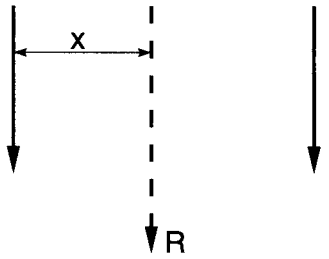
FACITLISTE

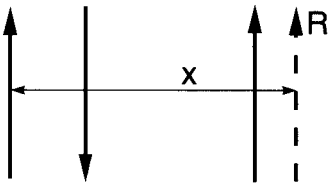
1. KRÆFTER OG MOMENTER

1. H = 86,99 N, V = 96,61 N
2. R = 100 N, v = 53,13°
3. R = 338,54 N, v = 22,01°
4. F = 17,32 N
5. F_{AC} = 400 N, F_{BC} = 300 N
6. R = 861,25 N, v = –6,41°
7. $F_1 = F_2$ = 1,3 kN
8. Højre ben: F = 544,5 N, Venstre ben: F = 189,1 N
9. H = 1 kN, V = 1,73 kN
10. a) $F_1 = F_2$ = 0,5 kN
    b) $F_1 = F_2$ = 0,54 kN
    c) $F_1 = F_2$ = 0,71 kN
    d) $F_1 = F_2$ = 1 kN
    e) $F_1 = F_2$ = 1,93 kN
11. F_1 = 704,98 N F_2 = 328,74 N
12. R = 7794 N (g = 10 m/s^2)
13. R = 600 N
14. R = 1,17 kN v = 13,28°
15. R = 1189 N v = 32,54°
16. R = 23,58 N v = 354,57°
17. R = 660,69 N v = 202,88°
18. R = 440,69 N v = 4,38°
19. R = 5,51 MN v = 337,6°
20. R = 21,26 kN
21. R = 35 N x = 1,97 m



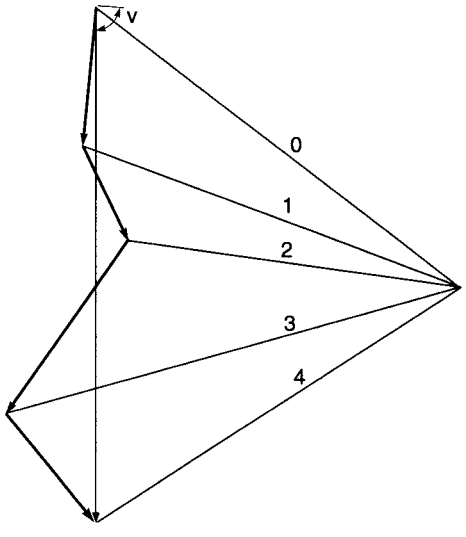
ad. 21

22. R = 12 N x = 4,17 m

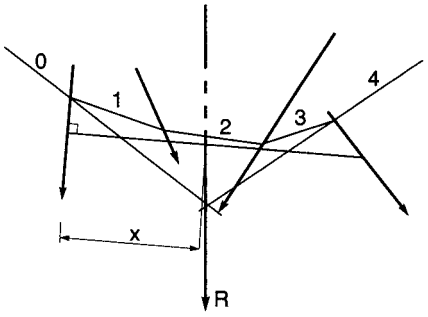


ad. 22

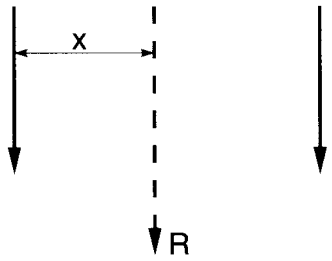
23. R = 14,7 MN
    x = 4,13
    v = 85°
24. M_A = 22 kNm
25. M_A = 16004 Nmm
26. M_A = 106 Nm
27. M_A = 9,068 kNm
28. a) $F_1 = F_2$ = 7,78 kN
    b) M_A = 178,76 kNmm



ad. 23

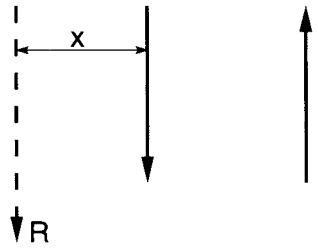


29. R = 43 MN x = 1,47 m



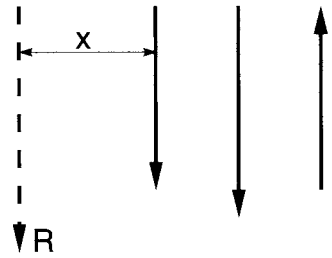
ad. 29

30. R = 13 kN x = 1,14 m



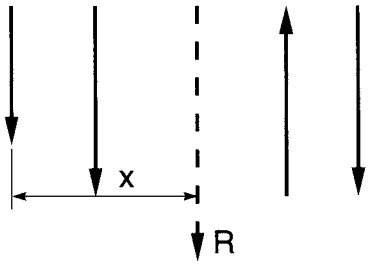
ad. 30

31. R = 10 N x = 11 m



ad. 31

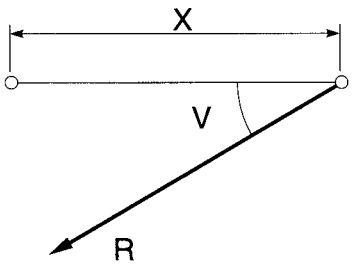
32. R = 41 N x = 2,3 m



ad. 32

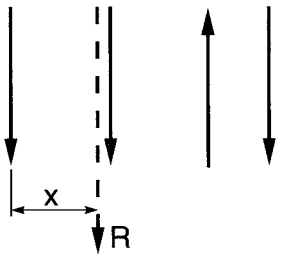
33. R = 90 N M_A = 500 Nm

34. x = 1,5 m
R = 5,57 kN
v = 21,04°



ad. 34

35. R = 7 kN x = 7,36 m

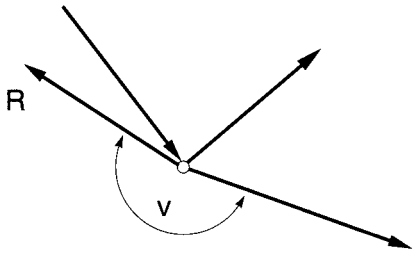


ad. 35

36. R = 373,44 N (R_V = 3616 N, R_H = 93,3 N)
(x,y) = (0,96, –11,6)

37. F_1 = 80 N

38. R = 2,57 MN v = 182°



ad. 38

39. F_2 = 2,33 kN

40. F = 0,49 kN

41. F_1 = 1091 N

42. a) F_2 = 765 N
b) F_1 = 392 N

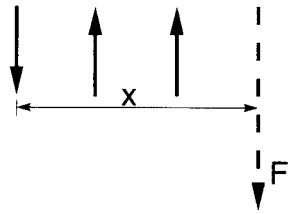
43. a_1 = 102 mm

44. F_1 = 217 N

45. F_2 = 700 N

46. F = 12,5 N

47. ↓F = 20 N x = 9,5 m



ad. 47

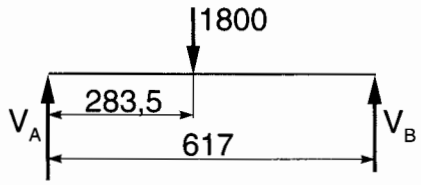
48. F = 386 N

49. A = 3,29 kN B = 3,71 kN

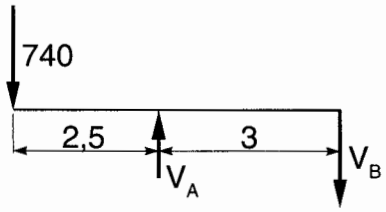
50. a) F = 1,04 kN
    b) A = 1,41 kN B = 2,45 kN

2. KONSTRUKTIONER PÅVIRKET TIL BØJNING

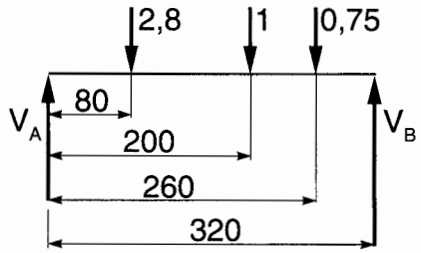
51. $V_A = 973$ N
$V_B = 827$ N



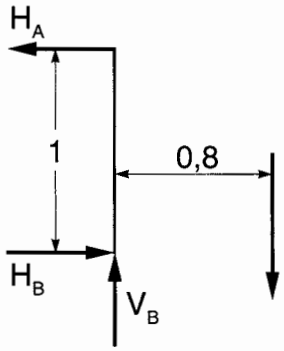
52. $V_A = 1357$ N
$V_B = 617$ N



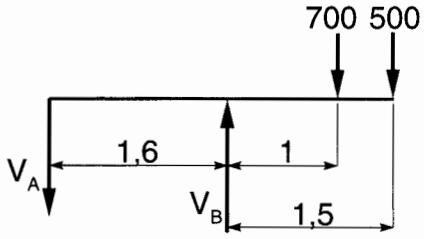
53. $V_A = 2{,}62$ kN
$V_B = 1{,}93$ kN



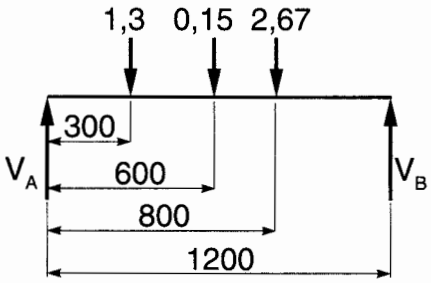
54. $H_A = 400$ N
$H_B = 400$ N
$V_B = 500$ N



