higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

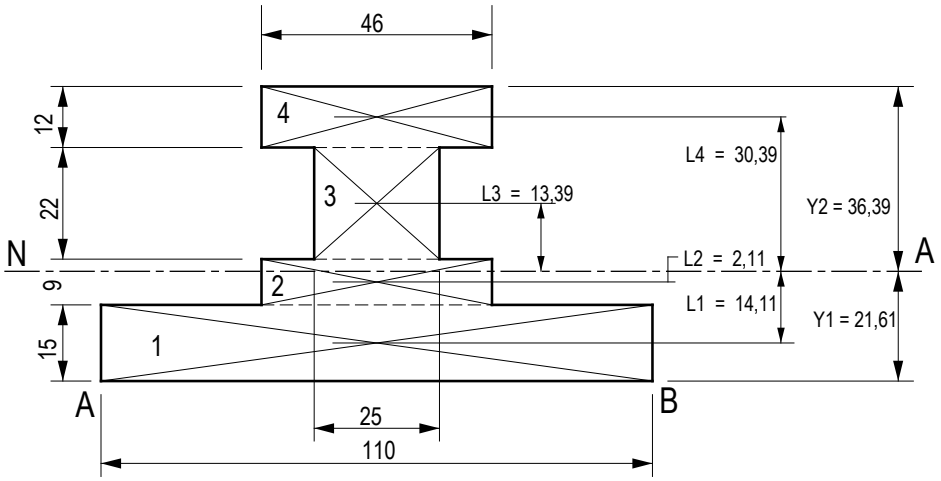
BOU- EN STRUKTUURKONSTRUKSIE N5

7 AUGUSTUS 2018

Hierdie nasienriglyn bestaan uit 9 bladsye.

Kopiereg voorbehou

VRAAG 1



1.1 Bereken oppervlakte:

Oppervlakte 1: $110 \times 15 = 1\,650$
Oppervlakte 2: $46 \times 9 = 414$
Oppervlakte 3: $25 \times 22 = 550$
Oppervlakte 4: $46 \times 12 = 552$

Totale oppervlakte $= 3\,166$✓

Bereken die neutrale as van A-B

$3\,166 \times y_1 = (1\,650 \times 7{,}5) + (414 \times 19{,}5) + (550 \times 35) + (552 \times 52)$✓✓

$$Y_1 = \frac{12\,375 + 8\,073 + 19\,250 + 28\,704}{3\,166}$$✓

$$Y_1 = \frac{68\,402}{3\,166}$$

$Y_1 = 21{,}61$ mm✓ (5)

1.2 $I_{xx\ Totaal} = \left(\frac{bd^3}{12} + al^2\right) + \left(\frac{bd^3}{12} + al^2\right) + \left(\frac{bd^3}{12} + al^2\right) + \left(\frac{bd^3}{12} + al^2\right)$

$I_{xx\ 1} = \left(\frac{110 \times 15^3}{12} + 110 \times 15 \times 14{,}11^2\right)$
$= (30\,937{,}5 + 328\,501{,}97) = 359\,439{,}47 \text{mm}^4$✓✓

$I_{xx\ 2} = \left(\frac{46 \times 9^3}{12} + 46 \times 9 \times 2{,}11^2\right)$
$= (2\,794{,}5 + 1\,843{,}17) = 4\,637{,}67\ \text{mm}^4$✓✓

$I_{xx\ 3} = \left(\frac{25 \times 22^3}{12} + 25 \times 22 \times 13{,}99^2\right)$
$= (49\,817{,}33 + 107\,646{,}06) = 157\,463{,}39\ \text{mm}^4$ ✓✓

$I_{xx\ 4} = \left(\frac{46 \times 12^3}{12} + 46 \times 12 \times 30{,}39^2\right)$
$= (6\,624 + 509\,800{,}76) = 516\,424{,}76\ \text{mm}^4$ ✓✓

