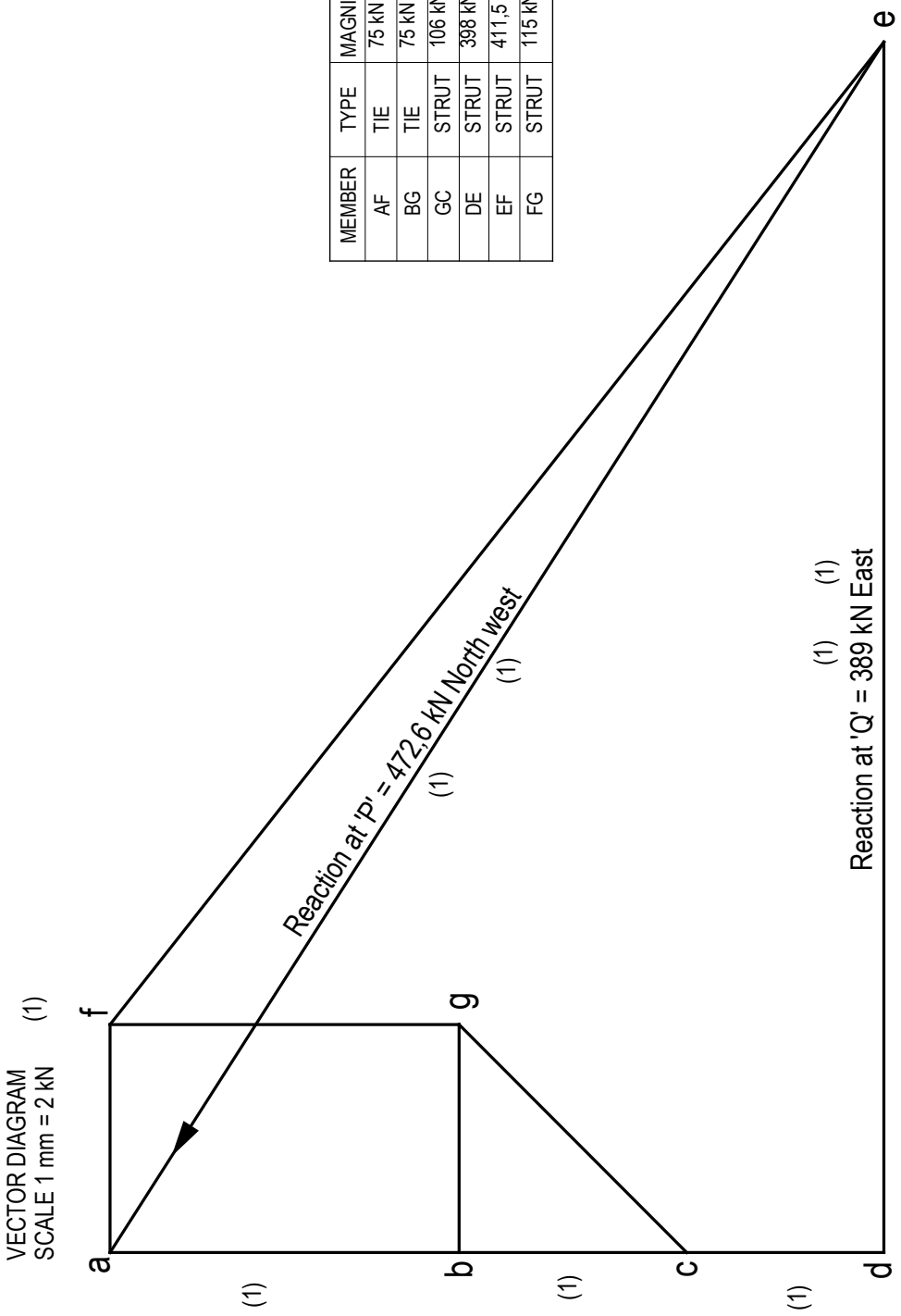
VRAAG 2

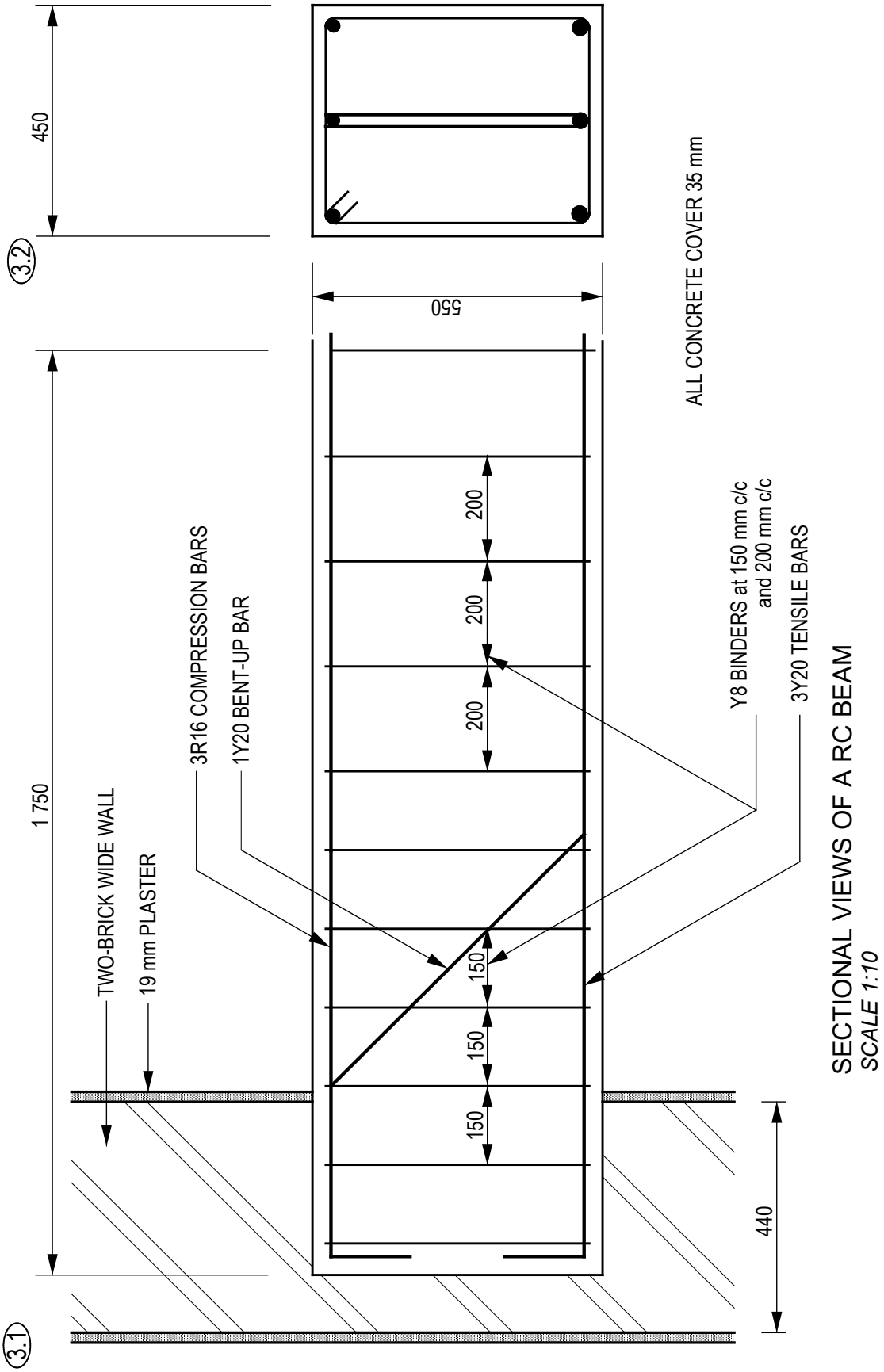

3,75 m
75 kN
B
C
G
45°
115 kN
65 kN
A
F
D
4,75 m
E
WALL
WALL
SPACE DIAGRAM
SCALE 15 mm = 1 metre

[14]

VRAAG 3

MEMBER	TYPE	MAGNITUDE	
AF	TIE	75 kN	(1)
BG	TIE	75 kN	(1)
GC	STRUT	106 kN	(1)
DE	STRUT	398 kN	(1)
EF	STRUT	411,5 kN	(1)
FG	STRUT	115 kN	(1)
			[6]