55. $V_A = 906$ N
$V_B = 2106$ N

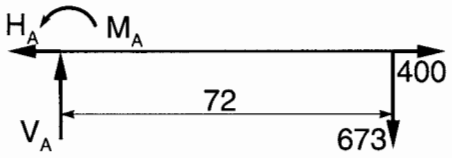


56. $V_A = 1{,}94$ kN
$V_B = 2{,}18$ kN

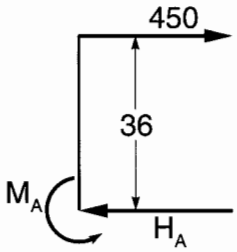


57. $F_2 = 2{,}25$ KN

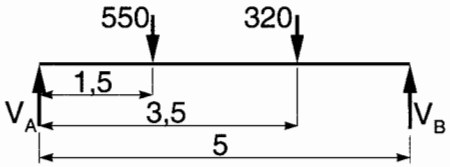
58. $H_A = 400$ N
$V_A = 693$ N
$M_A = 49896$ Nmm



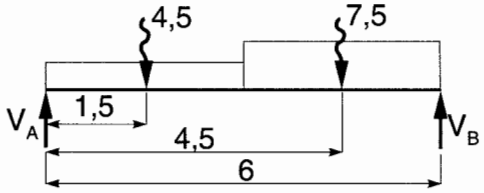
59. $H_A = 450$ N
$M_A = 11700$ Nmm



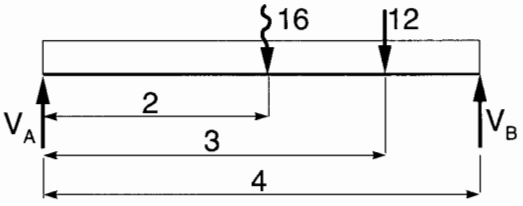
60a. $H_A = 0$
$V_A = 481$ N
$V_B = 389$ N



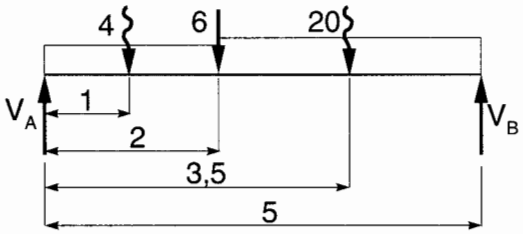
60b. $H_B = 0$
$V_A = 5{,}25$ kN
$V_B = 6{,}75$ kN



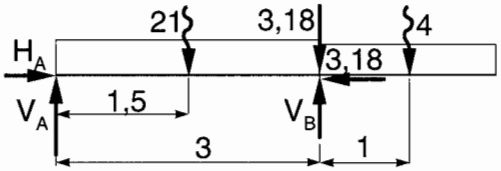
60c. $H_A = 0$
$V_A = 11$ kN
$V_B = 17$ kN



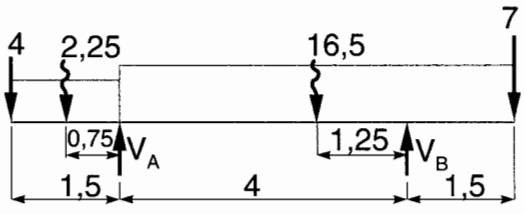
60d. $H_A = 0$
$V_A = 12{,}8$ kN
$V_B = 17{,}2$ kN



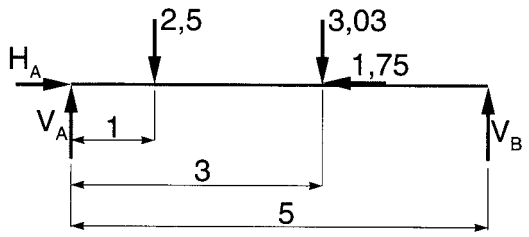
60e. $H_A = 3{,}18$ kN
$V_A = 9{,}17$ kN
$V_B = 19{,}02$ kN



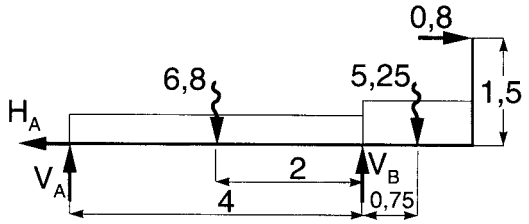
60f. $H_A = 0$
$V_A = 10{,}7$ kN
$V_B = 19{,}05$ kN



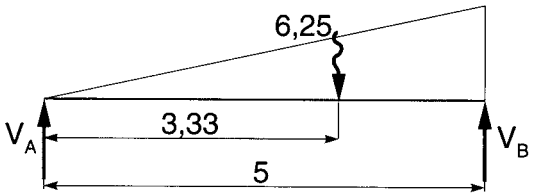
60g. $H_A = 1{,}75$ kN
$V_A = 3{,}21$ kN
$V_B = 2{,}32$ kN



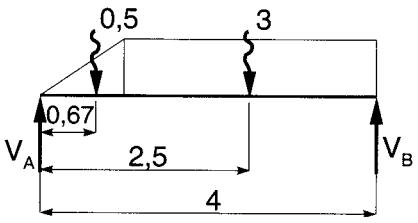
60h. $H_A = 0{,}8$ kN
$V_A = 2{,}12$ kN
$V_B = 9{,}93$ kN



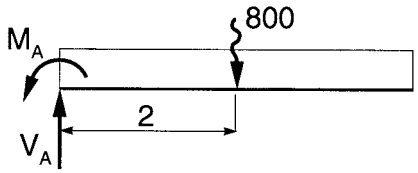
60i. $H_A = 0$
$V_A = 2{,}08$ kN
$V_B = 4{,}17$ kN



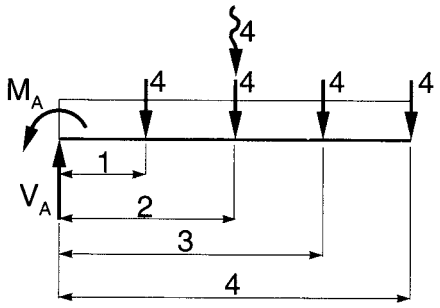
60j. $H_A = 0$
$V_A = 1{,}54$ kN
$V_B = 1{,}96$ kN



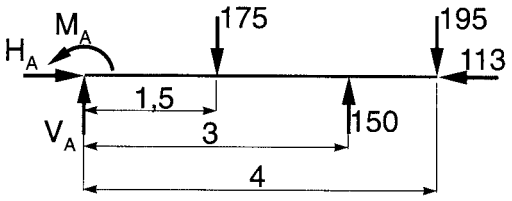
61a. $V_A = 800$ kN
$M_A = 1600$ kNm



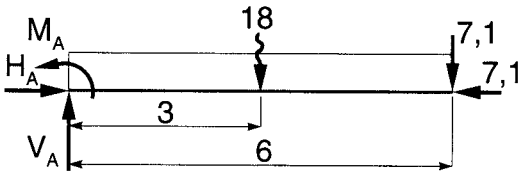
61b. $V_A = 20$ kN
$M_A = 48$ kNm



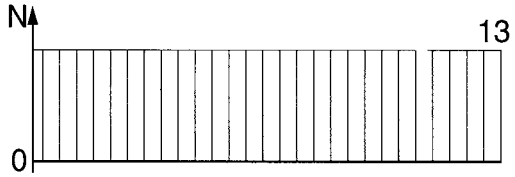
61c. $H_A = 113$ N
$V_A = 220$ N
$M_A = 592{,}5$ Nm



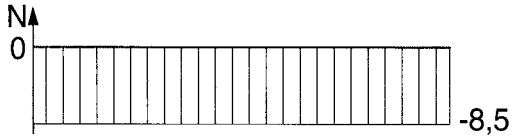
61d. $V_A = 25{,}1$ kN
$H_A = 7{,}1$ kN
$M_A = 96{,}6$ kNm