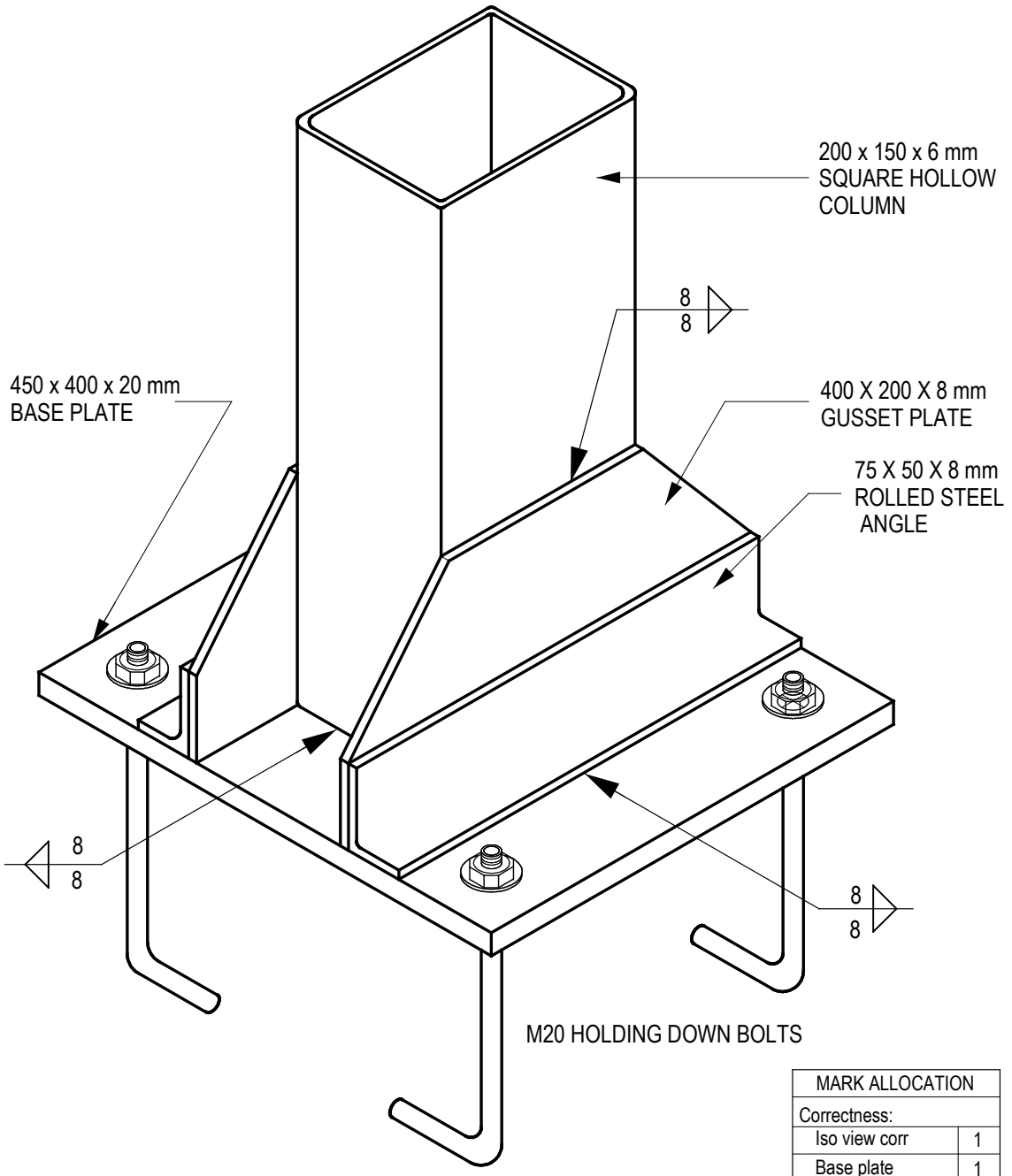
$I_{xx\ Totaal} = 1\,037\,965{,}29\ \text{mm}^4$ (9)