SECTIONAL VIEWS OF A RC BEAM
SCALE 1:10

MARK ALLOCATION QUESTION 3

CORRECTNESS	
Correctness:	
Beam corr size	2
Wall in place	2
Beam on wall corr	1
Sectional view in place	2
Plaster	2
	9

REINFORCEMENT	
Reinforcement:	
Main steel	3
Compression steel	2
Binders (all)	4
Bent-up bar	1
	10

Accuracy	3
Hatching	2
Labels	2
Dimensions	2
Title	9

Total = 9 + 10 + 9
= 28 marks / 2

TOTAL = 14 Marks

[14]

VRAAG 4

Bereken reaksies

4.1

Neem momente om RL:

(RR × 8) = (2,5 × 2,5 × 8,25) + (5 × 7) + (7 × 5 × 2,5) + (4 × 1)✓

$$RR = \frac{51,56 + 35 + 87,5 + 4}{8}$$

RR = 22,26 kN✓

Neem momente om RR:

(RL × 8) + (2,5 × 1,5 × 0,75) = (7 × 5 × 5,5) + (4 × 7) + (5 × 1) + (2,5 × 1 × 0,5)✓

$$RL = \frac{192,5 + 28 + 5 + 1,25 - 2,81}{8}$$

RL = 27,99 kN✓ (4)

Bereken skuifkragwaardes

4.2

SF A: 27,99 kN	**(Maks)**	27,99 kN✓
SF C: 27,99 – (7 × 1)		20,99 kN✓
SF C: 27,99 – (7 × 1) – 4		16,6 kN
SF D: 27,99 – (7 × 5) – 4		-11,01 kN✓
SF E: 27,99 – (7 × 5) – 4		-11,01 kN
SF E: 27,99 – (7 × 5) – 4 – 5		-16,01 kN
SF F: 27,99 – (7 × 5) – 4 – 5 – (2,5 × 1)		-18,5 kN
SF F: 27,99 – (7 × 5) – 4 – 5 – (2,5 × 1) + 22,25		3,75 kN

(3)

Skuifkragdiagram = 3 punte	

(3)

Bereken buigmomentwaardes

4.3

BM C: (27,99 × 1) – (7 × 1 × 0,5)	24,49 kN.m✓
BM D: (27,99 × 5) – (7 × 5 × 2,5) – (4 × 4)	36,45 kN.m✓
BM E: (27,99 × 7) – (7 × 5 × 4,5) – (4 × 6)	14,43 kN.m✓
BM F: -(2,5 × 1,5 × 0,75)	-2,81 kN.m✓

(4)

Buigmoment waar skuifkrag = zero (verwys na diagram vir berekening) BM R: (27,99 × 3,43) – (4 × 2,43) – (7 × 3,43 × $\frac{3,43}{2}$)✓	44,99 kN.m✓ **(maks)**

(2)

Buigmomentdiagram = 2 punte

(2)

Bereken profielmodulus en kies 'n gepaste I-profiel-parallelflens

4.4

Ze = $\frac{B\ M\ max}{Stress}$ = $\frac{44,99 \times 10^6}{156}$ = 288 397,44 mm³✓

Ze = 288,397 × 10^{-6} m^3

(2)

4.5

Kies: 254 × 146 × 31,3 kg/m (Ze = 352,1 × 10^{-6})✓

(1)