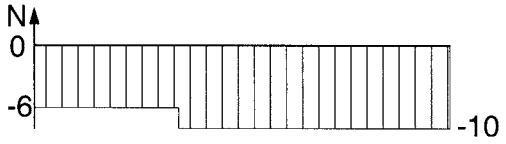
62. a) $N_{AB} = 13$ kN



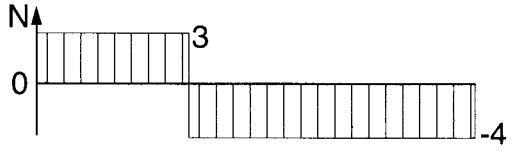
63. a) $N_{AB} = -8{,}5$ kN



64. a) $F_C = 10$ kN
b) $N_{AB} = -6$ kN
$N_{BC} = -10$ kN

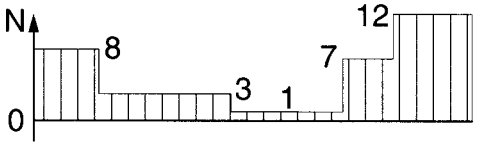


65. a) $F_C = 4$ kN
b) $N_{AB} = 3$ kN
$N_{BC} = -4$ kN

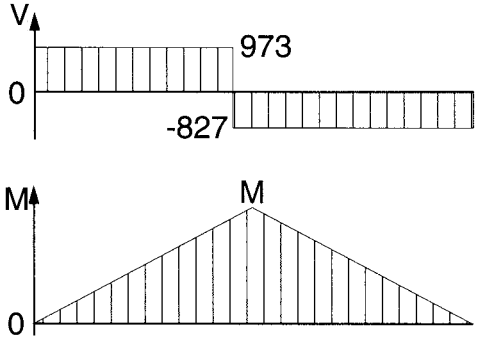


66. a) $F_F = -12$ kN

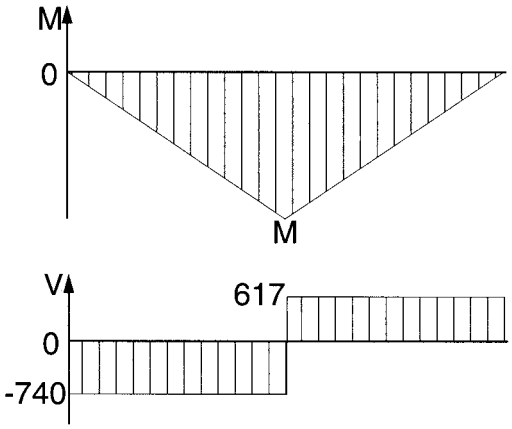
b) $N_{AB} = 8$ kN
$N_{BC} = 3$ kN
$N_{CD} = 1$ kN
$N_{DE} = 7$ kN
$N_{EF} = 12$ kN



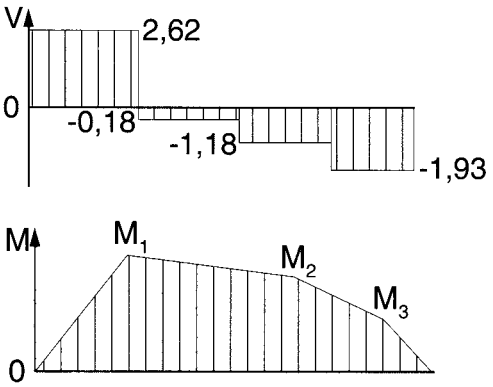
67. M = 275845,5 Nmm



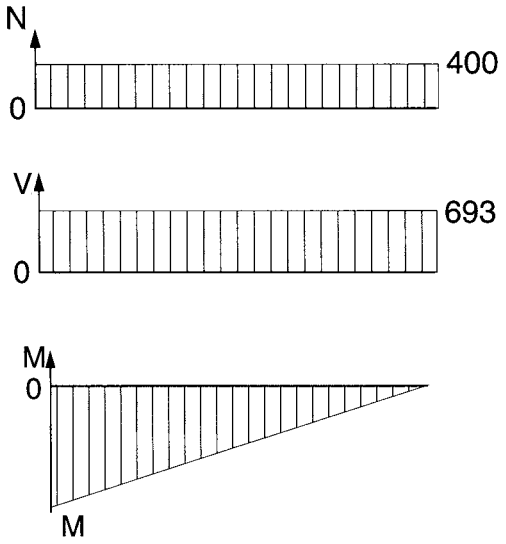
68. M = –1850 Nm



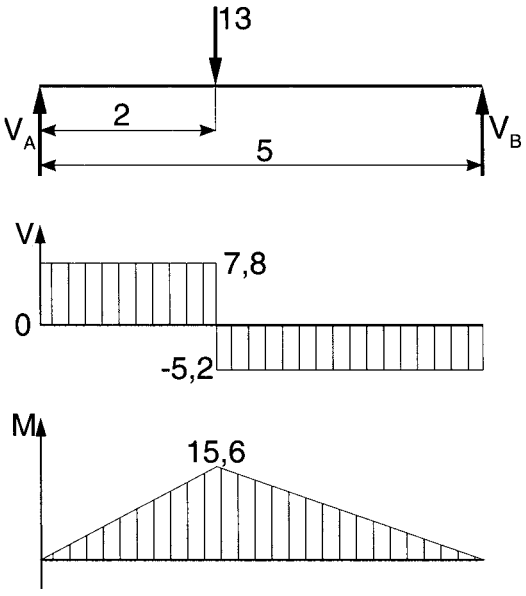
69. $M_1 = 2{,}096$ kNm
$M_2 = 1{,}88$ kNm
$M_3 = 1{,}158$ kNm



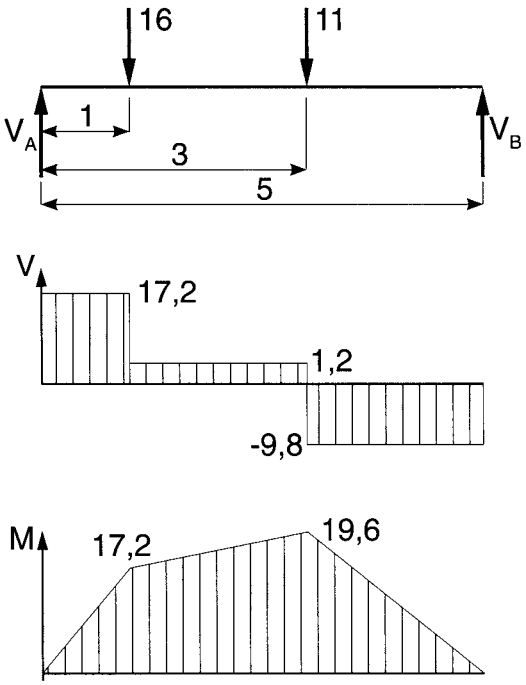
70. M = 49896 Nmm



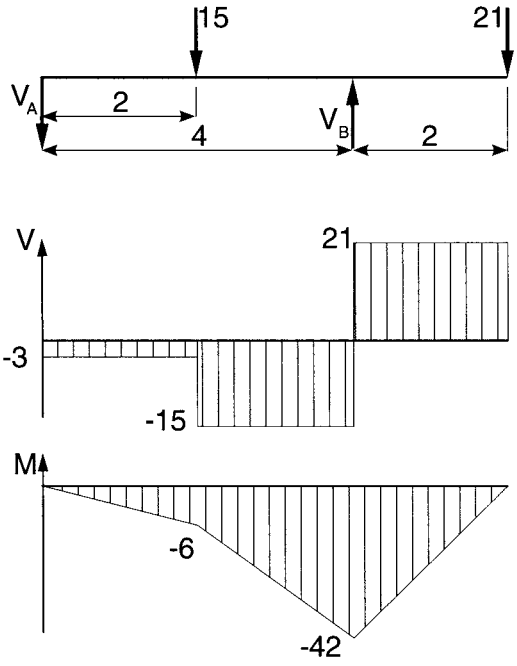
71a. V_A = 7,8 kN
V_B = 5,2 kN
M = 15,6 kNm