1.3 $Z = \frac{I}{Y}$

$Z = \frac{\mathbf{1\,037\,965{,}29\ mm4}}{\mathbf{21{,}61\ mm}}$✓✓

$Z = 48\,031{,}71\ \text{mm}^3$✓ $48{,}03 \times 10^{-6}\ \text{m}^3$ (3)
[17]

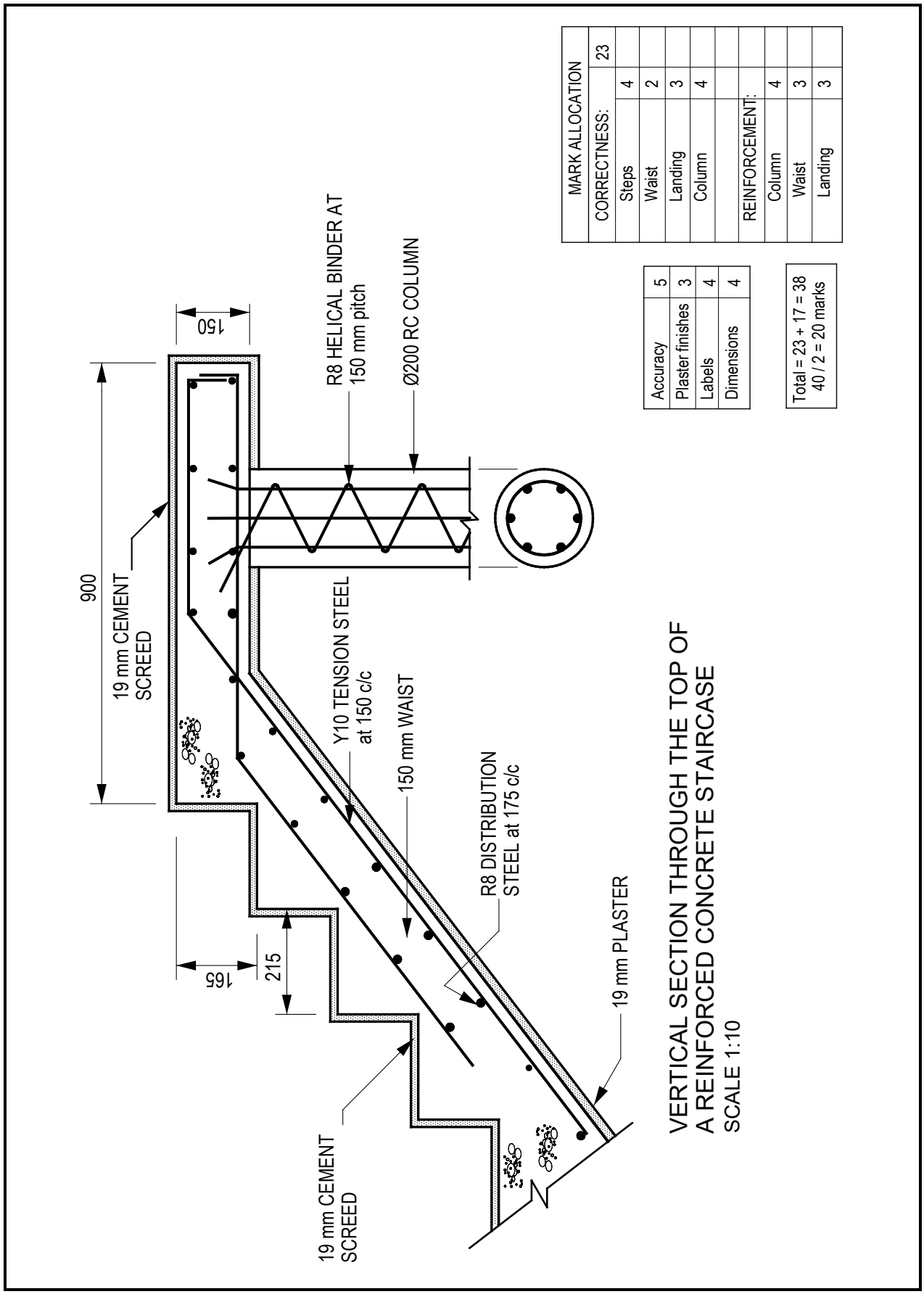
VRAAG 2



MARK ALLOCATION	
Correctness:	
Iso view corr	1
Base plate	1
Column	2
Gussets	2
Angles	2
Bolts	3
Accuracy	3
Welding symbols	1
Labels	3
Total	18

[18]

VRAAG 3



MARK ALLOCATION	
CORRECTNESS:	23
Steps	4
Waist	2
Landing	3
Column	4
REINFORCEMENT:	
Column	4
Waist	3
Landing	3

Accuracy	5
Plaster finishes	3
Labels	4
Dimensions	4

Total = 23 + 17 = 38
40 / 2 = 20 marks

[20]

VRAAG 4

4.1 Die skroefdraad is binne die skuifvlak

$$\text{Lading} = \text{oppervlakte} \times \text{spanning}$$

L

$$F_s = A_s \times f_s \times n$$

$$\text{Krag in skuifspanning} = \frac{\pi\,(d-0{,}9382\,p)^2}{4} \times f_s \times n$$

$$= \frac{\pi\,(10-0{,}9382 \times 1{,}75)^2}{4} \times 100\ \text{N/mm}^2 \times 6 \checkmark\checkmark$$

$$\text{Krag in skuifspanning} = 32{,}92\ \text{kN} \checkmark\checkmark \quad (4)$$