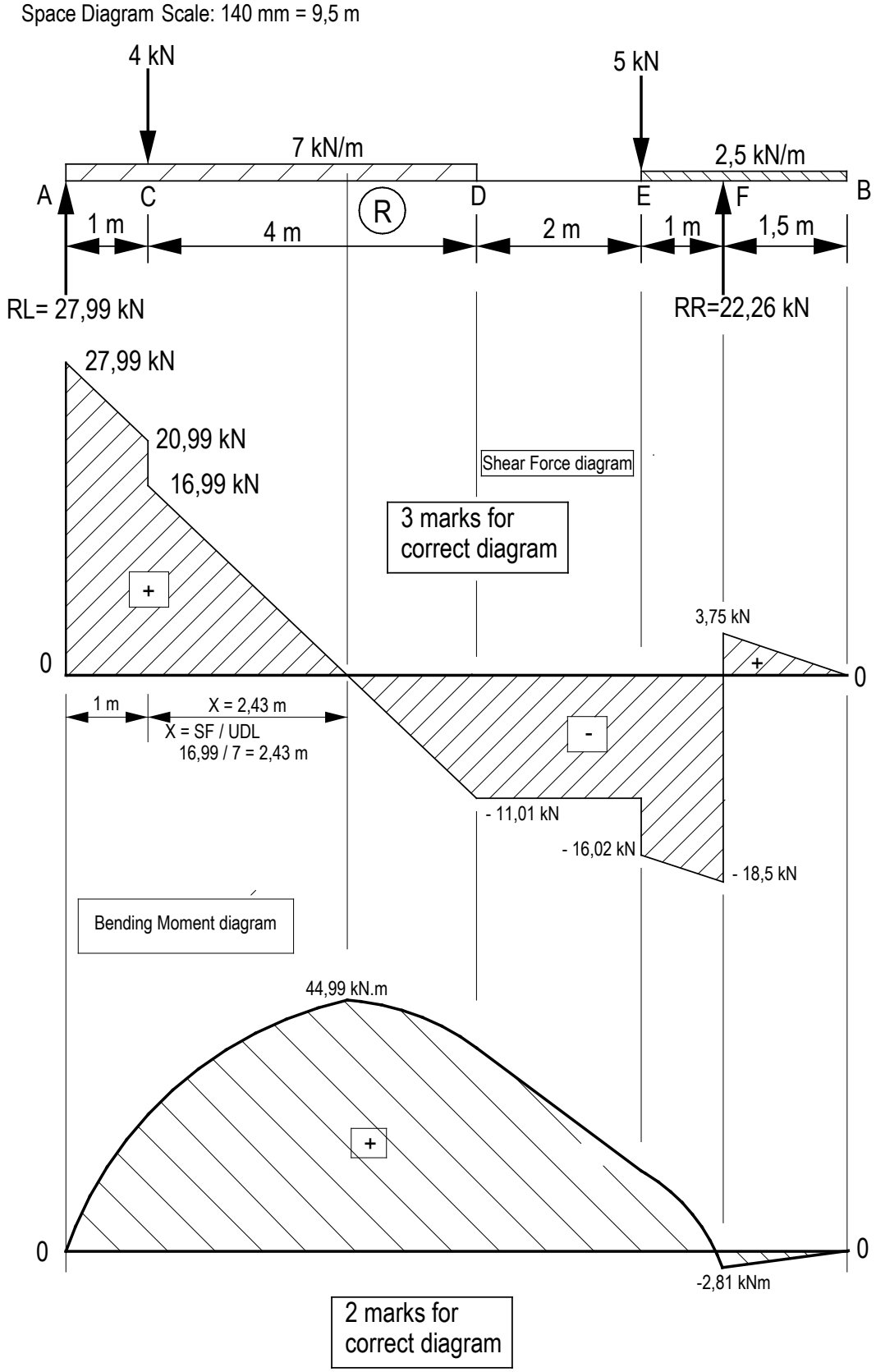
Kontroleer vir skuifspanning

4.6

Skuifspanning = $\frac{S\ F\ max}{D \times t}$ = $\frac{27,99 \times 10^3}{251,5 \times 6,1}$ = 18,24 MPa✓✓

Ze = 18,24 < 100 MPa✓

(3)


Space Diagram Scale: 140 mm = 9,5 m
4 kN
5 kN
7 kN/m
2,5 kN/m
A
C
R
D
E
F
B
1 m
4 m
2 m
1 m
1,5 m
RL= 27,99 kN
RR=22,26 kN
27,99 kN
20,99 kN
16,99 kN
Shear Force diagram
3 marks for correct diagram
+
3,75 kN
0
0
1 m
X = 2,43 m
X = SF / UDL
16,99 / 7 = 2,43 m
-
- 11,01 kN
- 16,02 kN
- 18,5 kN
Bending Moment diagram
44,99 kN.m
+
0
0
-2,81 kNm
2 marks for correct diagram