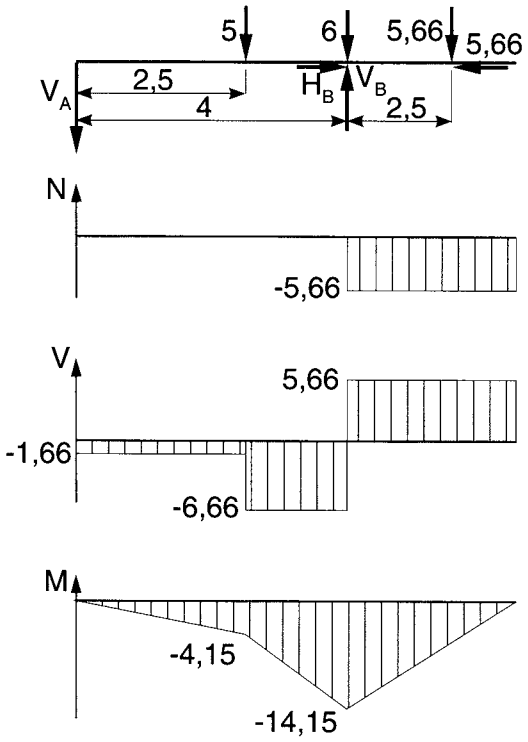
71b. V_A = 17,2 kN
V_B = 9,8 kN



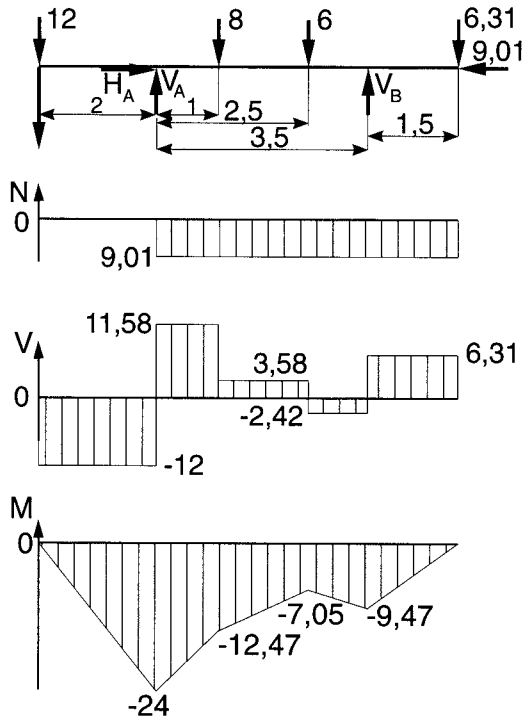
71c. V_A = 3 kN
V_B = 39 kN



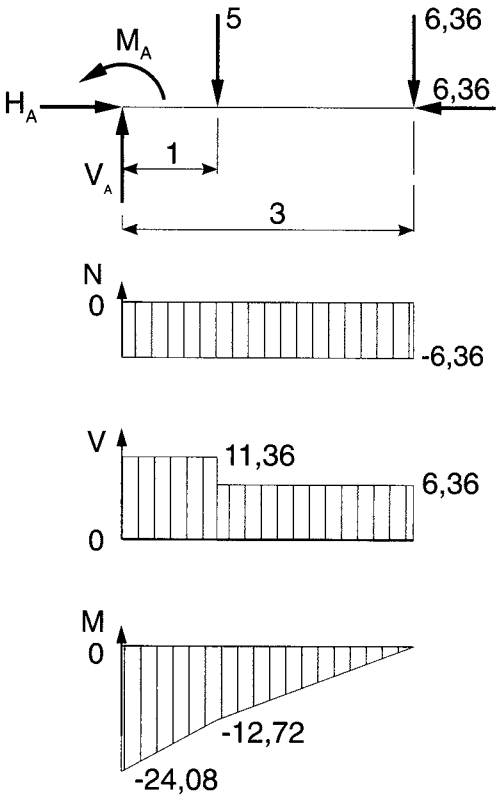
71d. $V_A = 1{,}66$ kN
$V_B = 18{,}32$ kN
$H_B = 5{,}66$ kN



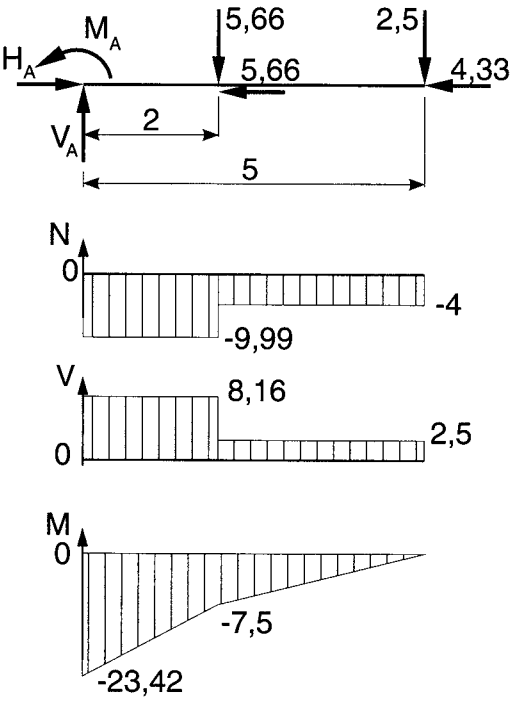
71e. $H_A = 9{,}01$ N
$V_A = 23{,}58$ N
$V_B = 8{,}73$ kNm



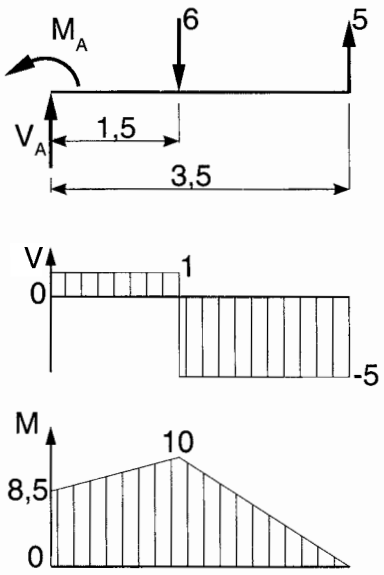
71f. $H_A = 6{,}36$ kN
$V_A = 11{,}36$ kN
$M_A = 24{,}08$ kNm



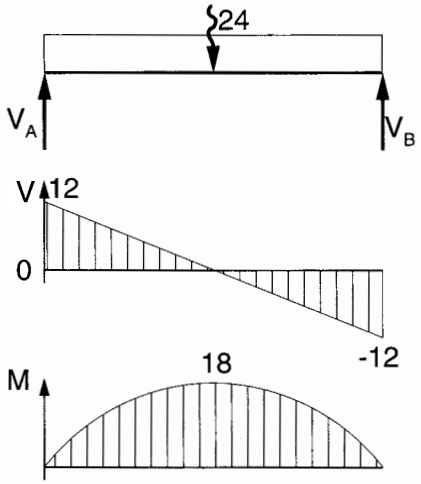
71g. $H_A = 9{,}99$ N
$V_A = 8{,}16$ N
$M_A = 23{,}42$ kNm



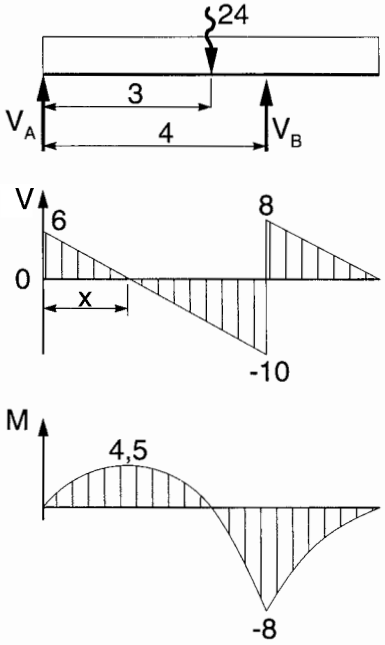
71h. $V_A = 1$ MN
$M_A = 8{,}5$ MNm



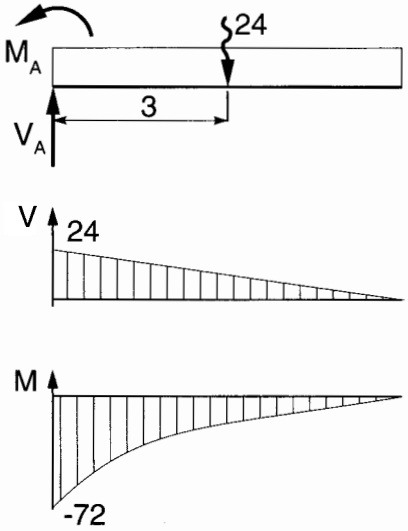
72a. $V_A = V_B = 12$ kN
$M = 18$ kNm



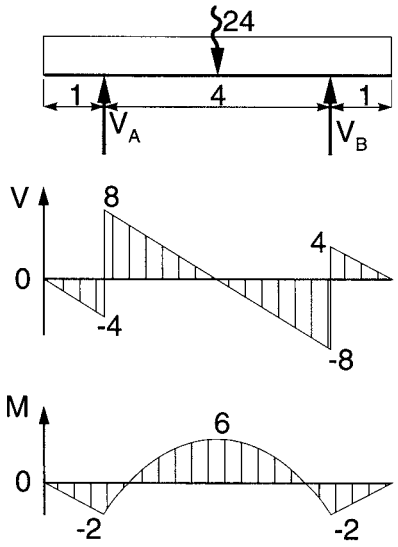
72b. $V_A = 6$ kN
$V_B = 18$ kN
$x = 1{,}5$ m