4.2 Die skroefdraad is buite die skuifvlak

$$\text{Lading} = \text{oppervlakte} \times \text{spanning}$$

$$F_s = A_s \times f_s \times n$$

$$\text{Krag in skuifspanning} = \frac{\pi\,d^2}{4} \times f_s \times n$$

$$= \frac{\pi 10^2}{4} \times 100\ \text{N/mm}^2 \times 6 \checkmark\checkmark$$

$$\text{Krag in skuifspanning} = 47{,}12\ \text{kN} \checkmark\checkmark \quad (4)$$

4.3

$$\text{Lading} = \text{oppervlakte} \times \text{spanning}$$

$$F_s = A_t \times f_t \times n$$

$$\text{Krag in skeuring} = [(B \times T) - n\,(d \times t)] \times f_t$$

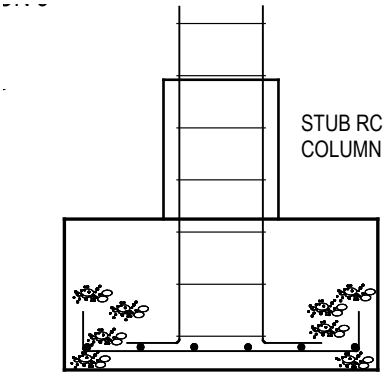
$$= [(40 \times 8) - 2\,(12 \times 8)] \times 155\ \text{N/mm}^2 \checkmark\checkmark$$

$$\text{Krag in skeuring} = 19{,}84\ \text{kN} \checkmark\checkmark \quad (4)$$

[12]

VRAAG 5

5.1

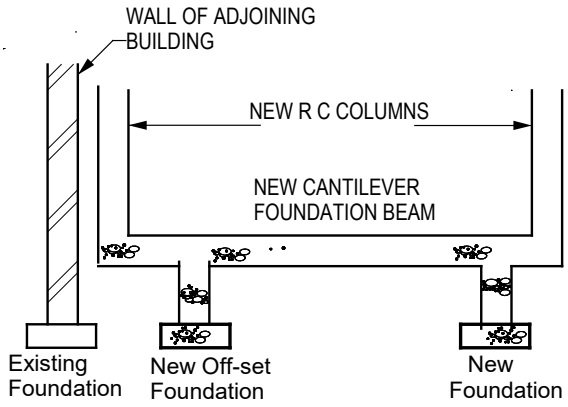


REINFORCED CONCRETE
PAD FOUNDATION WITH
STUB COLUMN

MARK ALLOCATION	
Pad foundation cor	1
Column in place	2
Reinforcement	2
Total	5

(5)