[24]

VRAAG 5

5.1

Bereken areas:

Area 1: 10 × 90 = 900

Area 2: 100 × 18 = 1 800

Area 3: 20 × 63 = 1 260

Totale area = 3 960✓

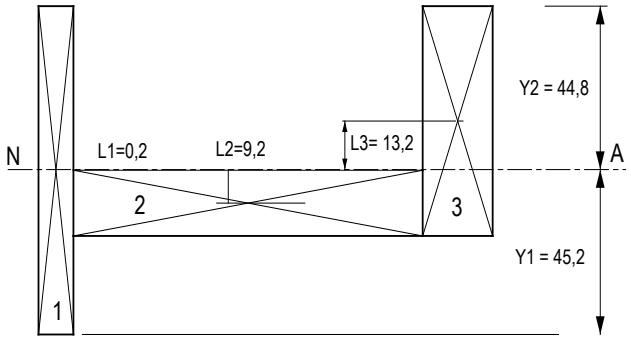
Bereken neutrale as vanaf A-B:

$3\,960 \times y_1 = (900 \times 45) + (1\,800 \times 36) + (1\,260 \times 58{,}5)$✓✓

$$Y_1 = \frac{40\,500 + 64\,800 + 73\,710}{3\,960}$$

$$Y_1 = \frac{179\,010}{3\,960}$$

Y_1 = 45,2 mm✓ (4)



5.2

Bereken tweede area-moment:

$I_{xx\ Total} = \left(\frac{bd^3}{12} + AL^2\right) + \left(\frac{bd^3}{12} + AL^2\right) + \left(\frac{bd^3}{12} + AL^2\right)$

$I_{xx\ 1} = \left(\frac{10 \times 90^3}{12} + 10 \times 90 \times 0{,}2^2\right)$

$= (607\,500 + 36)$ = 607 536 mm^4✓✓

$I_{xx\ 2} = \left(\frac{100 \times 18^3}{12} + 100 \times 18 \times 9{,}2^2\right)$

$= (48\,600 + 152\,352)$ = 200 952 mm^4✓✓

$I_{xx\ 3} = \left(\frac{20 \times 63^3}{12} + 20 \times 63 \times 13{,}3^2\right)$

$= (416\,745 + 222\,881{,}4)$ = 639 626,4 mm^4 ✓✓

$I_{xx\ Total}$ = 1 448 114,4 mm^4✓ (7)

5.3 **Bereken die profielmodulus (Z):**

$Z = \frac{I}{Y}$

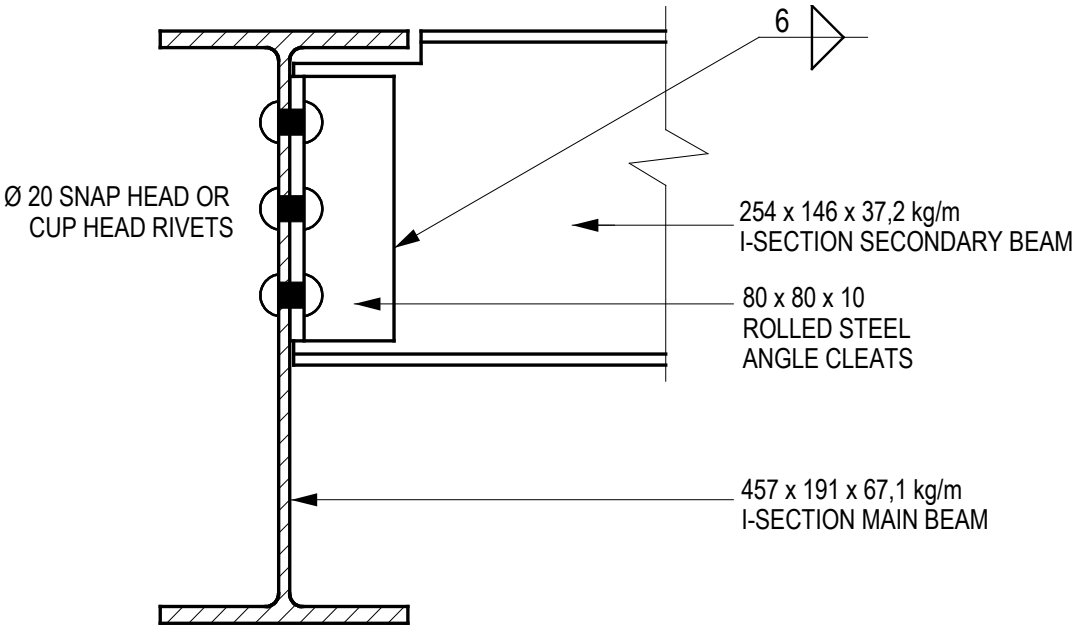
$Z = \frac{1\ 448\ 114{,}4\ \text{mm}4}{45{,}2\ \text{mm}}$ ✓✓