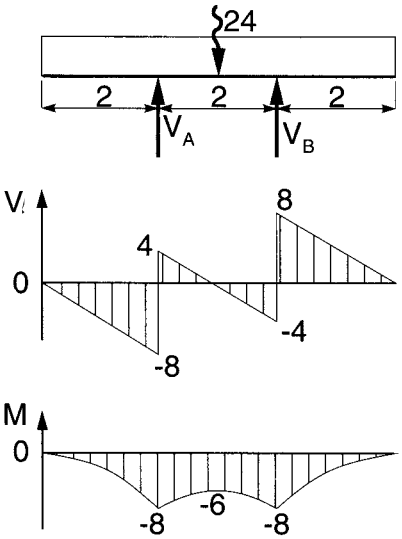
72c. $V_A = 24$ kN
$M_A = 72$ kNm



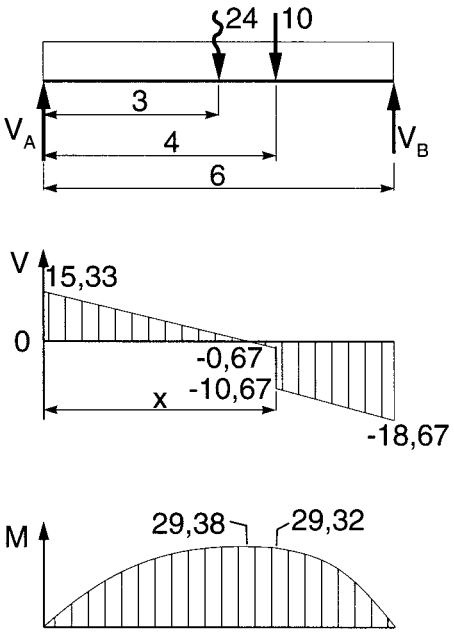
72d. $V_A = V_B = 12$ kN



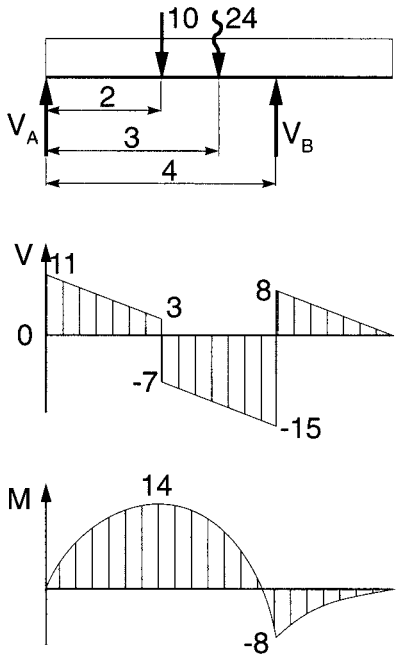
72e. $V_A = V_B = 12$ kN



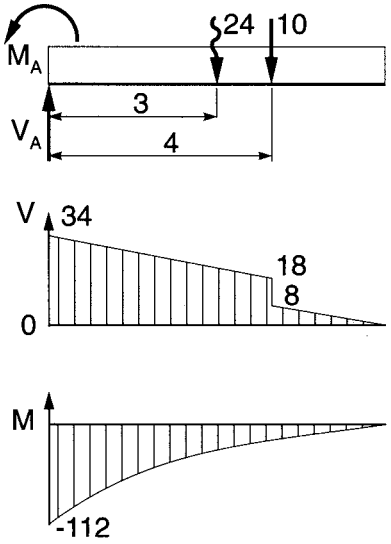
72f. $V_A = 15{,}33$ kN
$V_B = 18{,}67$ kN
$x = 3{,}83$ m



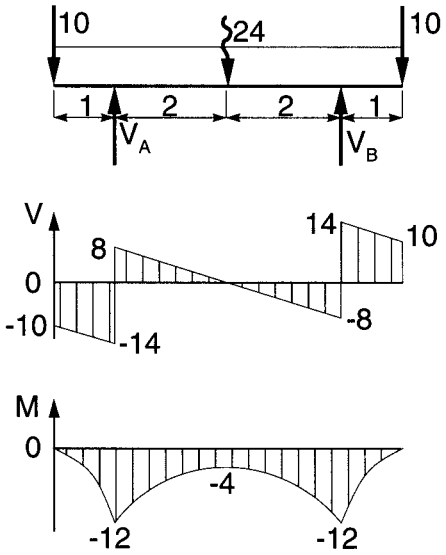
72g. $V_A = 11$ kN
$V_B = 23$ kN



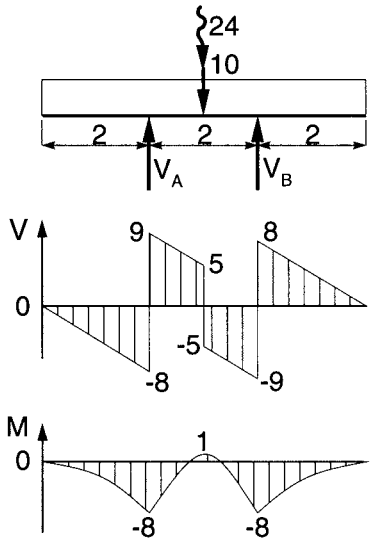
72h. $V_A = 34$ kN
$M_A = 112$ kNm



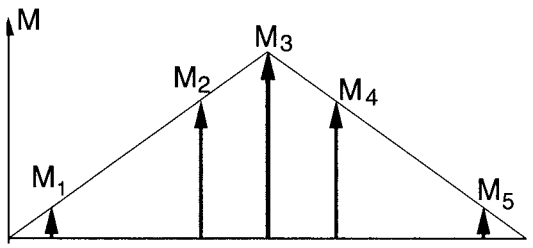
72i. $V_A = V_B = 22$ kN



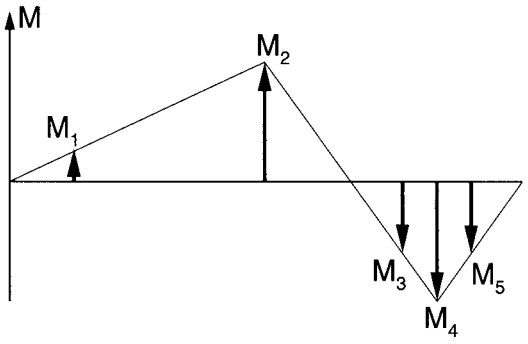
72j. $V_A = V_B = 17$ kN



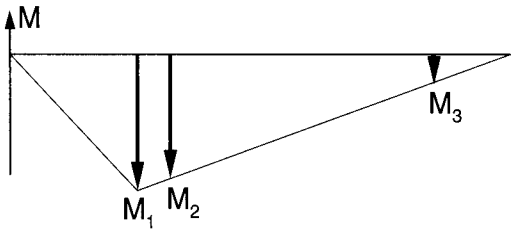
73. a) $V_A = 11{,}69$ kN
$V_B = 10{,}31$ kN
b) $M_1 = 187{,}04$ kNmm
$M_2 = 1262{,}52$ kNmm
$M_3 = 1753{,}5$ kNmm
$M_4 = 1299{,}06$ kNmm
$M_5 = 164{,}96$ kNmm



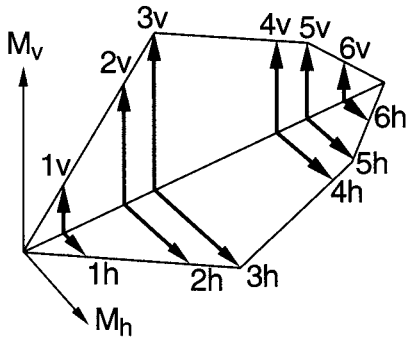
74. a) $V_A = 0{,}8$ kN
$V_B = 8{,}7$ kN
b) $M_1 = 24$ kNmm
$M_2 = 224$ kNmm
$M_3 = -190$ kNmm
$M_4 = -328$ kNmm
$M_5 = -205$ kNmm



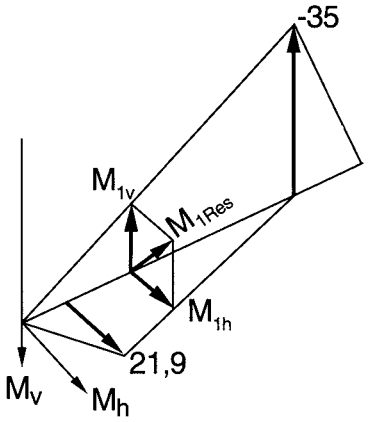
75. a) $V_A = 28{,}8$ kN
$V_B = 4{,}8$ kN ($\downarrow$)
b) $M_1 = -1920$ kNmm
$M_2 = -1824$ kNmm
$M_3 = -96$ kNmm



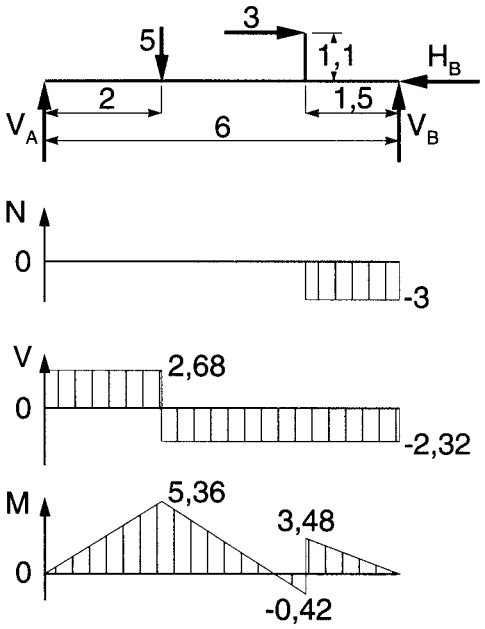
76. a) $V_A = 12{,}18$ kN
$V_B = 12{,}82$ kN
$H_A = 9{,}125$ kN
$H_B = 8{,}375$ kN
c) $M_{1Res} = 152{,}19$ kNmm
$M_{2Res} = 608{,}76$ kNmm
$M_{3Res} = 837{,}05$ kNmm
$M_{4Res} = 496{,}09$ kNmm
$M_{5Res} = 328{,}83$ kNmm
$M_{6Res} = 153{,}13$ kNmm