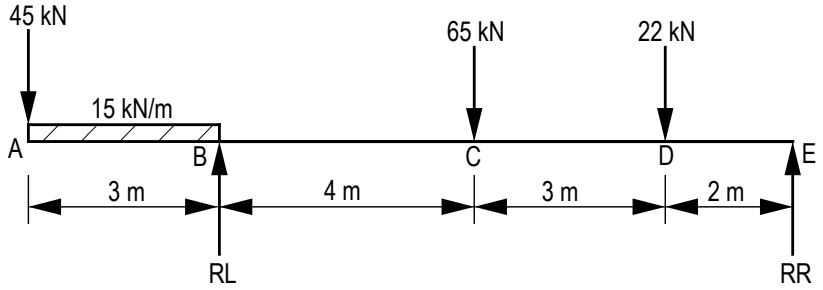
5.2



MARK ALLOCATION	
Foundations	1
Cantilever beam	1
Columns	2
Existing wall	1
Total	5

(5)
[10]

VRAAG 6



6.1 Neem momente rakende RL:

$(RR \times 9) + (15 \times 3 \times 1{,}5) + (45 \times 3) = (65 \times 4) + (22 \times 7)$✓

$RR = \frac{260 + 154 - 67{,}5 - 135}{9}$

$RR = 23{,}5$ kN✓

Neem momente rakende RR:

$(RL \times 9) = (45 \times 12) + (15 \times 3 \times 10{,}5) + (65 \times 5) + (22 \times 2)$

$RL = \frac{540 + 472{,}5 + 325 + 44}{9}$

$RL = 153{,}5$ kN✓ (4)

6.2

SF A: -45 kN	-45 kN
SF B: -45 – (15 × 3)	-90 kN✓
(Max)	63,5 kN
SF B: -45 – (15 × 3) + 153,5	63,5 kN✓
SF C: 153,5 – 45 – (15 × 3)	-1,5 kN✓
SF C: 153,5 – 45 – (15 × 3) – 65	-1,5 kN
SF D: 153,5 – 45 – (15 × 3) – 65	-23,5 kN
SF D: 153,5 – 45 – (15 × 3) – 65 – 22	-23,5 kN
SF E: 153,5 – 45 – (15 × 3) – 65 – 22	

(3)

6.3

BM B: -(45 × 3) – (15 × 3 × 1,5)	-202,5 kN.m✓
BM C: (153,5 × 4) – (45 × 7) – (15 × 3 × 1,5)	51,5 kN.m✓
BM D: (23,5 × 2)	47 kN.m✓

(3)