$Z = 32\ 037{,}93\ \text{mm}^3$ ✓ $32{,}04 \times 10^{-6}\ \text{m}^3$ (3)

[14]

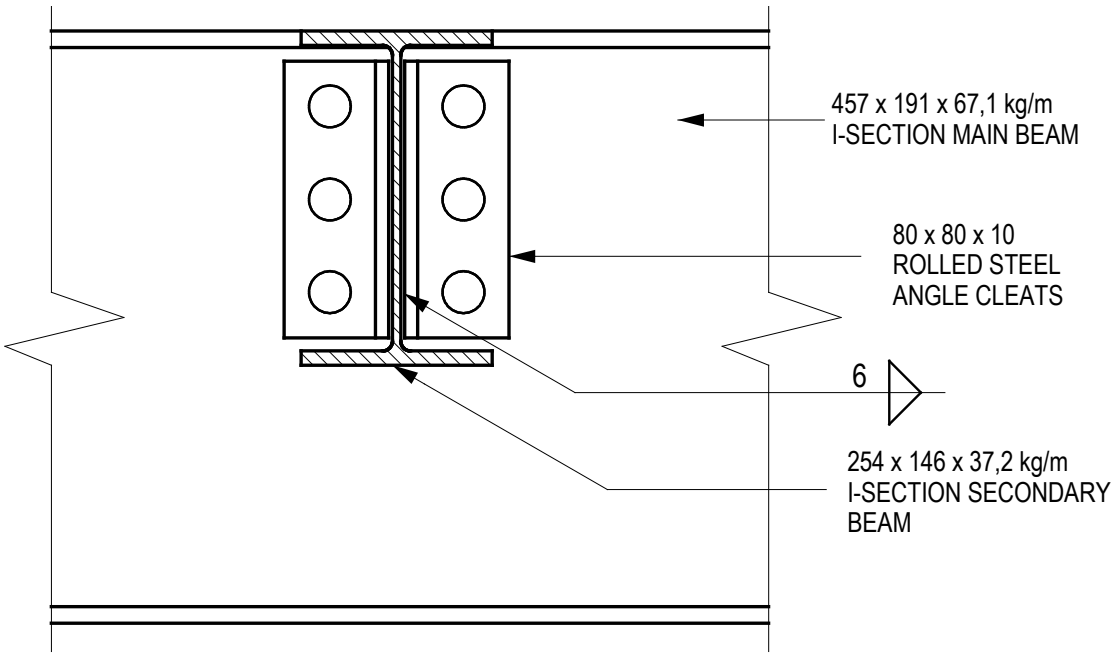
VRAAG 6

6.1



VERTICAL SECTION THROUGH THE MAIN BEAM
SCALE 1:5

6.2



VERTICAL SECTION THROUGH THE SECONDARY BEAM
SCALE 1:5

MARK ALLOCATION Question 6

MARK ALLOCATION (Q6.1)	
Correctness:	
Main beam corr.	2
Secondary beam corr.	2
Steel angle corr	2
Rivets in place	1
	7

MARK ALLOCATION (Q6.2)	
Correctness:	
Main beam corr.	2
Secondary beam corr.	2
Steel angle corr	2
Rivets in place	2
	8

Accuracy	3
Welding symbols	2
Labels	2
Titles	2
	9

Total = 7 + 8 + 9
= 24 marks

[24]

TOTAAL: 100

Kopiereg voorbehou