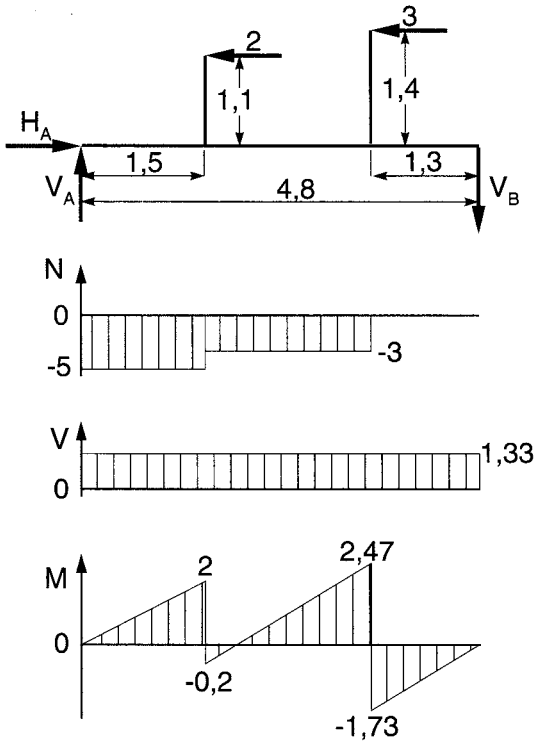
77. a) $V_A = 0{,}39$ kN ($\downarrow$)
$V_B = 1{,}79$ kN
b) $H_A = 0{,}73$ kN
$H_B = 0{,}37$ kN
c) $M_{Res} = 24{,}3$ kNmm



78a. $H_B = 3$ kN
$V_A = 2{,}68$ kN
$V_B = 2{,}3$ kN



78b. $H_B = 5$ kN
$V_A = 1{,}33$ kN
$V_B = 1{,}33$ kN (↓)



3. GITTERKONSTRUKTIONER

79. $H_A = 6$ MN
$V_A = 5{,}625$ MN
$V_B = 9{,}375$ MN

80. $V_A = 0{,}96$ MN
$V_B = 5{,}54$ MN

81. $H_A = 6{,}92$ MN
$H_B = 6{,}92$ MN
$V_B = 8$ MN

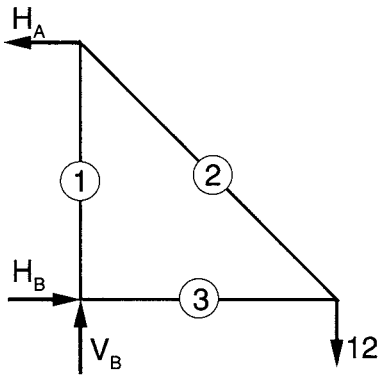
82. $H_A = 298{,}38$ N
$V_A = 19{,}56$ N
$V_B = 139{,}61$ N (↓)

83. $V_A = 250$ N
$V_B = 1050$ N

84. a) $V_A = V_B = 20$ MN
b) $S_1 = -20$ MN (trykstang)
$S_2 = 7{,}07$ MN (trækstang)
$S_3 = 15$ MN (trækstang)

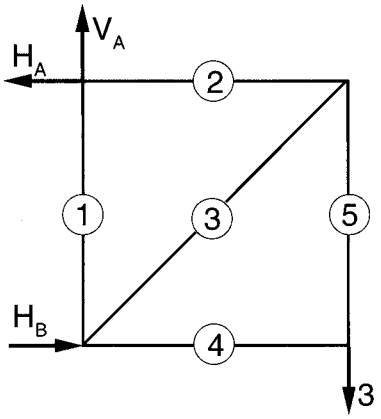
85. a) $V_A = V_B = 60$ MN
b) $S_1 = -60$ MN (trykstang)
$S_2 = 21{,}21$ MN (trækstang)
$S_3 = 45$ MN (trækstang)

86. a) $H_A = 12$ MN
$H_B = 12$ MN
$V_B = 12$ MN
b) $S_1 = -12$ MN (trykstang)
$S_2 = 16{,}97$ MN (trækstang)
$S_3 = -12$ MN (trykstang)



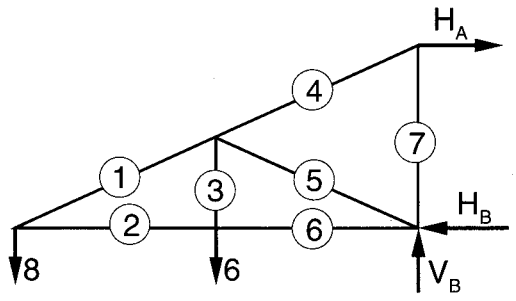
87. a) $H_A = 3$ MN
$V_A = 3$ MN
$H_B = 3$ MN

b) $S_1 = 3$ MN (trækstang)
$S_2 = 3$ MN (trækstang)
$S_3 = -4{,}24$ MN (trykstang)
$S_4 = 0$
$S_5 = 3$ MN (trækstang)



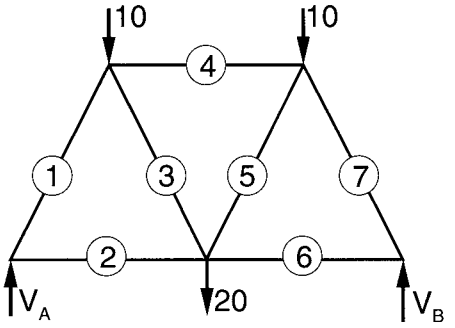
88. $H_A = 22$ kN
$H_B = 22$ kN
$V_B = 14$ kN

Stang nr.	Størrelse (kN) Træk	Tryk
1	17,89	
2		16
3	6	
4	24,6	
5		6,71
6		16
7		11



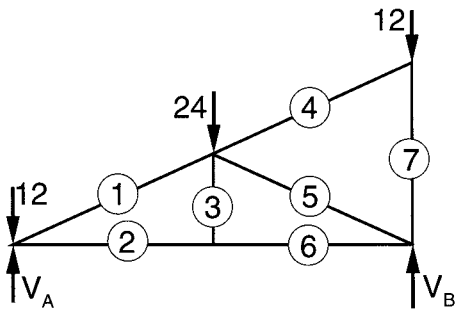
89.

Stang nr.	Størrelse (kN) Træk	Tryk
1 = 7		23,09
3 = 5	11,55	
2 = 6	11,55	
4		17,32



90.

Stang nr.	Størrelse (kN) Træk	Tryk
1		26,83
2	24	
3	0	
4	0	
5		26,83
6	24	
7		12

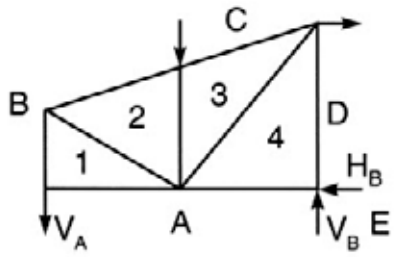


91.

VA = 300 N

VB = 900 N

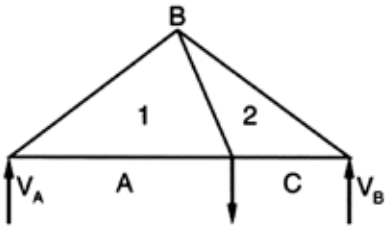
Stang nr.	Størrelse (kN) Træk	Tryk
a-1	0	
b-1	300	
b-2	335	
1-2		335
c-3	335	
2-3		600
a-4		800
d-4		900
3-4	0	



92.

V_A = 0,89 kN
V_B = 1,71 kN

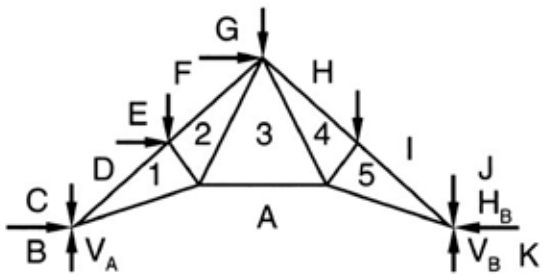
Stang nr.	Størrelse (kN) Træk	Tryk
a-1	1,19	
b-1		1,48
S_1 = b-2		2,85
S_2 = c-2	2,28	
S_3 = 1-2	2,82	



93.

V_A = 11,11 kN
V_B = 12,89 kN
H_B = 4 kN

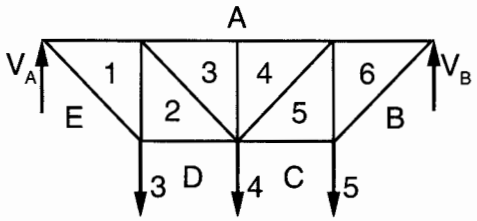
Stang nr.	Størrelse (kN) Træk	Tryk
S_2 = a-1	13,7	
a-3	5,1	
a-5	12	
S_1 = d-1		18,73
f-2		17
h-4		16,8
i-5		20,7
1-2		5,8
2-3	10,2	
3-4	8,4	
4-5		4,75



94.