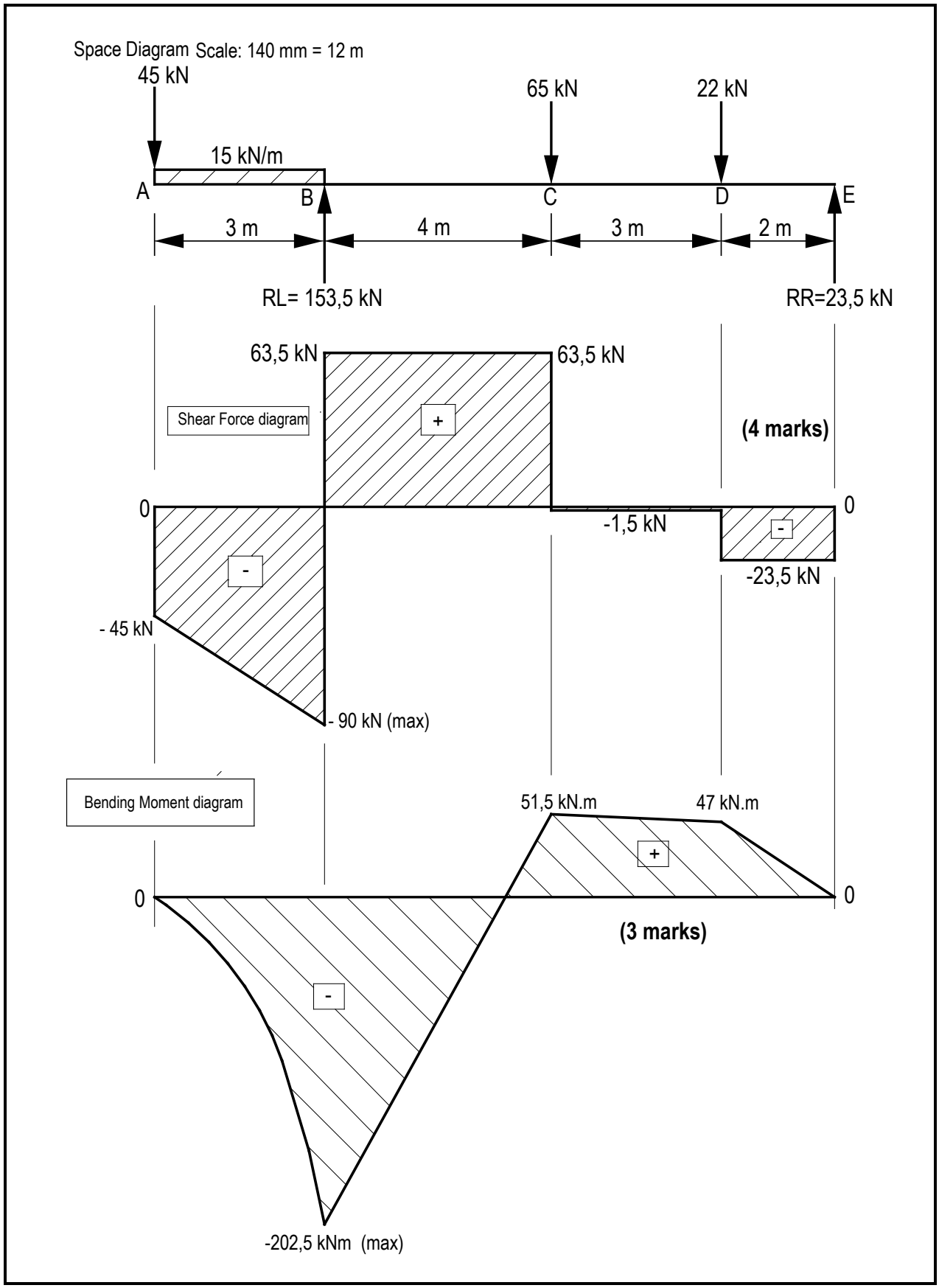
6.4 $Ze = \frac{B\,M\,maks}{Spanning} = \frac{202{,}5 \times 10^6}{165} = 1\,227\,272{,}73\ mm^3$✓✓

$Ze = 1\,227{,}27 \times 10^{-6}\ m^3$ (2)

6.5 Kies: $457 \times 191 \times 67{,}1$ kg/m $(Ze = 1\,297 \times 10^{-6})$✓ (1)

6.6 Skuifspanning $= \frac{S\,F\,maks}{D \times t} = \frac{90 \times 10^3}{453{,}6 \times 8{,}5} = 23{,}34$ MPa✓✓

$Ze = 23{,}34 < 100$ MPa✓ (3)



(4)

(3)

[23]

TOTAAL: 100

Kopiereg voorbehou