$V_A = 5{,}5$ MN
$V_B = 6{,}5$ MN

Stang nr.	Størrelse (kN) Træk	Tryk
a-1		5,5
a-3		8
a-4		7,5
a-6		6,5
b-6	9,19	
c-5	6,5	
d-2	5,5	
e-1	7,78	
1-2		2,5
2-3	2,83	
3-4	0	
4-5	2,12	
5-6		1,5



95.

a) $F = 2{,}549$ kN $(g = 10\ m/sek^2)$
b) $H_A = 2{,}549$ kN
$H_B = 2{,}549$ kN
$V_B = 2{,}549$ kN
c) $S_1 = 3{,}604$ kN (trækstang)
$S_2 = -2{,}549$ kN (trykstang)
$S_3 = -2{,}549$ kN (trykstang)

4. STYRKELÆRENS GRUNDBEGREBER

Opgave 96-110
Resultaterne er baseret på, at der på de givne figurer er indlagt et koordinatsystem, hvor x-aksen er beliggende i arealets nederste sidelinje, og y-aksen er beliggende i arealets yderste, venstre sidelinje.

96. a) (x,y) = (11,43 , 25,36)
b) v = 37,98°

97. (x,y) = (20 , 23,27)

98. (x,y) = (15 , 21,67)

99. (x,y) = (60 , 75,7)

100. (x,y) = (25 , 9,71)

101. (x,y) = (40 , 47,89)

102. (x,y) = (51,43 , 18,57)

103. (x,y) = (47,5 , 45)

104. (x,y) = (14,72 , 16,67)

105. (x,y) = (488,32 , 162,49)

106. (x,y) = (2 , 0,79)

107. (x,y) = (15 , 15,17)

108. $F_1 = 52$ N (til venstre)
$F_2 = 65$ N (til højre) $(g = 10\ m/s^2)$

109. Vinklen = 25,11°

110. (x,y) = (74,85 , 75) (x- og y-aksen er placeret i henholdsvis snitpladens nederste kantlinje og venstre kantlinje).

111. $I_x = 1{,}152 \cdot 10^6\ mm^4$ $I_y = 0{,}879 \cdot 10^6\ mm^4$

112. $I_x = I_y = 258 \cdot 10^6\ mm^4$

113. (y = 19,42 mm - tyngdepunktsafstand fra nederste linje)
$I_x = 0{,}44 \cdot 10^6\ mm^4$ $I_y = 0{,}47 \cdot 10^6\ mm^4$

144. a = 188,15 mm

115. $I_x = 22{,}4 \cdot 10^6\ mm^4$ $I_y = 4{,}8 \cdot 10^6\ mm^4$

116. $I_x = 38{,}2 \cdot 10^6\ mm^4$ $W_x = 382 \cdot 10^3\ mm^3$
$I_y = 16{,}06 \cdot 10^6\ mm^4$ $W_y = 160{,}6 \cdot 10^3\ mm^3$

117. (x,y) = (15,20) - koordinatsystemet er indlagt således, at y-aksen er placeret i arealets venstre sidelinje, og x-aksen er placeret i arealets nederste linje.
$I_x = 0{,}04 \cdot 10^6\ mm^4$ $W_x = 2 \cdot 10^3\ mm^3$
$I_y = 0{,}085 \cdot 10^6\ mm^4$ $W_y = 3{,}4 \cdot 10^3\ mm^3$

118. (x,y) = (19,38 , 17,18) - koordinatsystemet er indlagt således, at y-aksen er placeret i arealets venstre sidelinje, og x-aksen er placeret i arealets nederste linje.
$I_x = 0{,}1228 \cdot 10^6\ mm^4$ $W_x = 5{,}39 \cdot 10^3\ mm^3$
$I_y = 0{,}0764 \cdot 10^6\ mm^4$ $W_y = 3{,}71 \cdot 10^3\ mm^3$

119. y = 106,84 mm (y er afstanden fra arealets nederste linje til tyngdelinjen)
$I_x = 48{,}24 \cdot 10^6\ mm^4$ $W_x = 315 \cdot 10^3\ mm^3$

120. y = 94,35 mm (y er afstanden fra arealets nederste sidelinje til tyngdelinjen)
$I_x = 7{,}29 \cdot 10^6\ mm^4$ $W_x = 77{,}31 \cdot 10^3\ mm^3$

121. (x,y) = (13,19) - koordinatsystemet er indlagt således, at y-aksen er placeret i arealets venstre sidelinje, og x-aksen er placeret i arealets nederste sidelinje.
$I_x = 0{,}036 \cdot 10^6\ mm^4$ $W_x = 1{,}9 \cdot 10^3\ mm^3$
$I_y = 0{,}072 \cdot 10^6\ mm^4$ $W_y = 2{,}7 \cdot 10^3\ mm^3$

122. y = 52,44 mm (y er afstanden fra arealets nederste sidelinje til tyngdelinjen)
$I_x = 7{,}777 \cdot 10^6\ mm^4$ $W_x = 148{,}294 \cdot 10^3\ mm^3$

123. $I_x = 2{,}028 \cdot 10^6\ mm^4$ $W_x = 50{,}71 \cdot 10^3\ mm^3$
$I_y = 1{,}91 \cdot 10^6\ mm^4$ $W_y = 45{,}796 \cdot 10^3\ mm^3$

124. a) $\sigma = 100\ \frac{N}{mm^2}$

b) $\Delta L = 3{,}8$ mm

125. a) N= 26950 N
b) $\sigma = 77\ \frac{N}{mm^2}$

126. a) N= 11875 N
b) $\Delta L = 0{,}4$ mm

127. $\Delta L = 0{,}418$ mm

5. STÅLKONSTRUKTIONER

128. $22 \cdot 10^3\ N < 51{,}27 \cdot 10^3\ N$

129. a) Rørprofil 60 · 60 · 2,9 mm
b) $135 \cdot 10^3\ N < 139{,}93 \cdot 10^3\ N$

130. N_{Ed}= 1160 kN

131. a) Middelsvært gevindrør med d = 20 mm
b) $40{,}5 \cdot 10^3\ N < 43{,}15 \cdot 10^3\ N$

132. a) $S_1 = S_2 = 11{,}31$ kN
b) Svært gevindrør med d = 6 mm
c) $11{,}31 \cdot 10^3\ N < 13{,}43 \cdot 10^3\ N$

133. a) 19,976 kN (g ~ 10 $\frac{m}{s^2}$)

b) d = 10,91 mm ~ 12 mm

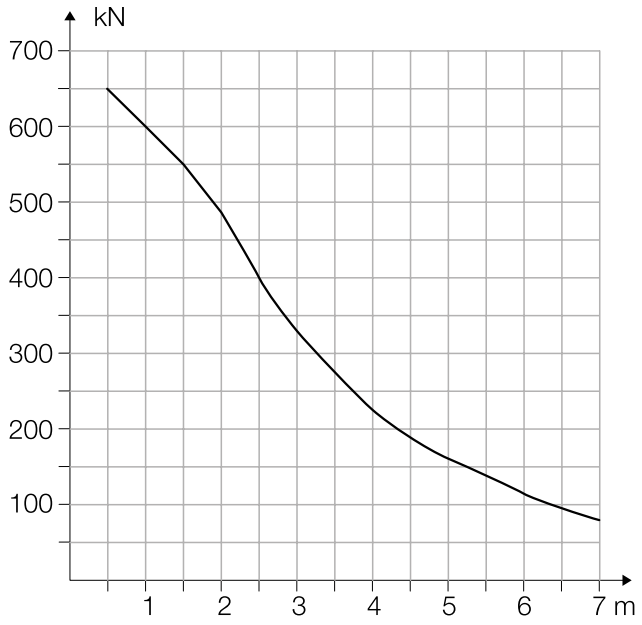
c) $19{,}976 \cdot 10^3\ N < 24{,}161 \cdot 10^3\ N$

134. HE 200B : $520 \cdot 10^3\ N < 780{,}024 \cdot 10^3\ N$

135. N_{Ed} ~ 712 kN

136. IPE 240 : $200 \cdot 10^3\ N < 222{,}055 \cdot 10^3\ N$

137.



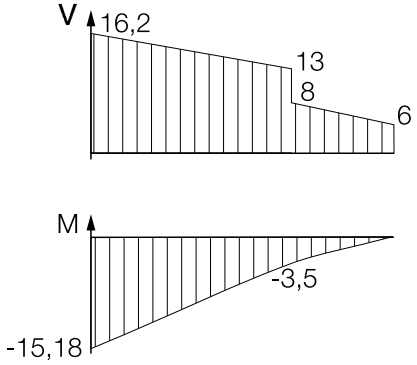
138. HE 140B : $260 \cdot 10^3\ N < 395{,}78 \cdot 10^3\ N$

139. HE 120B : $505 \cdot 10^3\ N < 529{,}83 \cdot 10^3\ N$

140. N_{Ed} ~ 1029,3 kN

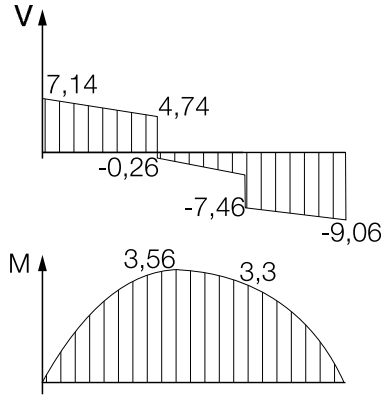
141. a) $S_1 = 47{,}67$ kN (trækstang)
$S_2 = 62{,}23$ kN (trykstang)
b) 1. $47{,}67 \cdot 10^3$ N < $177{,}53 \cdot 10^3$ N
2. $62{,}23 \cdot 10^3$ N < $156{,}23 \cdot 10^3$ N

142. a) $V_A = 16{,}2$ kN $M_A = 15{,}18$ kNm
b)



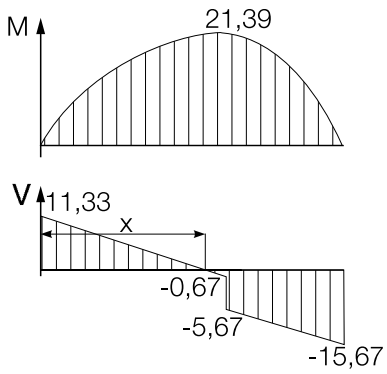
c) IPE 140
d) $15180 \cdot 10^3$ Nmm < $19325 \cdot 10^3$ Nmm

143. a) $V_A = 7{,}14$ kN $V_B = 9{,}06$ kN
b)



c) INP 80
d) $3560 \cdot 10^3$ Nmm < $4272 \cdot 10^3$ Nmm

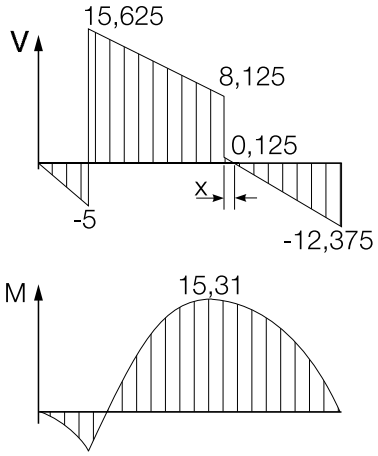
144. a) $V_A = 11{,}33$ kN $V_B = 15{,}67$ kN
b) x = 3,78 m (se figuren)



c) HE 120B
d) $21390 \cdot 10^3$ Nmm < $30763 \cdot 10^3$ Nmm

145. $q_{rmax} = 46{,}65 \ \frac{kN}{m}$

146. a) $V_A = 20{,}625$ kN $V_B = 12{,}375$ kN
b) x = 0,025 m (se figuren)



c) INP 140
d) $15310 \cdot 10^3$ Nmm < $16514 \cdot 10^3$ Nmm

147. INP 260 ($I_x = 57{,}4 \cdot 10^6\,mm^4 > I = 56{,}25 \cdot 10^6\,mm^4$)

148. HE 200B ($I_x = 57 \cdot 10^6\,mm^4 > I = 46{,}42 \cdot 10^6\,mm^4$)

149. a = 371 mm

150. a = 119,35 mm

6. TRÆKONSTRUKTIONER

151. $\sigma_{t,0,d}$ = 6,8 MPa < $f_{t,0,d}$ = 7,99 MPa

152. a) 100 · 200 mm
b) $\sigma_{t,0,d}$ = 5,5 MPa < $f_{t,0,d}$ = 6,21 MPa

153. a) N_{Ed} = 53846,5 N
b) N_{Ed} = 62799,5 N
c) N_{Ed} = 71753,5 N
d) N_{Ed} = 80707 N
e) N_{Ed} = 98615 N

154. a) h = 175 mm (50 · 175 mm)
b) $\sigma_{t,0,d}$ = 5,33 MPa < $f_{t,0,d}$ = 6,21 MPa

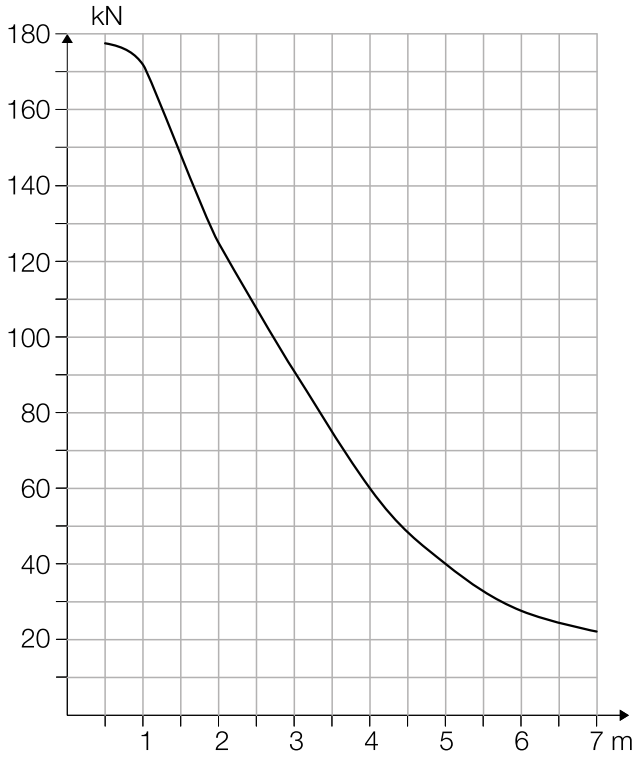
155. $\sigma_{t,0,d}$ = 6,67 MPa > $f_{t,0,d}$ = 4,88 MPa
Omdimensionering: 19 · 175 mm
$\sigma_{t,0,d}$ = 2,86 MPa < $f_{t,0,d}$ = 4,88 MPa

156. N_{Ed} = 36685 N

157. 150 · 150 mm, $\sigma_{c,0,d}$ = 1,87 MPa < $k_c \cdot k_d \cdot f_{c,0,k}$ = 3,44 MPa

158. N_{Ed} ~ 58275 N

159.



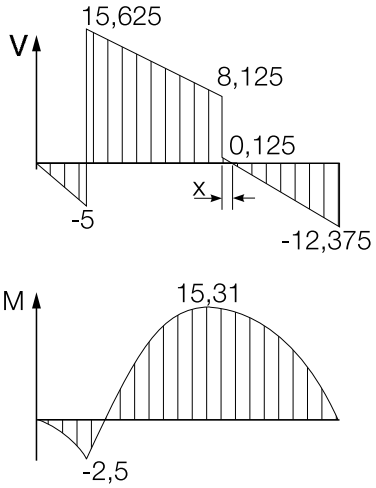
160. 200 · 200 mm
$\sigma_{c,0,d}$ = 1,5 MPa < 3,04 MPa

161. N_{Ed} ~ 39160 N

162. a) 100 · 225 mm
b) $\sigma_{m,d}$ = 5,92 MPa < $f_{m,d}$ = 7,99 MPa

163. p_{max} = 5,66 $\frac{kN}{m}$

164. a) V_A = 20,625 kN V_B = 12,375 kN
b) x = 0,025 m (se figuren)



c) 225 · 225 mm
d) $\sigma_{m.d}$ = 8,07 MPa < $f_{m,d}$ = 10,65 MPa

165. u_{max} = 8,33 mm

166. Deformation: 140 · 220 mm
u = 7,66 mm < u_{max} = 8 mm

7. MASKINELEMENTER

167. a) $\sigma = 78$ MPa $< \sigma_{til} = 85$ MPa

$\tau = 3{,}25$ MPa $< \tau_{til} = 65$ MPa

b) $\sigma = 66{,}3$ MPa $< \sigma_{til} = 85$ MPa

$\tau = 2{,}6$ MPa $< \tau_{til} = 65$ MPa

168. a) torsion - varierende
b) d = 35,39 mm

169. Fladetryk i gaffel: $p = 27{,}5$ MPa $< p_{til} = 50$ MPa

Fladetryk i midterstykke:
$p = 34{,}5$ MPa $< p_{til} = 75$ MPa

Forskydning: $\tau = 17{,}5$ MPa $< \tau_{til} = 90$ MPa

Bøjning: $\sigma_b = 34{,}4$ MPa $< \sigma_{btil} = 85$ MPa

170. a) $V_A = 57{,}6$ kN $V_B = 38{,}4$ kN
b) $M_1 = 2880$ kNmm
$M_2 = 10368$ kNmm
$M_3 = 13824$ kNmm
$M_4 = 11904$ kNmm
$M_5 = 1920$ kNmm
c) $d_1 = 69{,}7$ mm
$d_2 = 106{,}8$ mm
$d_3 = 117{,}6$ mm
$d_4 = 111{,}9$ mm
$d_5 = 60{,}9$ mm